Journal of Intelligent Decision Support System (IDSS) 4 (1) (2021) 1-5

Published by: IOCSCIENCE

Journal of Intelligent Decision Support System (IDSS)

Journal homepage: www. idss.iocspublisher.org

Decision Support System for Determining the Location of Bank Indonesia Gorontalo Offices Using the Weighted Product Method

Siddiq Fahriady Seban

Fakultas Teknik, Teknik Informatika, Universitas Negeri Gorontalo

Article Info

Article history:

Received: 10/01/2021
Revised: 20/02/2021
Accepted: 02/03/2021
Available online 30/03/2021

Keywords:

Decision Support System,
FMADM,
WP,
Alternative,
Land

ABSTRACT

The decision support system for determining the location of the Bank Indonesia Gorontalo office is an application program created to be used by the Bank Indonesia Gorontalo office in determining the best alternative land that will become the land for the Bank Indonesia Gorontalo Office, the assessment of this alternative land is modeled based on alternative data compiled with the following criteria. has been determined. The data and alternative criteria were processed using the Fuzzy Multiple Attribute Decision Making (FMADM) Weigted Product (WP) method. In using this method, it is hoped that the system application that will be used can assist the decision-making process so as to obtain the best alternative land which will later be used as land for the Bank Indonesia Gorontalo office.

This is an open access article under the CC BY-NC license.

Corresponding Author:

Siddiq Fahriady Seban,
Fakultas Teknik, Teknik Informatika,
Universitas Negeri Gorontalo
Email: fahriady.siddiq@gmail.com

1. Introduction

Bank Indonesia is the Central Bank of the Republic of Indonesia. The Bank Indonesia Gorontalo office was officially established on December 15, 2008 with a working area covering the Province of Gorontalo. Based on PDG no. 10/5/PDG/2008 dated August 28, 2008 and SE INTERN no. 10/71/INTERN dated December 1, 2008, KBI Gorontalo carried out a limited function in the field of monetary economy and then will carry out its full function in stages in accordance with the planning and readiness for the fulfillment of facilities, infrastructure and resources.

Currently, the Bank Indonesia Gorontalo Office carries out the functions of the monetary economy, banking functions and internal management, but in terms of the implementation of the payment system, it has not yet been implemented. In the future, Bank Indonesia Gorontalo will carry out its functions in full, meaning that it will carry out the functions of the payment system. However, this condition is still constrained by the availability of unrepresentative office buildings.

Bank Indonesia through the Directorate of Logistics and Security (DLP) in collaboration with the Bank Indonesia Gorontalo Office is currently trying to review and analyze the location of a representative office building.

Based on the problems above, the effort to build a Decision Support System is one of the important factors to be implemented so that it can assist Bank Indonesia management in determining the location of the Office Building. In the following research the decision support system that will be applied is the Weighted Product Method, with this system it is expected to be able to overcome the problems - problems above.

2. Method

2.1 Data collection

Data collection techniques that will be used in this study are as follows:

a. Documentation Study The author conducted a documentation study by reviewing documents related to the criteria for determining land for the Bank Indonesia Gorontalo Office.
b. Interviews were conducted to obtain detailed data on the existing system from various sources interviewed such as the Human Resources Unit, Managers and Leadership Levels that determine the Location

2.2 Analysis of the Weighted Product (WP) Method

The weighted product method is a method for completing Multi Attribute Decision Making (MADM). The Weighted Product uses a multiplication technique to connect the rating attribute, where the rating of each attribute must be raised first with the associated weight attribute. The steps taken in solving the problem using the Weighted Product method are.

a. Normalization or Repair of Weights

$$w_j = \frac{w_j}{\sum w_j}$$

Normalize or correct the weights to produce values where 1, 2, ..., n are the number of alternatives and is the total number of weighted values. 2. Determining Vector Value (S)

$$S_i = \prod_{j-1}^{n} x_{ij}\, w_j \prod_{j-1}^{n} x_{ij}\, w_j, \; w_j = 1 \qquad j = \sum w_j$$

with i = 1, 2, ..., n

b. Determine the vector value (S) by multiplying all the criteria with an alternative normalization result or weight improvement that has a positive rank for the profit criteria (benefit) and the negative power for the cost criteria (cost). Where (S) is the criterion preference, (x) is the criterion value and (n) is the number of criteria.
c. Determining Vector Value (V)

$$V_i = \frac{\prod_{j=1}^{n} x_{1j}\, w_j}{\prod_{j=1}^{n} (x_j^w) w_j}$$, where i = 1, 2, ..., n

Determine the vector value (V) where is vector (V) is an alternative preference that will used for ranking of each number of vector values by the sum of all vector values (S)

3. Results and Discussion

3.1 Results

a. Weighting

In this research method, there are weights and criteria needed to determine the location that will be selected as the Location of the Gorontalo Bank Indonesia Office. The criteria are:

TABLE 1.
CRITERIA

Code	Description
C1	Land area
C2	Market price
C3	Legal Aspect
C4	Located in the area/office zone
C5	not located in areas that are potentially affected by natural disasters
C6	Soil Contour
C7	Supporting Facilities
C8	Accessibility

Code	Description
C9	City planning
C10	Environmental conditions

The level of interest that will be weighted in each criterion is as follows:

1 = Very Low
2 = Low
3 = Enough
4 = Height
5 = Very High

Furthermore, the decision maker gives the Preference Weight for each criterion as W = (5, 5, 5, 4, 5, 4, 5, 3, 4, 5).

b. Manual Calculation

As an example of the manual implementation of the Weighted Product method, namely with 3 alternative land offers that have been entered at the Bank Indonesia Gorontalo Representative Office

TABLE 2.
ALTERNATIVE

No.	Bidders Name	Land area	Market price	Legal Aspect	Office Zone
1.	Rusni Napu	15,050 m2	Rp. 430,000/meter	Legality is very good	Office and Street Type 2
2.	Zainudin Hasan	12,826 m2	Rp. 500,000 /meter	Potential problems	Office and Street Type 1
3.	Masri Hamzah	22,400 m2	Rp. 500,000/meter	Legality is very good	Office and Street Type 1

TABLE 3.
DATA

Disaster Impact	Land contour	Facility	Accessibility	City Planning	Environmental conditions
Flood/Landslide Path	Hard Ground, Soil flat & solid	Available	not main line, Adequate road width & there are alternative roads	Residential area is planned, relatively close to local government offices	Enabling Environment
No disaster history	Former rice fields & > 5 years buried	Available	Not the main line, the road width is adequate, there are no alternative roads	According to the spatial and urban planning	Enabling Environment
No disaster history	Former rice fields & > 5 years buried	Available	Not the main line, the road width is adequate, there are no alternative roads	According to the spatial plan and urban planning	Enabling Environment

c. Based on alternative data

Based on the alternative data above, a suitability rating for each alternative on each criterion can be formed, which can be seen in table 3:

TABLE 4.
THE SUITABILITY RATING OF EACH ALTERNATIVE ON EACH CRITERION

Alternative	Criteria									
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
A1	5	5	5	3	3	5	5	3	4	5
A2	5	5	1	4	5	4	5	2	5	5
A3	5	5	5	4	5	4	5	2	5	5

The categories for each criterion are as follows:

Criteria C1 (Land Area), C3 (Legal Aspects), C4 (located in an office area/zone), C5 (not located in an area potentially affected by natural disasters), C6 (Soil contour), C7 (Supporting Facilities), C8 (Accessibility), C9 (City Planology) and C10 (Environmental conditions) are the criteria of benefit.

Criterion C2 (Market price) is the cost criterion.

Previously, the weights were corrected so that W = 1, then the following calculations were obtained:

$$W1 = = = 0.11\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$$

$$W2 = = = 0.11\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$$

W3 = = = 0.11$\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$
W4 = = = 0.09$\frac{4}{5+5+5+4+5+4+5+3+4+5}\frac{4}{45}$
W5 = = = 0.11$\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$
W6 = = = 0.09$\frac{4}{5+5+5+4+5+4+5+3+4+5}\frac{4}{45}$
W7 = = = 0.11$\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$
W8 = = = 0.07$\frac{3}{5+5+5+4+5+4+5+3+4+5}\frac{3}{45}$
W9 = = = 0.09$\frac{4}{5+5+5+4+5+4+5+3+4+5}\frac{4}{45}$
W10 = = = 0.11$\frac{5}{5+5+5+4+5+4+5+3+4+5}\frac{5}{45}$

Then the vector S is calculated based on the equation:

$$S_i = \prod_{j=1}^{n} x_{ij}^{w_j}, \quad \text{..... (1)}$$

with i = 1,2,……., m.

Where Wj = 1. Wj is a positive rank for the profit attribute, and a negative value for the cost attribute. Then Vector S can be calculated as follows:

S1 = (50.11) (5-0.11) (50.11) (30.09) (30.11) (50.09) (50.11) (30.07) (40.09) (50.11) = 2.96 S2 = (50.11) (5-0.11) (10.11) (40.09) (50.11) (40.09) (50.11) (20 .07) (50.09) (50.11) = 2.62

S3 = (50.11) (5-0.11) (50.11) (40.09) (50.11) (40.09) (50.11) (20.07) (50.09) (50.11) = 3.12 The value of the vector V used for ranking is calculated based on:

$$V_i = \frac{\prod_{j=1}^{n} x_{ij}^{w_j}}{\prod_{j=1}^{n} \left(x_j^w\right)^{w_j}}; \quad \text{..... (2)}$$

with i = 1,2,…, m. as follows :

V1 = = = 0.3402$\frac{2,96}{2,96+2,62+3,12}\frac{2,96}{8,70}$
V2 = = = 0.3011$\frac{2,64}{2,96+2,62+3,12}\frac{2,62}{8,70}$
V3 = = = 0.3586$\frac{3,16}{2,96+2,62+3,12}\frac{3,12}{8,70}$

The final step is the ranking process. The ranking results obtained: V1 = 0.3402; V2 = 0.3011; and V3 = 0.3586. The greatest value is in V3 so that alternative A3 (3rd offer) is the alternative chosen as the best alternative.

3.2 Discussion

Based on the observations obtained from this research, it can be expected that the accuracy of the Decision Support System for Determining the Location of the Gorontalo Bank Indonesia Office can be better and further improved.

4. Conclusion

Based on the results of analysis, design, and implementation, a decision support system has been successfully built so that objective decisions can be determined. The system that has been made refers to the existing problem formulation, namely the system can select alternative offers for Bank Indonesia office land that are entered according to the provisions by performing calculations based on the WP (Weighted Product) method on FMADM (Fuzzy Multiple Attribute Decision Making).

The decision with the best alternative resulting from the decision support system to determine the location of the Bank Indonesia Gorontalo Office using the Weighted Product method, is not an

absolute decision where the final decision is still determined by the management decision maker. So a decision support system is a program that is used to assist in considering a decision.

Reference

Azhar, Kasim. 1995. Decision Making Theory. Jakarta: Faculty of Economics, University of Indonesia.

Bank Indonesia. 2004. Bank Indonesia Central Bank of the Republic of Indonesia An Introduction. Jakarta: Center for Central Banking Education and Studies.

Bank Indonesia. 2008. Circular No. 10/71/INTERN dated December 1, 2008. Regarding the Organization of the Gorontalo Bank Indonesia Office. Jakarta

Farida, Noorafni. 2006. Decision Support System for Determining the Location of the Final Disposal Site (TPA). Thesis is not published. Bandung: Faculty of Engineering and Computer Science, Indonesian Computer University.

Kusrini. 2007. Concepts and Applications of Decision Support Systems. Yogyakarta: Andi.

Kusumadewi, Sri et al. 2006. Fuzzy Multi-Attribute Decision Making (Fuzzy MADM). Yogyakarta: Graha Ilmu.

Pressman, Roger. 1992. Software Engineering a Practitioner's Approach. Singapore: McGraw-Hill, Inc.

Turban et al. 2005. Decision Support System and Intelligent System. Yogyakarta: Andi.

(1999), Law no. 23 of 1999 concerning Bank Indonesia, Jakarta.

(2004), Law no. 3 of 2004 concerning Bank Indonesia, Jakarta.