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MOORA Method Analysis For Decision Support System Determining the Best Subsidized Housing in Tanjung Morawa

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Abstract

Subsidized housing is a government program as an alternative for low-income communities so that the primary needs of the community such as housing are met, especially for people who are already married. One of the areas where subsidized housing is located is the Tanjung Morawa area, Deli Serdang, North Sumatra. However, the problem for the community or employees who want to find a residence to live in the Tanjung Merowa area is the difficulty in determining a subsidized house that suits their wishes, such as comfort, housing price, house model, strategic location. The factor that makes it difficult for people to determine a residential house is because there is no knowledge or information about which subsidized house is the best according to the criteria to be occupied. Therefore, it is necessary to apply a method to analyze to determine the best subsidized house, the Objective Optimization on the basis of Ratio Analysis Simple (MOORA) method is applied to analyze the decision support system to determine the best subsidized house in Tanjung Morawa, where the MOORA method is able to produce the best subsidized house based on the highest value or ranking, where the highest value is ranking 1 alternative 6, Mulia Residence housing.

Keywords: *Best Subsidized Housing, Decision Support System, MOORA Method, Tanjung Morawa*

1. Introduction

Subsidized housing is a government program as an alternative for low-income communities so that the community's primary needs such as housing are met, especially for people who are already married.[1]. One of the areas that has subsidized housing is the Tanjung Morawa area, Deli Serdang, North Sumatra. Where in this area there are many companies, both as state-owned enterprises (BUMN) such as Kuala Namu airport, as well as private companies with large to small scales, and there are several government offices. So with the many BUMN and private companies and government offices, it will bring many people from various regions as employees so that they will settle in the Tanjung Morawa area and will look for housing to live in.

However, the problem for the community or employees who want to find a residence to live in the Tanjung Merowa area is the difficulty in determining a subsidized house that suits their wishes, such as comfort, housing price, house model, strategic location. Factors that make it difficult for people to determine a residential house because of the lack of knowledge or information about which subsidized house is the best according to the criteria to be occupied. Therefore, it is necessary to apply a method or system to determine the best subsidized house, so that with this method it can help the wider community in getting information to determine the subsidized house that they want to live in or occupy.

In computer science, there are many fields of science that can be applied to solve complex problems, including data mining decision support systems, expert systems, image processing, and others.[2][3][4][5].

In this study, the researcher applies a decision support system as a solution to solve existing problems. The decision support system explains the concept and activities of the Decision Support System, as well as the Factors that Influence Decision Making.[6]. In the decision-making system, there are many methods contained in it, namely the MOORA method, AHP, SAW and others. The researcher used the Objective Optimization on the basis of Ratio Analysis Simple (MOORA) method. The reason the researcher used the MOORA method is because the MOORA method has been widely used by previous researchers in decision making, including with the title "Application of the MOORA Method in Determining the Best Subsidized Housing in the Sei Mencirim Area", where the study produced the best subsidized housing according to the ranking based on existing criteria.[1]. Other researchers also say that the Moora method is better than the TOPSIS method.[7].

Based on the existing problems and problem-solving references, researchers use the Moora method to analyze the determination of the best subsidized housing in the Tanjung Morawa area, so that it can provide new knowledge for many groups in society in determining the best subsidized housing in Tanjung Morawa.

2. Research methods

This study begins by identifying the problem of determining the best subsidized houses in Morawa, then continues with data collection through interviews, observations, and literature studies to obtain the right method to solve the existing problems. The MOORA method is applied to the decision support system in analyzing the determination of the best subsidized house. The following is the flowchart applied to analyze the results of determining the best subsidized house.

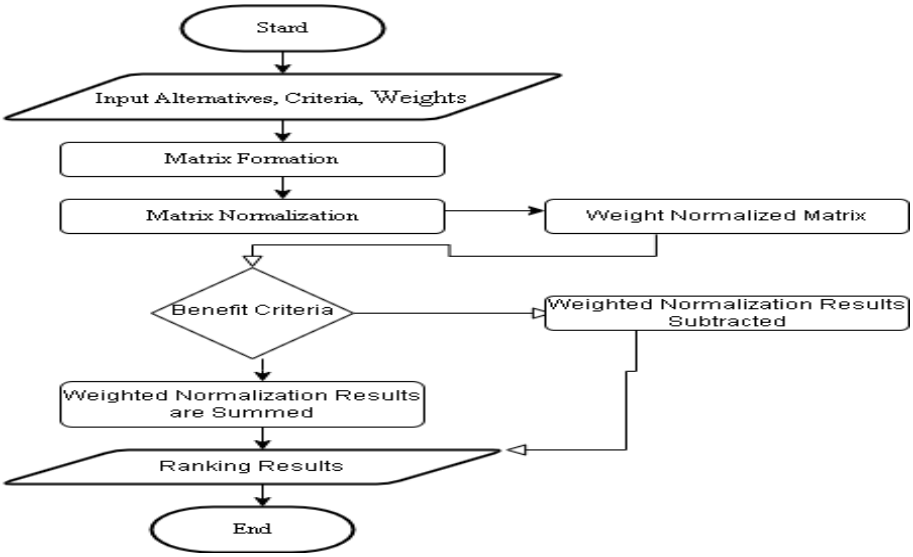

Fig. 1: Flowchart of Moora Method Solution

The explanation of the MOORA methodology completion flowchart is articulated as follows:

2.1. Inputting Criteria Values and Alternatives

Inputting criteria values into an alternative, where the values will be processed and the results used as a basis for decision making.

2.2. Forming a Decision MatrixDecision.

Forming a MOORA Matrix represents all available information for each attribute in the form of a decision matrix.

$$X = \begin{bmatrix} \text{X11} & X1j & X1n \\ Xj1 & Xij & Xjn \\ Xm1 & Xmi & Xmn \end{bmatrix} \quad (1)$$

2.3. Normalization Matrix

Normalization aims to unite each element of the matrix, so that the elements in the matrix have the same value. Normalization in Moora can be calculated using the following equation:

$$X * \text{ij} = \frac{\text{Xij}}{\sqrt{\left[\sum_{j=1}^{m} \text{x}^2\text{ij}\right]}} \quad (2)$$

2.4. Weighted Normalized Results Reduced

If the criteria for each alternative are not assigned a weight value, the normalized measure is added in the case of maximization (for favorable attributes) and subtracted in the case of minimization (for unfavorable attributes) if formulated as follows:

$$Yj* = \sum xij\ i{=}g * i{=}1 - \sum xij\ i{=}n * i{=}g{+}1 \quad (3)$$

2.5. Weighted Normalized Results Summed

If the criteria for each alternative are given an importance weight value. Giving a weight value to the criteria, with the provision that the maximum criteria type weight value is greater than the minimum criteria type weight value. To indicate that an attribute is more important, it can be multiplied by the appropriate weight (significance coefficient). The following is the formula for calculating the MOORA multiobjective optimization value.

$$Yi = \sum_{j=1}^{g} \text{w}\, j\text{x*ij} — \text{jx*ij} \sum_{j=g+1}^{n} \text{w} \quad (4)$$

2.6. Calculating Optimization Value

Multiplying the criteria weight by the maximum attribute value minus the multiplication of the criteria weight by the minimum attribute value, if formulated.

$$Y^*_j = \sum_{i=1}^{i=g} x^*_{ij} - \sum_{i=g+1}^{i=n} x^*_{ij} \quad (5)$$

2.7. P Resultranking

Determine the results of the calculation by ranking the values that have been produced using the MOORA method. Where the highest value or ranking 1 (one) is the best alternative.

3. Results

To determine the best subsidized house in Tanjung Morawa, Deli Serdang, it is necessary to calculate using the MOORA method, where the results will later be analyzed to determine which housing is the best. Where people who want to live in Tanjung Morawa always find it difficult to determine the best subsidized house because they do not have information or knowledge about subsidized houses in Tanjung Morawa. Therefore, it is necessary to conduct a decision support system analysis using the MOORA method (multi-objective optimization on the basis of ratio analysis). The ranking produced by the MOORA process shows that the highest ranking alternative is the best alternative as the best subsidized house in Tanjung Morawa[8][9].
Based on the description of the data that has been collected to identify the sub-criteria needed in the calculation process. With the results of this analysis, the sub-criteria that have been identified will be the basis for the next steps in the research process or decision making carried out by researchers. The following are the results of the analysis:

Table 1: Analysis of Criteria and Sub Criteria

Criteria	Information	Sub Criteria Value
C1	Comfort	Very Good, Good, Fair, Bad
C2	House Model	Very Good, Good, Fair, Bad
C3	Price Range	Cheap, Standard, Expensive, Very Expensive
C4	Strategic Location	Very Good, Good, Fair, Bad
C5	Road Quality	Very Good, Good, Fair, Bad

The following is the preparation of alternative data needed to determine the best subsidized housing using the MOORA (Multi-Objective Optimization on the basis of Ratio Analysis) method after going through the calculation process:

Table 2: Alternative Data

Alternative	Housing Name
A1	Citra Harmoni
A2	Griya Seruni
A3	Grand Mahagony
A4	Graha Mutiara
A5	PutriAsri
A6	Mulia Residence

Table 3: Criteria Weight Values

Criteria	Information	Weight	Type
C1	Comfort	0.25	Benefits
C2	House Model	0.25	Benefits
C3	Price Range	0.15	Benefits
C4	Strategic Location	0.15	Benefits
C5	Road Quality	0.20	Benefits

Table 4: Weighting of Comfort criteria (C1)

Comfort	Information	Weight
90	Very good	8
80	Good	5
60	Enough	2
0	Not enough	0

Table 5. Weighting of House Model Criteria (C2)

House Model	Information	Weight
90	Very good	15
80	Good	7
60	Enough	3
0	Not enough	0

Table 6: Weighting of Price Range criteria (C3)

Price Range	Information	Weight
90	Cheap	8
80	Standard	5
60	Expensive	2
0	Very expensive	0

Table 7: Weighting of Strategic Location Criteria (C4)

Strategic Location	Information	Weight
90	Very good	8
80	Good	5
60	Enough	2
0	Not enough	0

Table 8: Weighting of Road Quality criteria (C5)

Road Quality	Information	Weight
90	Very good	8
80	Good	5
60	Enough	2
0	Not enough	0

Table 9: Rating of suitability of alternatives and criteria

Alternative	C1	C2	C3	C4	C5
A1	70	75	75	80	80
A2	70	75	75	80	85
A3	90	75	60	80	60
A4	75	75	70	60	70
A5	60	80	75	80	80
A6	70	80	80	90	90

4. Discussion

After getting the alternative value of each criterion, the MOORA calculation process is carried out to analyze the results of the MOORA method to support the decision support system for determining the best subsidized housing. The followingMOORA calculation steps

1. Create a decision matrix X taken from table 4.9

$$X=\begin{bmatrix}70 & 75 & 75 & 80 & 80\\ 70 & 75 & 75 & 80 & 85\\ 90 & 75 & 60 & 80 & 60\\ 75 & 75 & 70 & 60 & 70\\ 60 & 80 & 75 & 80 & 80\\ 70 & 80 & 80 & 90 & 90\end{bmatrix}$$

2. Then the next stage is to normalize the X matrix using the 2nd equation. For Performance Criteria (C1).

$$X*1,1=\frac{70}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,391$$
$$X*2,1=\frac{70}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,391$$
$$X*3,1=\frac{90}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,503$$
$$X*4,1=\frac{75}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,419$$
$$X*5,1=\frac{60}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,335$$
$$X*6,1=\frac{70}{\sqrt{70^2+70^2+90^2+75^2+60^2+70^2}}=0,391$$

Next, do the calculation as above until X6 in this case until the criterion C5. So that the result of the normalization of the X matrix, the matrix $Xij*$ is obtained below:

$$\begin{bmatrix}0,391 & 0,399 & 0,393 & 0,396 & 0,418\\ 0,391 & 0,399 & 0,393 & 0,396 & 0,444\\ 0,503 & 0,399 & 0,315 & 0,396 & 0,314\\ 0,419 & 0,399 & 0,367 & 0,202 & 0,366\\ 0,335 & 0,426 & 0,393 & 0,396 & 0,418\\ 0,391 & 0,426 & 0,419 & 0,445 & 0,470\end{bmatrix}$$

3. Calculating Optimization Value

Y1*= (0.25*0.391)+(0.25*0399)+(0.15*0.393)+(0.15*0.396)+(0.20*0.418) = 0.399
Y2*= (0.25*0.391)+(0.25*0.399)+(0.15*0.393)+(0.15*0.396)+(0.20*0.444) = 0.4047
Y3* = (0.25*0.503)+(0.25*0.399)+(0.15*0.315)+(0.15*0.396)+(0.20*0.314) = 0.3950
Y4* = (0.25*0.419)+(0.25*0.399)+(0.15*0.367)+(0.15*0.202)+(0.20*0.366) = 0.363
Y5* = (0.25*0.335)+(0.25*0.426)+(0.15*0.393)+(0.15*0.396)+(0.20*0.418) = 0.3922
Y6* = (0.25*0.391)+(0.25*0.426)+(0.15*0.419)+(0.15*0.445)+(0.20*0.470) = 0.4289

4. Determining the Ranking Value from Calculation Results
From the results of the Optimization Value calculation, the ranking of each alternative can be seen from the calculation of the criteria for each alternative or subsidized housing.

Table 10: Ranking Results

Alternative	Housing Name	Mark	Ranking
A1	Citra Harmoni	0.399	3
A2	Griya Seruni	0.4047	2
A3	Grand Mahagony	0.3950	4
A4	Graha Mutiara	0.363	6
A5	PutriAsri	0.3922	5
A6	Mulia Residence	0.4289	1

5. Conclusion

Based on the calculation results of each criteria value in each alternative through the MOORA method, the results of the MOORA method analysis in the decision support system can produce the best subsidized house based on the highest value, ranking 1. So that with this research, it can provide new information or knowledge for the wider community in supporting the decision support system in determining subsidized houses for people to occupy.

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