



## Decision Support System for Selecting House using Analytical Hierarchy Process

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### ABSTRACT

Houses are the primary needs of everyone other than clothing and food needs. When consumers choose a house criteria that are used such as facilities, payment methods, type of house, land area, number of rooms, bathrooms, kitchens, living rooms, models, prices, developers and housing names. Sometimes choosing a house is difficult because of the many criteria that you always want to meet in accordance with consumer standards. The existence of a system is expected to help consumers provide alternatives in accordance with the choice of criteria as input and output systems in the form of alternative sequences of results from the system. The use of the Analytical Hierarchy Process (AHP) method solves a complex situation that is not structured into several components in a hierarchical arrangement, by giving subjective values about the relative importance of each variable, and determining which variables have the highest priority to influence the results. Data collection methods used are literature studies, interviews and observations. The test method is a test for interface functionality and application questionnaire. The results obtained by this system are in the form of a decision support system that can provide an alternative selection of houses that can be used as a comparison with the choice of criteria according to consumer.

### INTRODUCTION

One of the primary needs of humans other than clothing and food is a place to live or home. Houses are buildings that have rooms with certain functions such as sleeping, cooking, bathing, and other activities<sup>1</sup>. There are many factors that influence everyone to choose a house, including the price of a house, land area, building area, house model, distance from the house to the road, distance to the workplace, distance to the child's school, environmental security facilities, and distance from the house to shopping place<sup>2</sup>.

Many factors cause conflicting things, for example, houses that are close to the center of the crowd are expensive or suitable houses in terms of price, size, and location, but places of worship that are not close to the complex or environment are available. So, if one factor is fulfilled, the other factors will not be fulfilled<sup>3</sup>. The best solution is to try to obtain an optimal point of completion taking into account all the factors that exist even if they are least satisfactory on one factor<sup>4</sup>.

The existence of promotional programs offered to consumers with a variety of facilities and facilities offered by each type of housing makes consumers increasingly confused in choosing the right type of house. There needs to be a service that can be used to choose homes that are by following the wishes of consumers so that to buy a prospective home buyer does not have to go to any existing housing developer to get information about the desired house. Besides consumers can also compare prices and areas of the house directly using the system of each type of house that exists<sup>5</sup>.

A decision support system for the selection of houses, using the AHP (Analytical Hierarchy Process) model can be used as an alternative to assist the decision-making process.<sup>6</sup> This system provides information from a variety of housing, especially those in Merauke Regency, in the form of house types, prices, and other house specifications along with services to compare the results of specifications chosen by consumers.

The AHP method is used to assess actions related to comparing the weight of importance between factors and the comparison of several choices. This method gives the weighting results of each alternative according to the many criteria set<sup>7</sup>. The data needed in the AHP method is the data criteria used by consumers in housing selection, namely price, type, and other specifications available in the housing. A choice with the greatest weight is a choice that is a recommendation to be chosen by consumers.



### LITERATURE REVIEW

One form of property in land and buildings as well as building facilities and infrastructure buildings which are an integral part of land or buildings. Property in 17 days means the property is simpler as property ownership of a person or group of people usually in the form of land and buildings that stand on it, as well as facilities and infrastructure that are part of the building. Based on the definition above, where there is an emphasis on the word property and ownership, it can be concluded that property is the right to own a plot of land and use whatever is in it<sup>5</sup>.

Information systems that provide interaction between information, modeling, and data manipulation are part of the Decision Support System (DSS). DSS is a computer-based information system that contains business and organizational decision-making activities, planning and helping individuals or groups make decisions. Decision support systems serve management, operational, and organizational planning levels and help to make decisions, which may change quickly and are not easily determined before unstructured and semi-structured decision problems [8].

An information system can information for user and a collection of hardware and software designed to transform data into useful forms of information[9]. Home decision-making decision support system is one of the benefits of users being able to obtain information about existing housing in Merauke Regency. users can also directly use the system to compare the criteria that exist between the housing offered by the system. System is a network from procedures that are interconnected, gathered together to carry out an activity or complete a certain goal [10]

Methods of solving complex and unstructured situations in some component forms of hierarchical arrangements, by providing a subjective value about the relative importance of each variable, and can determine which variable has the highest priority so that it can be used to influence the situation. AHP's advantages in explaining the decision making process. One of them is to be graphically illustrated so that it is easily understood by all parties involved in decision making [11].

### METHOD

Based on the research that has been done, it is known that consumers are often wrong in choosing the housing they want. So far, consumers have chosen to house based solely on price, information from housing developers or other people or even social media that makes it difficult for consumers to compare the types of housing to be chosen so that in the future it creates problems for themselves. This study describes how to choose housing that fits the criteria that have been set. The selection process is based on the AHP method. below will be elaborated the steps for determining alternatives starting by comparing priority criteria, Make a Criteria Value Matrix. add up each line so you can find an alternative that is the result

#### *Determining Criteria Priorities*

Steps taken to determine the desired house:

Create a Pairing Comparison Matrix : Pairwise comparison matrix is to compare between each attribute that is attribute used in this study are facilities, method of payment, type of house, land area, number of rooms, number of bathrooms, number of kitchens, number of living rooms, house models, prices, developers, housing. The comparison matrix of all criteria with developer criteria and housing name. Examples of comparison matrices can be seen in Table 1.

Table 1. Pairwise Comparison Matrix

Criteria	Developer	Housing Name
Facilities	5,000	5,000
Payment method	4,000	4,000
House Type	4,000	4,000
Surface area	4,000	4,000
Number of rooms	4,000	4,000
Number of bathrooms	3,000	3,000
Number of Kitchens	3,000	3,000
Number of Guest Rooms	3,000	3,000
House Model	3,000	3,000
Price	3,000	3,000
Developer	1,000	3,000
Housing Name	0,333	1,000
Total	37,667	40,333



At this stage, a comparison of one criterion with other criteria is carried out. The results can be seen in Table 1. How :

- Determine the priority of each criterion
- The number 1,000 in the row-row facility illustrates the same level of importance between facilities and facilities, while the 5,000 number in the column for facility payment method shows the method of payment is more important than the facility.
- The value obtained in the row facility payment method is obtained from 1,000 (the value in the facilities row-column facility) is divided by 4,000 (the value in the rowing facility column method of payment) then it is obtained 0,250.
- The other numbers are obtained in the same way

#### Make a Criteria Value Matrix

After we get the results of the pairwise comparison matrix in Table 1 the next lag is to determine the criteria value obtained from the calculation of row values divided by the number of columns that are as many as 12 according to the number of criteria.

Comparison to 12 criteria will be compared with in Table 2 the criteria value matrix with 12 criteria compared to the criteria of facilities, method of payment, type of house, land area, and number of rooms

The matrix in Table 3 is obtained by the following formula

- The value of the new column row = Value of the old columns and number of each old column in Table 1
- The Amount value is obtained from the number of values in each column in 1 row
- Priority values are obtained from the number / n, where the number of criteria (n = 12).

Table 2. Criteria Value Matrix(a)

Criteria	Facilities	Payment method	House Type	Surface area	Number of rooms
Facilities	0,240	0,500	0,316	0,273	0,222
Payment method	0,048	0,100	0,211	0,182	0,167
House Type	0,080	0,050	0,105	0,182	0,167
Surface area	0,080	0,050	0,053	0,091	0,167
Number of rooms	0,060	0,033	0,035	0,030	0,056
Number of bathrooms	0,060	0,033	0,035	0,030	0,028
Number of Kitchens	0,080	0,050	0,053	0,045	0,056
Number of Guest Rooms	0,080	0,050	0,053	0,045	0,056
House Model	0,080	0,033	0,035	0,030	0,028
Price	0,048	0,025	0,026	0,023	0,014
Developer	0,048	0,025	0,026	0,023	0,014
Housing Name	0,048	0,025	0,026	0,023	0,014

Furthermore, the calculation of the criteria matrix is done for 12 criteria, namely facilities, method of payment, type of house, land area, number of rooms, number of rooms, number of living rooms, house models, prices, developers, housing. compared to the criteria for the number of bathrooms, number of kitchens, number of living rooms, house models and prices can be seen in the Table 3.

Table 3. Criteria Value Matrix(b)

Criteria	Number of bathrooms	Number of Kitchens	Number of Guest Rooms	House Model	Price
Facilities	0,202	0,202	0,202	0,134	0,143
Payment method	0,151	0,135	0,135	0,134	0,114
House Type	0,151	0,135	0,135	0,134	0,114
Surface area	0,151	0,135	0,135	0,134	0,114
Number of rooms	0,101	0,067	0,067	0,090	0,114



Number of bathrooms	0,050	0,067	0,067	0,090	0,086
Number of Kitchens	0,050	0,067	0,067	0,090	0,086
Number of Guest Rooms	0,050	0,067	0,067	0,090	0,086
House Model	0,025	0,034	0,034	0,045	0,086
Price	0,017	0,022	0,022	0,015	0,029
Developer	0,017	0,022	0,022	0,015	0,010
Housing Name	0,017	0,022	0,022	0,015	0,010

The last comparison of the criteria matrix is comparing 12 criteria with 2 more criteria, namely developer and housing name. After 12 criteria compared to 12 existing criteria namely facilities criteria, method of payment, type of house, land area, number of rooms, number of bathrooms, number of kitchens, number of living rooms, house models, prices, developers, housing then then add up all the results of the matrix and determine the priority values for the existing criteria.

Seeing the priority values of the criteria value matrix can be seen in Table 4.

Table 4. Criteria Value Matrix(c)

Criteria	Developer	Housing Name	Total	Priority
Facilities	0,133	0,124	2,807	0,201
Payment method	0,106	0,099	1,675	0,120
House Type	0,106	0,099	1,552	0,111
Surface area	0,106	0,099	1,408	0,101
Number of rooms	0,106	0,099	0,952	0,068
Number of bathrooms	0,080	0,074	0,771	0,055
Number of Kitchens	0,080	0,074	0,868	0,062
Number of Guest Rooms	0,080	0,074	0,868	0,062
House Model	0,080	0,074	0,653	0,047
Price	0,080	0,074	0,465	0,033
Developer	0,027	0,074	0,393	0,028
Housing Name	0,009	0,025	0,326	0,023

#### Creating the Sum of Each Row Matrix

After getting the priority value it will be multiplied by the results in Table 2 multiplied by Table 4. After obtaining these results, it will be summed for each row in the criteria so that the results can be seen in Table 5.

Table 5. The Sum of Each Row Matrix

Crieria	Total
Facilities	9,825
Payment method	4,092
House Type	3,639
Surface area	3,152
Number of rooms	1,649
Number of bathrooms	1,032
Number of Kitchens	1,230
Number of Guest Rooms	1,230
House Model	0,762
Price	0,416
Developer	0,277
Housing Name	0,167



The matrix in Table 5 is obtained by:

The priority of a line in Table 4 is multiplied by the same row value in the same column Table 1. For example, the value in the building quality row of the building quality column Table 5 is obtained from the priority of building quality lines in Table 4 multiplied by the row quality of the building quality column in Table 1. The sum value in this matrix is obtained by summing the values in each row in the Table 6. So that the number of results for each row in each criterion is obtained.

#### Calculation of Consistency Ratio

Furthermore, the calculation process is used to ensure that the consistency ratio value (CR)  $\leq 0.1$ . If it turns out that the CR value is greater than 0.1, the pairwise comparison matrix must be corrected. Results in Table 6.

Table 6. Calculation of Consistency Ratio

Criteria	Amount of Row	Priority	Result
Facilities	9,825	0,201	<b>10,025</b>
Payment method	4,092	0,120	<b>4,211</b>
House Type	3,639	0,111	<b>3,750</b>
Surface area	3,152	0,101	<b>3,252</b>
Number of rooms	1,649	0,068	<b>1,717</b>
Number of bathrooms	1,032	0,055	<b>1,087</b>
Number of Kitchens	1,230	0,062	<b>1,292</b>
Number of Guest Rooms	1,230	0,062	<b>1,292</b>
House Model	0,762	0,047	<b>0,809</b>
Price	0,416	0,033	<b>0,449</b>
Developer	0,277	0,028	<b>0,305</b>
Housing Name	0,167	0,023	<b>0,191</b>

The column number per row is obtained from the column number in Table 5 while the priority column in Table 3. The results are obtained by adding priority and number per line.

Amount (total value of Table 3.7): 28,484

n (number of criteria): 13,000

max (number / n): 2,191 $\lambda$

max-n) / n): -0,831 $\lambda$

CI((CR (CI / IR (IR = 1.56)): -0,533

Conclusion:

Because CR  $< 0.1$ , the consistency ratio of the calculation is acceptable Table 6.

The priority results of calculations in steps 2 and 3 are then poured in the results matrix seen in Table 7. using 3 alternatives and 12 criteria

Table 7. Final Results

House	Total
<b>R1</b>	1,004
<b>R2</b>	1,306
<b>R3</b>	0,898

The total column 1,004 is obtained from the sum of each row. This total value is used as the basis for choosing a house. The greater the value, the house will be closer to the desired criteria.

R2 with a total of 1,306 is a house that has the highest total, that means R2 is a house with the criteria closest to the criteria desired by prospective buyers. Then followed by R1 with a total of 1.004 and R3 for a total of 0.898.

## RESULT

To obtain a choice of alternative options, prospective buyers must enter several criteria according to their choice can be seen in the Figure 1.



Criteria	Options
Developer	<input checked="" type="checkbox"/> PT. Suman Karya Makmur <input checked="" type="checkbox"/> PT. Cakrawala Propertiindo <input checked="" type="checkbox"/> PT. Suman Jaya Raya
Location	<input checked="" type="checkbox"/> Payum Asri Indah <input checked="" type="checkbox"/> Perumahan Suman Jaya <input checked="" type="checkbox"/> Suman Jaya Raya
Facility	<input checked="" type="checkbox"/> Kalam Kembang
Width of the house	<input checked="" type="radio"/> 1
Width of the land	<input checked="" type="radio"/> 1
Number of rooms	<input checked="" type="radio"/> 1
Number of bathrooms	<input checked="" type="radio"/> 1
Number of kitchen	<input checked="" type="radio"/> 1
Number of living room	<input checked="" type="radio"/> 1
Foundation	<input checked="" type="radio"/> River stone <input type="radio"/> Brick
Ceiling	<input checked="" type="radio"/> Gypsum <input type="radio"/> Triplek
Roof	<input checked="" type="radio"/> Metal <input type="radio"/> Tin Roof <input type="radio"/> Sekuro Roof
Window	<input checked="" type="radio"/> Clear glass <input type="radio"/> Glass panel <input type="radio"/> Rayban
Frame	<input checked="" type="radio"/> Local wood <input type="radio"/> Class Wood II <input type="radio"/> Class Wood III
Wall	<input checked="" type="radio"/> Red brick <input type="radio"/> Brick
Door	<input checked="" type="radio"/> Double Triplek <input type="radio"/> Panel <input type="radio"/> Wood Finishing
Floor	<input checked="" type="radio"/> 30x30 <input type="radio"/> 40x40 <input type="radio"/> 30x50
Bathroom floor	<input checked="" type="radio"/> 20x20 <input type="radio"/> 20x25 <input type="radio"/> 25x25
Toilet	<input checked="" type="radio"/> squat toilet <input type="radio"/> toilet seat <input type="radio"/> toilet seat and squat toilet
Bathroom	<input type="radio"/> Yes <input checked="" type="radio"/> No
Shower	<input type="radio"/> Yes <input checked="" type="radio"/> No
Bath-up	<input type="radio"/> Yes <input checked="" type="radio"/> No
Water Source	<input checked="" type="radio"/> PAM <input type="radio"/> Well
Electricity	<input checked="" type="radio"/> 220V <input type="radio"/> 110V <input type="radio"/> 240V

Figure 1. Input data criteria for prospective buyers

The results of user input, the prospective buyer can obtain alternative home choices according to the choice criteria of the user. to see alternative results can be seen in the Figure 2



Figure 2. Alternative home results

In addition to being able to select criteria and get alternatives, the user can also see the choices of houses available to compare the criteria for each house offered by the system can be seen in the Figure 3.



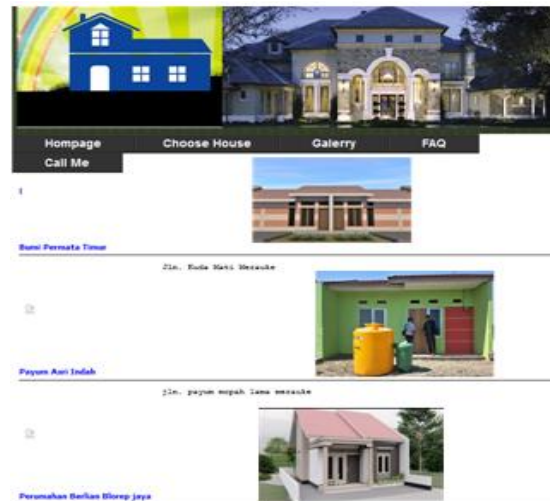


Figure 3. Display of home choices

### DISCUSSION

From the results of testing carried out using questionnaires that have been carried out it can be concluded that the system can be run and function in accordance with the objectives of the researcher. The results of the system can provide an alternative selection of houses according to the criteria entered by prospective buyers. with the alternative choice it makes it easier for prospective users to choose the house that best fits the choice criteria.

### CONCLUSION

AHP method can be used to create a decision support system that can help users in selecting a house and can provide information about a house sorted from the highest number of criteria and the lowest price. Wording, the house selection decision support system can be used in the Mozilla Firefox and Google Chrome browsers. In making a decision support system a house selection is developed with a user-friendly display.

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