IDENTIFICATION OF MORTGAGE HOUSE CHOICE USING THE WEIGHTED PRODUCT METHOD AS A DECISION SUPPORT SYSTEM

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Abstract: Decisions are actions taken as a solution to a problem or obstacle. The decision support system consists of a number of methods, one of which is the Weighted Product method. Method assistance can minimize errors and confusion in the decisions taken. The WP method determines the criteria factors and multiplies the criteria values with the weights. Housing is a primary need that most people want to fulfill. A house is one choice of residence to live life and settle in one location and region. However, choosing a house requires complex thinking and considering various factors because the price of a house is not cheap. Factors to be taken into consideration include location, size of the house, price, facilities and legality of house permits. To overcome this, identification was carried out using the WP method to select mortgage houses based on the ranking of the value results obtained by the method. Analysis and observation regarding the problem and process of selecting a KPR house can support the calculation and management process. The research results explain that the WP method can be used in selecting a KPR house so that it can then be implemented for decision support applications as a community facility for choosing a house efficiently and effectively.

INTRODUCTION

Decisions are things that must be taken as a solution to a problem or obstacle. Decision-making requires consideration based on supporting factors. Decision support systems have criteria that form the basis for calculating alternative values. Decision problems are solved using decision support methods. The method is adapted to the needs of the problem. Method assistance will minimize errors and confusion in the decisions taken. Because sometimes several problems have equal values or weights so it is difficult to make a decision based on the best ranking.

Housing is a primary need that most people and families want to fulfill. Home is one of the places to live that is often chosen by Indonesian people. A house is a residence

that people need to live their lives and settle in one location and region. So for most people choosing a house requires complex thinking because the price of a house is not cheap. There are many factors in choosing a house that is taken into consideration, such as location, size of the house, price, facilities, and legality of house permits.

Choosing a house that suits your needs and desires is often hampered by managing information about several house options. The community must collect house occupancy information from several housing developers and assess its suitability to the community's needs and desires. This requires quite a long time because you have to collect information and visit each candidate location one by one. Sometimes when you have chosen a house, it turns out it doesn't suit your needs and desires. The selection process which is carried out manually based on information without going through a data management process in decision support is often less effective or efficient. So, with these obstacles, a method is needed that can support people's decisions in choosing residential houses based on supporting criteria.

The process of choosing a house makes consumers confused about choosing a house that suits their needs and financial conditions. The WP method is used in the house selection system in the city of Lhokseumawe. The calculation process involves multiplying the criteria values, and multiplying the alternative values by the criteria weights so that the resulting values will be able to help consumers in making decisions about choosing a house (Kurniawati et al., 2019).

Homeownership credit can be obtained if the prospective consumer meets the criteria based on selection and determination. The WP method is used to select potential consumers who can apply for credit so that credit payments run smoothly. The right prospective consumer is based on calculating alternative rankings from the preference values of all alternatives (Sari & Novitasari, 2022).

Decision support systems are the application of theoretical decision-making methods in finding solutions to problems through manual and computerized calculations (Permatasari, 2020).The system will help process problems or obstacles that arise, collect data, and approach and determine each appropriate alternative (Rizka, 2022). The stages of decision-making go through a process to provide good decision results precisely, namely intelligence, design, choice, and implementation (Anjar Wanto et al., 2020). The system can be used in decision-making in semi-structured situations, conditions where

the decision-maker cannot make a decision (Muslihudin & Rahayu, 2018).

The Weighted Product method is a decision support method for Multi-Criteria Decision Making (MCDM) by determining the criteria factors and multiplying the criteria values by the weights (Sari & Novitasari, 2022). The process of the method stages begins by determining the suitability value of the alternative with the criteria, fixing the weight value of each criterion, determining the vector S value by multiplying the criteria by the weight of the criteria based on advantages and disadvantages, for each alternative and determining the vector value V which can then be carried out by a ranking process (Ade Rizka, 2022). This research will identify the WP method in supporting decisions for selecting a KPR house so that later it can be used in an application to help people choose a KPR house based on criteria to meet their needs and desires.

RESEARCH METHODS

This research uses research methods and a research framework to describe the process sequence and processing of test data. Figure 1 below is a framework in research for identifying WP methods.

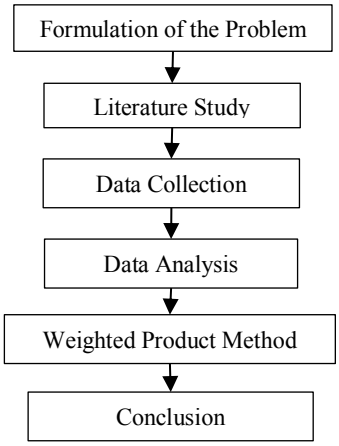

Figure 1. Research Framework

An explanation of the framework of the research methods carried out is as follows:

1. Formulation of the Problem

The problems that arise in this research are identified to find solutions that suit the problem constraints in choosing a mortgage house for the Binjai city area.

2. Literature Study

A literature study is a process carried out to collect theoretical knowledge and supporting information from validated sources, in the form of previous research,

books, and journals. The knowledge and theories found can support the complete information needed by the research process. Theories related to the WP method process in selecting a KPR house are based on knowledge and theory that meets research needs.

3. Data Collection

Data collection is based on the data needed in the research. Data comes from literature studies, interviews, and observations with the community and developers. Data in the form of several housing alternatives in the Binjai city area. Several house criteria used are price, house area, ownership certificate, number of rooms, and water source. Several housing complexes in the Binjai city area will be used for identification.

4. Data Analysis

Data analysis is a stage in the process of matching test data as well as calculation results and data management using the help of the WP method. Housing alternative data is selected and the criteria are adjusted based on the weight of importance.

5. Weighted Product Method

The WP method is a method used to identify houses from alternative housing. This is done in several stages, namely, preparing alternatives, setting criteria, determining the weight of each criterion, calculating the vector value of each alternative, and ranking housing based on the highest to lowest alternative vector values.

6. Conclusion

The conclusion from the results and discussion of the identification process for selecting a KPR house is that based on the problems that arise when selecting a KPR house in the Binjai city area, the community will later be able to choose a KPR house according to their needs and desires effectively and efficiently using the WP method.

RESULTS AND DISCUSSION

1. Results

The data is sample data from 10 housing alternatives with the criteria of house area, price, ownership certificate, number of rooms, and water source. The data will be used in the WP method identification process. Each criterion has assessment conditions which can be seen in the following table.

Table 1. Table of House Area Values (C1)

House Area	Value
> 500 m^2	5
250 m^2 > 500 m^2	4
200 m^2 > 250 m^2	3
150m^2 > 200 m^2	2
> 100 m^2	1

Table 2. Table of Price Values (C2)

Price	Value
> Rp. 1.500.000.000	5
Rp. 1.000.000.000 > Rp. 1.500.000.000	4
Rp. 500.000.000 > Rp. 1.000.000.000	3
Rp. 250.000.000 > Rp. 500.000.000	2
> Rp. 250.000.000	1

Table 3. Table of Ownership Certificate Values (C3)

Ownership Certificate	Value
Certificate of Ownership	5
Building Rights	3
Others (PPJB, girik and adat)	1

Table 4. Table of Room Number Values (C4)

Number of Rooms	Value
5	5
4	4
3	3
2	2
1	1

Table 5. Table of Water Source Values (C5)

Water Source	Value
PAM	5
Sumur	3
Tidak Ada	1

Table 6. Data Table for Alternative Suitability Values and Criteria

No.	Alternatives	C1	C2	C3	C4	C5
1	Savanna Sumatera	4	1	5	3	3
2	River Valley Residence	5	5	3	5	5
3	Cluster Maryland	5	5	3	4	5
4	Villa The Green Makmur	5	5	1	4	5
5	Arta Land Binjai	5	3	1	5	5
6	Cengkeh Turi Asri	5	3	3	5	5
7	Batusalam Residence	5	5	3	3	5
8	Graha Skip Mancirim	3	3	1	4	1
9	Green View Sunggal	3	1	3	3	1
10	Suka Raya Binjai	4	3	3	3	1

Table 6 provides data on alternative suitability values with the values of each criterion. The weight of each criterion can be seen in Table 7.

Table 7. Table of Criteria Weights

Criteria	Criteria Weights
House Area	30
Price	20
Ownership Certificate	15
Number of Rooms	15
Water Source	20
Total Weight	**100**

2. Discussion

This research uses the WP method to identify data processing. The WP method has several process stages. After determining alternative data, appropriate criteria, and criteria weights, the next stage of the process is as follows (Roni et al., 2019):

Stage 1 is improving the weight value (Wj). If the weight is worth a profit, then the rank is positive and if the weight is worth a loss then the rank is negative. The weight value range is between 0 and 1. The weight of each criterion will be corrected with the following equation:

$$\boldsymbol{Wj} = \frac{\boldsymbol{W_j}}{\sum \boldsymbol{W_j}} \quad (1)$$

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

$$\mathbf{W_2} = \frac{\mathbf{20}}{\mathbf{100}} = \mathbf{0,2}$$

$$\mathbf{W_3} = \frac{\mathbf{15}}{\mathbf{100}} = \mathbf{0,15}$$

$$\mathbf{W_4} = \frac{\mathbf{15}}{\mathbf{100}} = \mathbf{0,15}$$

$$\mathbf{W_5} = \frac{\mathbf{20}}{\mathbf{100}} = \mathbf{0,2}$$

Stage 2 is determining the value of the vector Si. All criteria will be multiplied by the weight of the criteria based on profits and losses, for each alternative. The value is calculated using the following equation:

$$\boldsymbol{S_i} = \prod_{j=1}^{n} \boldsymbol{x_{ij}^{wj}} \quad (2)$$

$$\mathbf{S_1} = (\mathbf{4^{0,3} * 1^{0,2} * 5^{0,5} * 3^{-0,15} * 3^{-0,2}}) = \mathbf{2,307}$$

$$\mathbf{S_2} = (\mathbf{5^{0,3} * 5^{0,2} * 3^{0,5} * 5^{-0,15} * 5^{-0,2}}) = \mathbf{2,205}$$

$$\mathbf{S_3} = (\mathbf{5^{0,3} * 5^{0,2} * 3^{0,5} * 4^{-0,15} * 5^{-0,2}}) = \mathbf{2,28}$$

$$\mathbf{S_4} = (\mathbf{5^{0,3} * 5^{0,2} * 1^{0,5} * 4^{-0,15} * 5^{-0,2}}) = \mathbf{1,316}$$

$$\mathbf{S_5} = (\mathbf{5^{0,3} * 3^{0,2} * 1^{0,5} * 5^{-0,15} * 5^{-0,2}}) = \mathbf{1,149}$$

$$\mathbf{S_6} = (\mathbf{5^{0,3} * 3^{0,2} * 3^{0,5} * 5^{-0,15} * 5^{-0,2}}) = \mathbf{1,991}$$

$$\mathbf{S_7} = (\mathbf{5^{0,3} * 5^{0,2} * 3^{0,5} * 3^{-0,15} * 5^{-0,2}}) = \mathbf{2,381}$$

$$\mathbf{S_8} = (\mathbf{3^{0,3} * 3^{0,2} * 1^{0,5} * 4^{-0,15} * 1^{-0,2}}) = \mathbf{1,407}$$

$$\mathbf{S_9} = (\mathbf{3^{0,3} * 1^{0,2} * 3^{0,5} * 3^{-0,15} * 1^{-0,2}}) = \mathbf{2,042}$$

$$\mathbf{S_{10}} = (\mathbf{4^{0,3} * 3^{0,2} * 3^{0,5} * 3^{-0,15} * 1^{-0,2}}) = \mathbf{2,774}$$

Stage 3 is to determine the vector value Vi using the following equation:

$$\boldsymbol{V_i} = \frac{\prod_{j=1}^{n} \boldsymbol{x_{ij}^{wj}}}{\prod_{j=1}^{n} \boldsymbol{x_{(j)}^{wj}}} \boldsymbol{atau} \frac{\boldsymbol{S_i}}{\sum \boldsymbol{S_i}} \quad (3)$$

$$\boldsymbol{V_1} = \frac{\mathbf{2,307}}{\mathbf{19,852}} = \mathbf{0,116}$$

$$\boldsymbol{V_2} = \frac{\mathbf{2,205}}{\mathbf{19,852}} = \mathbf{0,111}$$

$$\boldsymbol{V_3} = \frac{\mathbf{2,28}}{\mathbf{19,852}} = \mathbf{0,115}$$

$$\boldsymbol{V_4} = \frac{\mathbf{1,316}}{\mathbf{19,852}} = \mathbf{0,066}$$

$$\boldsymbol{V_5} = \frac{\mathbf{1,149}}{\mathbf{19,852}} = \mathbf{0,058}$$

$$\boldsymbol{V_6} = \frac{\mathbf{1,991}}{\mathbf{19,852}} = \mathbf{0,1}$$

$$\boldsymbol{V_7} = \frac{\mathbf{2,381}}{\mathbf{19,852}} = \mathbf{0,12}$$

$$\boldsymbol{V_8} = \frac{\mathbf{1,407}}{\mathbf{19,852}} = \mathbf{0,071}$$

$$V_9 = \frac{2{,}042}{19{,}852} = \mathbf{0,103}$$

$$V_{10} = \frac{2{,}774}{19{,}852} = \mathbf{0,14}$$

Based on the calculation of the Vi vector value, there is a final value for each alternative which can be seen in Table 8.

Table 8. Vi Value Results

No.	Alternatives	V_i Value
1	Savanna Sumatera	0,116
2	River Valley Residence	0,111
3	Cluster Maryland	0,115
4	Villa The Green Makmur	0,066
5	Arta Land Binjai	0,058
6	Cengkeh Turi Asri	0,1
7	Batusalam Residence	0,12
8	Graha Skip Mancirim	0,071
9	Green View Sunggal	0,103
10	Suka Raya Binjai	0,14

In Table 8 you can see the final vector value results for each alternative using the WP method. The final results can be ranked according to the highest to lowest vector values. The highest vector value is 0.14 for the Suka Raya Binjai alternative and the lowest vector value is 0.058 for the Arta Land Binjai alternative. From the overall value of the alternative vector, people can choose a mortgage house based on their needs and desires efficiently and effectively.

CONCLUSION

The results of calculations and data management using the WP method can be used as decision support. Based on the vector values, the highest to lowest values were obtained, namely, Suka Raya Binjai, Batusalam Residence, Savanna Sumatra, Cluster Maryland, River Valley Residence, Green View Sunggal, Cengkeh Turi Asri, Graha Skip Mancirim, Villa The Green Makmur and Arta Land Binjai. The calculation results can be a recommendation for the public in selecting a mortgage home. The research results are the initial stage in creating a KPR house selection application based on the Binjai city area using the WP method. This research is the identification stage in the KPR housing

selection process, to detect obstacles in the data management process, so that it can then be carried out using supporting applications to facilitate people to choose efficiently and effectively.

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