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

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Article Info

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. 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.

Keywords: Decision Support System, FMADM, WP, Alternative, Land

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.

b. Determining Vector Value (\( \mathbf{x} \))

\[ \mathbf{x}_j = \prod_{i=1}^{n} x_{ij} \prod_{j=1}^{n} w_j \]

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

c. Determining Vector Value (\( \mathbf{v} \))

\[ \mathbf{v}_i = \frac{\prod_{j=1}^{n} x_{ij} w_j}{\prod_{j=1}^{n} (x_{ij})^{w_j}}, \text{ where } i = 1, 2, ..., n \]

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>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Land area</td>
</tr>
<tr>
<td>C2</td>
<td>Market price</td>
</tr>
<tr>
<td>C3</td>
<td>Legal Aspect</td>
</tr>
<tr>
<td>C4</td>
<td>Located in the area/office zone</td>
</tr>
<tr>
<td>C5</td>
<td>not located in areas that are potentially affected by natural disasters</td>
</tr>
<tr>
<td>C6</td>
<td>Soil Contour</td>
</tr>
<tr>
<td>C7</td>
<td>Supporting Facilities</td>
</tr>
<tr>
<td>C8</td>
<td>Accessibility</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>No.</th>
<th>Bidders Name</th>
<th>Land area</th>
<th>Market price</th>
<th>Legal Aspect</th>
<th>Office Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rusni Napu</td>
<td>15,050 m2</td>
<td>Rp. 430,000/meter</td>
<td>Legality is very good</td>
<td>Office and Street Type 2</td>
</tr>
<tr>
<td>2.</td>
<td>Zainudin Hasan</td>
<td>12,826 m2</td>
<td>Rp. 500,000/meter</td>
<td>Potential problems</td>
<td>Office and Street Type 1</td>
</tr>
<tr>
<td>3.</td>
<td>Masri Hamzah</td>
<td>22,400 m2</td>
<td>Rp. 500,000/meter</td>
<td>Legality is very good</td>
<td>Office and Street Type 1</td>
</tr>
</tbody>
</table>

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:

\[
W_1 = \frac{5}{5 + 5 + 4 + 5 + 4 + 5 + 3 + 4 + 5 + 45} = 0.11
\]
\[
W_2 = \frac{5}{5 + 5 + 4 + 5 + 4 + 5 + 3 + 4 + 5 + 45} = 0.11
\]
Decision Support System for Determining the Location of Bank Indonesia Gorontalo Offices Using the Weighted Product Method (Siddiq Fahriady Seban)

\[ W_3 = \frac{0.11}{5} \]
\[ W_4 = \frac{0.09}{4} \]
\[ W_5 = \frac{0.11}{5} \]
\[ W_6 = \frac{0.09}{4} \]
\[ W_7 = \frac{0.11}{5} \]
\[ W_8 = \frac{0.07}{3} \]
\[ W_9 = \frac{0.09}{4} \]
\[ W_{10} = \frac{0.11}{5} \]

Then the vector \( S \) is calculated based on the equation:

\[ S_i = \prod_{j=1}^{n} x_{ij}^{w_j} \]

(1)

with \( i = 1,2, \ldots, m \).

Where \( W_j \) = 1. \( W_j \) is a positive rank for the profit attribute, and a negative value for the cost attribute.

Then Vector \( S \) can be calculated as follows:

\[ S_1 = (50.11)(5-0.11)(50.11)(30.09)(30.11)(50.09)(50.11)(30.07)(40.09) \]
\[ S_2 = (50.11)(5-0.11)(10.11)(40.09)(50.11)(40.09)(50.11)(20.07)(50.09)(50.11) = 2.62 \]
\[ S_3 = (50.11)(5-0.11)(50.11)(40.09)(50.11)(40.09)(50.11)(20.07)(50.09)(50.11) = 3.12 \]

The value of the vector \( V \) used for ranking is calculated based on:

\[ V_i = \frac{\prod_{j=1}^{n} x_{ij}^{w_j}}{\prod_{j=1}^{n} (x_{ij}^{w_j})^{w_j}} \]

(2)

with \( i = 1,2, \ldots, m \) as follows:

\[ V_1 = 0.3402 \]
\[ V_2 = 0.3011 \]
\[ V_3 = 0.3586 \]

The final step is the ranking process. The ranking results obtained: \( V_1 = 0.3402; V_2 = 0.3011; \) and \( V_3 = 0.3586 \). The greatest value is in \( V_3 \) 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

(1999), Law no. 23 of 1999 concerning Bank Indonesia, Jakarta.
(2004), Law no. 3 of 2004 concerning Bank Indonesia, Jakarta.