



Implementation of a Decision Support System in Selecting the Best Mid-Range Smartphone Using the Ahp and Moora Methods

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Abstract

The rapid development of information technology, especially the internet and smartphones, has changed the paradigm in the way humans interact and access information. In Indonesia, internet use has soared, with most access via smartphones. The growth of the mid-range smartphone market creates the need for a more in-depth assessment in selecting suitable products. To help potential buyers, this research proposes the use of a decision support system (DSS) that uses the Analytical Hierarchy Process (AHP) and Multi-Objective Optimization by Ratio Analysis (MOORA) methods. AHP is used to determine the weight of the criteria, while MOORA is used to provide recommendations for smartphone selection. From the test results on 87 types of mid-range smartphones using a combination of these two methods, the recommendation results for mid-range smartphones with the Realme GT Neo 3T brand as first place, Realme GT Neo 3 as second place, and Poco F4 as third place.

Introduction

The development of information technology is currently increasingly rapid and is accompanied by a variety of increasingly advanced facilities. In the current digital era, the internet is one of the basic human needs. Based on survey results from the Indonesian Internet Service Providers Association (APJII), internet users in Indonesia reached 215.63 million people in the 2022-2023 period. This number increased by 2.67% compared to the previous period which was 210.03 million users. The number of internet users is equivalent to 78.19% of Indonesia's total population of 275.77 million people.

One tool for accessing the internet is a smartphone. As many as 98.3% of Indonesian users access the internet via smartphone. Smartphones are also the best-selling products sold through e-commerce (Ristia et al., 2022). The various types, brands and models of smartphones circulating on the market will cause potential buyers to be careful in choosing a product that suits their needs. Mid-range smartphones are generally more affordable than high-end devices, but still offer many of the same features and capabilities (Komalasari et al., 2023). This makes it a great choice for people who want a high-quality smartphone at an affordable price.

The rapid growth in the mid-range smartphone market creates a need for a more in-depth assessment of these products. With various specifications and prices on offer, prospective buyers often face difficulties in choosing the smartphone that best suits their needs and budget. Based on data from a technology group from a well-known social media platform, debates often occur in determining the best mid-range smartphone recommendations (Rumondang et

al., 2020). By finding the best mid-range smartphone, users can ensure that they get the best value for their money and can enjoy all the benefits of a modern smartphone without overspending. To help potential buyers in choosing a smartphone, a decision support system will be used to produce recommendations in the form of ranking smartphone products based on specifications and price (Rusnedy et al., 2021; Bączkiewicz et al., 2021).

A decision support system (DSS) is a method that can be used by decision makers to decide something from unstructured data and models. In decision support systems, weights are needed. Weights are assigned to each different criterion. In determining the weight of a criterion, it would be better to use the Analytical Hierarchy Process (AHP) (Binjori et al., 2018).

AHP is often used as a problem solving method because it uses a hierarchical structure as a consequence of the selected criteria, down to the deepest sub-criteria, takes into account validity up to the tolerance limit for inconsistencies in the various criteria and alternatives chosen by the decision maker, takes into account the durability of the sensitivity analysis output decision making (Sharma et al., 2020).

This research also uses the Multi-Objective Optimization by Ratio Analysis (MOORA) method to provide recommendations for smartphone selection. The MOORA method was introduced by Brauers and Zavadkas and was first used by Brauers in multi-criteria decision making (Ilham, 2023). This method has a high level of flexibility and ease in separating the subjective part of an evaluation process into decision weight criteria with several decision making attributes. Apart from that, the MOORA method also has a good level of selectivity because it can determine the objectives of conflicting criteria, where the criteria can be beneficial (benefit) or unprofitable (cost) (Binjori et al., 2018; Daulay et al., 2021).

The AHP method is used in the development of this information system because the method is very simple, stable and strong, while the MOORA method is used because it takes into account the durability or robustness of the decision making sensitivity analysis output well. (Madyaratri et al., 2021).

Methods

In this methodology the author conducted research using the Research and Development (R&D) method. The R&D method is used to produce certain products and to perfect a product in accordance with the references and criteria of the product being made so as to produce a new product through various stages and validation or testing. Data collection can be done through primary sources (directly from data providers) and secondary sources (through other people or documents). The steps taken are as follows:

The problem faced in this research is how to apply the AHP and MOORA methods to mid-range smartphone data which can help in analysis. In the context of this research, observation refers to the process of analyzing data on the official website of each smartphone product. Observations were carried out to collect information about smartphone specifications. This observation became the basis for applying the AHP and MOORA methods.

Needs Analysis

Data collection technique

Data collection techniques are procedures or methods used to collect relevant and valid information or data for research or other analytical purposes (Forin Saputri, 2019). The data collection techniques in this sub-chapter explain the steps taken from the start of the research to the end to get the desired results. The technique used in this research is as follows

The meaning of observation in this context is the activity of analyzing data on the official website which provides data on all smartphones that match the criteria studied. Analytic

Hierarchy Process (AHP) can solve complex multi-criteria problems into a hierarchy. With hierarchy, a complex problem can be broken down into groups which are then arranged into a form of hierarchy so that the problem will appear more structured and systematic (Aminah et al., 2022). The following are the steps required in the design: (1) Defining the problem so that it is easy to understand, namely to determine the best mid-range smartphone; (2) Collect a dataset that includes information about the specifications of each smartphone; (3) Determine the value of the pairwise comparison matrix; (4) Normalizing the comparison matrix; (5) Calculation of criteria weight values.

The MOORA method optimizes at least two conflicting attributes simultaneously. The application of this method is quite effective for solving various types of problems related to complex mathematical calculations (Aminah et al., 2022). The following are the stages required in the design: (1) Inputting criteria values; (2) Changing the criteria values into a Decision Matrix; (3) Normalization using the MOORA method; (4) Reducing the maximax value from the minimax; (5) Determine the ranking from the MOORA calculation results.

This testing stage was carried out to test the feasibility of the system that has been built in determining the best mid-range smartphone using the AHP and MOORA methods. This test aims to verify whether the system can operate well and meet previously determined requirements.

Results and Discussion

This section contains a discussion of the steps that will be taken in implementing a decision support system for selecting the best mid-range smartphone using the AHP and MOORA methods. In this research, the AHP method will be used to determine the weighting based on the data that has been obtained. Next, the MOORA method will be used to determine the ranking.

Data analysis

In building a decision support system for selecting a smartphone, the stages of data collection and analysis of the needs of the system to be built will first be carried out. Data collection is carried out to collect all types of information needed to build a decision support system for selecting a smartphone.

In this research, researchers collected data obtained from the official website which provides data on all smartphones that match the criteria studied. Researchers also collect data obtained from other sources that provide information about smartphones to broaden horizons and enrich the knowledge base that will be applied to the system.

Table 1 is a sample of mid-range smartphone data where the total sample is 10 smartphones taken as a comparison of the amount of data that has been obtained.

Table 1. Mid-Range Smartphone Data

Nama	C1	C2	C3	C4	C5	C6	C7	C8
Galaxy A54 5G	8 GB	128 GB	Exynos 1380	FHD +	50 MP	Yes	Type-C	Rp 5,999,000
Nokia G42 5G	4 GB	128 GB	Snapdragon 480+	HD	50 MP	Yes	Type-C	Rp 4,300,000
Redmi Note 12 Pro 5G	8 GB	256 GB	Dimensity 1080	FHD +	50 MP	Yes	Type-C	Rp 4,399,000
Poco X5 5G	8 GB	256 GB	Snapdragon 695 5G	FHD +	48 MP	Yes	Type-C	Rp 3,300,000
Oppo A98 5G	8 GB	256 GB	Snapdragon 695 5G	IPS FHD	64 MP	No	Type-C	Rp 3,800,000

Reno 8T 5G	8 GB	256 GB	Snapdragon 695 5G	FHD +	108 MP	Yes	Type-C	Rp 4,900,000
Realme 11 Pro 5G	8 GB	256 GB	Dimensity 7050	FHD +	100 MP	Yes	Type-C	Rp 4,700,000
Vivo Y75 5G	8 GB	128 GB	Dimensity 700	IPS FHD	50 MP	Yes	Type-C	Rp 4,000,000
Infinix GT 10 pro	8 GB	256 GB	Dimensity 8050	FHD +	108 MP	Yes	Type-C	Rp 3,300,000
Tecno Pova 5 Pro 5G	8 GB	256 GB	Dimensity 6080 5G	IPS FHD	50 MP	Yes	Type-C	Rp 2,950,000

Data processing

Criteria and alternatives are carried out by pairwise comparison. According to Saaty (2008), for various issues, a scale of 1 to 9 is the best scale for expressing opinions (Sa'adati et al., 2018). The value and definition of qualitative opinions from the Saaty comparison scale can be measured using an analysis table as follows:

Table 2. Pairwise Comparison Rating Scale

Intensity of Interest	Information
1	Both elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other elements
7	One element is more strongly important than the other elements
9	One element is more important than the other elements
2,4,6,8	When in doubt between two very close values
The opposite	If activity i gets one point compared to activity j, then j has the opposite value compared to i

In the research to determine the best mid-range smartphone, all the information obtained will be stored in the system database which will later be processed by the decision support system that will be built. Analysis of data processed by the AHP-MOORA method, namely determining valid criteria in evaluating alternatives to selected mid-range smartphones. The following is the criteria and alternative data that will be used, including:

Table 3. Smartphone Criteria

No	Criteria	Information	Attribute
1	C1	RAM	Benefits
2	C2	Internal	Benefits
3	C3	Chipset	Benefits
4	C4	Display	Benefits
5	C5	Camera	Benefits
6	C6	NFC	Benefits
7	C7	USB	Benefits
8	C8	Price	Cost

Table 4. Alternative Data

No	Name	Code
1	Galaxy A54 5G	A1
2	Nokia G42 5G	A2
3	Redmi Note 12 Pro 5G	A3
4	Poco X5 5G	A4

5	Oppo A98 5G	A5
6	Reno 8T 5G	A6
7	Realme 11 Pro 5G	A7
8	Vivo Y75 5G	A8
9	Infinix GT 10 pro	A9
10	Tecno Pova 5 Pro 5G	A10

Application of the AHP Method

In this research, the AHP method will be used as a system algorithm for weighting criteria. In the AHP method, after the weight is obtained, it will continue with testing the consistency. The goal is whether the weight is consistent or not. If the weights are consistent then it will produce a weighting, and if not it will return to the pairwise comparison matrix.

Table 5. Pairwise Comparison Matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8
C1	1	2	1/2	3	3	3	3	1/3
C2	1/2	1	1/3	3	3	3	2	1/3
C3	2	3	1	3	3	5	3	2
C4	1/3	1/3	1/3	1	1/3	3	1/2	1/3
C5	1/3	1/3	1/3	3	1	3	3	1/3
C6	1/3	1/3	1/5	1/3	1/3	1	1/2	1/3
C7	1/3	1/2	1/3	2	1/3	2	1	1/3
C8	3	3	1/2	3	3	3	3	1

Table 6. Simplified Pairwise Comparison Matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8
C1	1	2	0.5	3	3	3	3	0.3333
C2	0.5	1	0.3333	3	3	3	2	0.3333
C3	2	3	1	3	3	5	3	2
C4	0.3333	0.3333	0.3333	1	0.3333	3	0.5	0.3333
C5	0.3333	0.3333	0.3333	3	1	3	3	0.3333
C6	0.3333	0.3333	0.2	0.3333	0.3333	1	0.5	0.3333
C7	0.3333	0.5	0.3333	2	0.3333	2	1	0.3333
C8	3	3	0.5	3	3	3	3	1
Amount	7.8333	10.5	3.5333	18.3333	14	23	16	5

The next step is to calculate the value of the criteria column elements, where each element of the criteria column is divided by the number of matrices for each column in table 4. Then add up the row matrix of values for each element.

Table 7. Normalization Matrix Calculation

Criteria	C1	C2	C3	C4	C5	C6	C7	C8
C1	1 /	2 /	0.5 /	3 /	3/14	3/23	3/16	0.3333 /
	7.8333	10.5	3.5333	18.3333				5
C2	0.5 /	1 /	0.3333 /	3 /	3/14	3/23	2/16	0.3333 /
	7.8333	10.5	3.5333	18.3333				5
C3	2 /	3 /	1 /	3 /	3/14	5/23	3/16	2/5
	7.8333	10.5	3.5333	18.3333				
C4	0.3333 /	0.3333 /	0.3333 /	1 /	0.3333 /	3/23	0.5/16	0.3333 /
	7.8333	10.5	3.5333	18.3333	14			5

C5	0.3333 /	0.3333 /	0.3333 /	3 /	1/14	3/23	3/16	0.3333 /
	7.8333	10.5	3.5333	18.3333				5
C6	0.3333 /	0.3333 /	0.2 /	0.3333 /	0.3333 /	1/23	0.5/16	0.3333 /
	7.8333	10.5	3.5333	18.3333	14			5
C7	0.3333 /	0.5 /	0.3333 /	2 /	0.3333 /	2/23	1/16	0.3333 /
	7.8333	10.5	3.5333	18.3333	14			5
C8	3 /	3 /	0.5 /	3 /	3/14	3/23	3/16	1/5
	7.8333	10.5	3.5333	18.3333				

To calculate Priority Weight = Average Criteria Value (Row), the results are in table 6. It can be seen that each criterion has a different priority weight. Pairwise comparisons result in priority weights that reflect the relative importance of elements in the hierarchy.

Table 8. Priority Weight Normalization Matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Priority Weight
C1	0.1277	0.1905	0.1415	0.1636	0.2143	0.1304	0.1875	0.0667	0.1528
C2	0.0638	0.0952	0.0943	0.1636	0.2143	0.1304	0.1250	0.0667	0.1192
C3	0.2553	0.2857	0.2830	0.1636	0.2143	0.2174	0.1875	0.4000	0.2509
C4	0.0426	0.0317	0.0943	0.0545	0.0238	0.1304	0.0313	0.0667	0.0594
C5	0.0426	0.0317	0.0943	0.1636	0.0714	0.1304	0.1875	0.0667	0.0985
C6	0.0426	0.0317	0.0566	0.0182	0.0238	0.0435	0.0313	0.0667	0.0393
C7	0.0426	0.0476	0.0943	0.1091	0.0238	0.0870	0.0625	0.0667	0.0667
C8	0.3830	0.2857	0.1415	0.1636	0.2143	0.1304	0.1875	0.2000	0.2133

Next is to find the lambda value. The first stage is to multiply the elements in the pairwise comparison matrix columns in table 4.6 by the priority values in table 4.8, the results of the multiplication are then added up for each row. The following are the stages of carrying out the multiplication process with criteria data C1 and C2: With the above calculation process, the following calculation results are obtained:

Table 9. Lambda Value

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Lamda
C1	0.1528	0.2384	0.1254	0.1783	0.2956	0.1179	0.2001	0.0711	1.3794
C2	0.0764	0.1192	0.0836	0.1783	0.2956	0.1179	0.1334	0.0711	1.0754
C3	0.3055	0.3575	0.2509	0.1783	0.2956	0.1964	0.2001	0.4265	2.2108
C4	0.0509	0.0397	0.0836	0.0594	0.0328	0.1179	0.0333	0.0711	0.4888
C5	0.0509	0.0397	0.0836	0.1783	0.0985	0.1179	0.2001	0.0711	0.8401
C6	0.0509	0.0397	0.0502	0.0198	0.0328	0.0393	0.0333	0.0711	0.3372
C7	0.0509	0.0596	0.0836	0.1188	0.0328	0.0786	0.0667	0.0711	0.5622
C8	0.4583	0.3575	0.1254	0.1783	0.2956	0.1179	0.2001	0.2133	1.9463

The next stage is to calculate the Consistency Index (CI) and Consistency Ratio (CR). If the hierarchical consistency is $0 \leq \text{ratio} \leq 0.1$, it is called consistent, then the calculation is justified.

Application of the MOORA Method

After the weight search is carried out, the next stage is to carry out MOORA calculations to get a ranking of mid-range smartphones so that we can find out which ones are rated as the best mid-range smartphones and which ones are the worst mid-range smartphones among

mid-range smartphones. The assessment scale will be used as calculation material in the assessment process. This is intended to determine the best mid-range smartphone.

Table 10 Rating Scale

Code	Criterion Name	Information	Value
C1	RAM	8GB	3
		6GB	2
		4GB	1
C2	Internal	256GB	3
		128GB	2
		64GB	1
C3	Chipset	1 - 50	6
		51 - 100	5
		101 - 150	4
		151 - 200	3
		200 - 250	2
		> 250	1
C4	Display	FHD+	3
		IPS-FHD	2
		HD	1
C5	Kamera	>100MP	3
		50 - 100MP	2
		<50MP	1
C6	NFC	Yes	1
		No	0
C7	USB	Type-C	2
		MicroUSB	1
C8	Harga	<3Juta	4
		3 - 4Juta	3
		4 - 5Juta	2
		>5Juta	1

The next stage is to create a decision matrix from the results of the assessment scale according to existing conditions.

Table 11. Decision Matrix

Alternative	C1	C2	C3	C4	C5	C6	C7	C8
A1	3	2	5	3	2	1	2	1
A2	1	2	4	1	2	1	2	2
A3	3	3	5	3	2	1	2	2
A4	3	3	5	3	1	1	2	3
A5	3	3	5	2	2	0	2	3
A6	3	3	5	3	3	1	2	2
A7	3	3	5	3	3	1	2	2
A8	3	2	5	2	2	1	2	2
A9	3	3	6	3	3	1	2	3
A10	3	3	5	2	2	1	2	4

After determining the decision matrix, the next step is to normalize the matrix. The element of the first column is divided by the square root of the first column. The elements of the second column are divided by the square root of the second column, and so on.

Table 12. Matrix Normalization

Alternative	C1	C2	C3	C4	C5	C6	C7	C8
	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Cost
A1	0.331	0.231	0.315	0.367	0.277	0.333	0.316	0.125
A2	0.110	0.231	0.252	0.122	0.277	0.333	0.316	0.250
A3	0.331	0.346	0.315	0.367	0.277	0.333	0.316	0.250
A4	0.331	0.346	0.315	0.367	0.139	0.333	0.316	0.375
A5	0.331	0.346	0.315	0.244	0.277	0.000	0.316	0.375
A6	0.331	0.346	0.315	0.367	0.416	0.333	0.316	0.250
A7	0.331	0.346	0.315	0.367	0.416	0.333	0.316	0.250
A8	0.331	0.231	0.315	0.244	0.277	0.333	0.316	0.250
A9	0.331	0.346	0.378	0.367	0.416	0.333	0.316	0.375
A10	0.331	0.346	0.315	0.244	0.277	0.333	0.316	0.500

The next step is normalization of the weighted matrix. Weighted matrix normalization is obtained by multiplying the criteria weights obtained using AHP with Matrix Normalization

Table 13. Weighted Normalization Matrix

Alternative	C1	C2	C3	C4	C5	C6	C7	C8
	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Benefits	Cost
Weight	0.1528	0.1192	0.2509	0.0594	0.0985	0.0393	0.0667	0.2133
A1	0.051	0.028	0.079	0.022	0.027	0.013	0.021	0.027
A2	0.017	0.028	0.063	0.007	0.027	0.013	0.021	0.053
A3	0.051	0.041	0.079	0.022	0.027	0.013	0.021	0.053
A4	0.051	0.041	0.079	0.022	0.014	0.013	0.021	0.080
A5	0.051	0.041	0.079	0.015	0.027	0.000	0.021	0.080
A6	0.051	0.041	0.079	0.022	0.041	0.013	0.021	0.053
A7	0.051	0.041	0.079	0.022	0.041	0.013	0.021	0.053
A8	0.051	0.028	0.079	0.015	0.027	0.013	0.021	0.053
A9	0.051	0.041	0.095	0.022	0.041	0.013	0.021	0.080
A10	0.051	0.041	0.079	0.015	0.027	0.013	0.021	0.107

The next step is to calculate the optimization value, the benefit attribute will be added up with the other benefit attributes. The cost attribute will be added to other cost attributes. The yi value is obtained by subtracting the sum of benefits and costs.

Table 14. Optimization Results

Alternative Data	Max (C1+C2+C3+C4+C5+C6+C7)	Min (C8)	Value (yi)
A1	0.2405	0.0267	0.2138
A2	0.1764	0.0533	0.1231
A3	0.2542	0.0533	0.2009
A4	0.2406	0.0800	0.1606
A5	0.2339	0.0800	0.1539
A6	0.2679	0.0533	0.2146
A7	0.2679	0.0533	0.2146
A8	0.2332	0.0533	0.1799
A9	0.2837	0.0800	0.2037
A10	0.2470	0.1067	0.1403

The final step is to determine the ranking. Ranking is seen from the y_i value obtained. The smartphone that has the largest y_i value is the best alternative to become the best mid-range smartphone.

Table 15. Ranking

Alternative Data	Value (y_i)	Rating
A1	0.2138	3
A2	0.1231	10
A3	0.2009	5
A4	0.1606	7
A5	0.1539	8
A6	0.2146	1
A7	0.2146	2
A8	0.1799	6
A9	0.2037	4
A10	0.1403	9

With the ranking results in table 15, it can be seen which is the best alternative that can be used in making decisions about selecting the best mid-range smartphone based on the criteria data and alternative weight values that have been tested.

Table 16. Smartphone ranking data

Alternative Data	Alternative Name	Value (y_i)	Rating
A6	Reno 8T 5G	0.2146	1
A7	Realme 11 Pro 5G	0.2146	2
A1	Galaxy A54 5G	0.2138	3
A9	Infinix GT 10 Pro	0.2037	4
A3	Redmi Note 12 Pro 5G	0.2009	5
A8	Vivo Y75 5G	0.1799	6
A4	Poco X5 5G	0.1606	7
A5	Oppo A98 5G	0.1539	8
A10	Tecno Pova 5 Pro 5G	0.1403	9
A2	Nokia G42 5G	0.1231	10

System planning

This stage is the stage of developing a website-based application by writing programming code so that it can produce the desired decision support system application. The system development was built using the PHP and MySQL programming languages so that it was able to select a smartphone using the method to be used. Before building a system, the first step that will be taken first is to design the system flow, database and system interface. The following are the results of the system flowchart design:

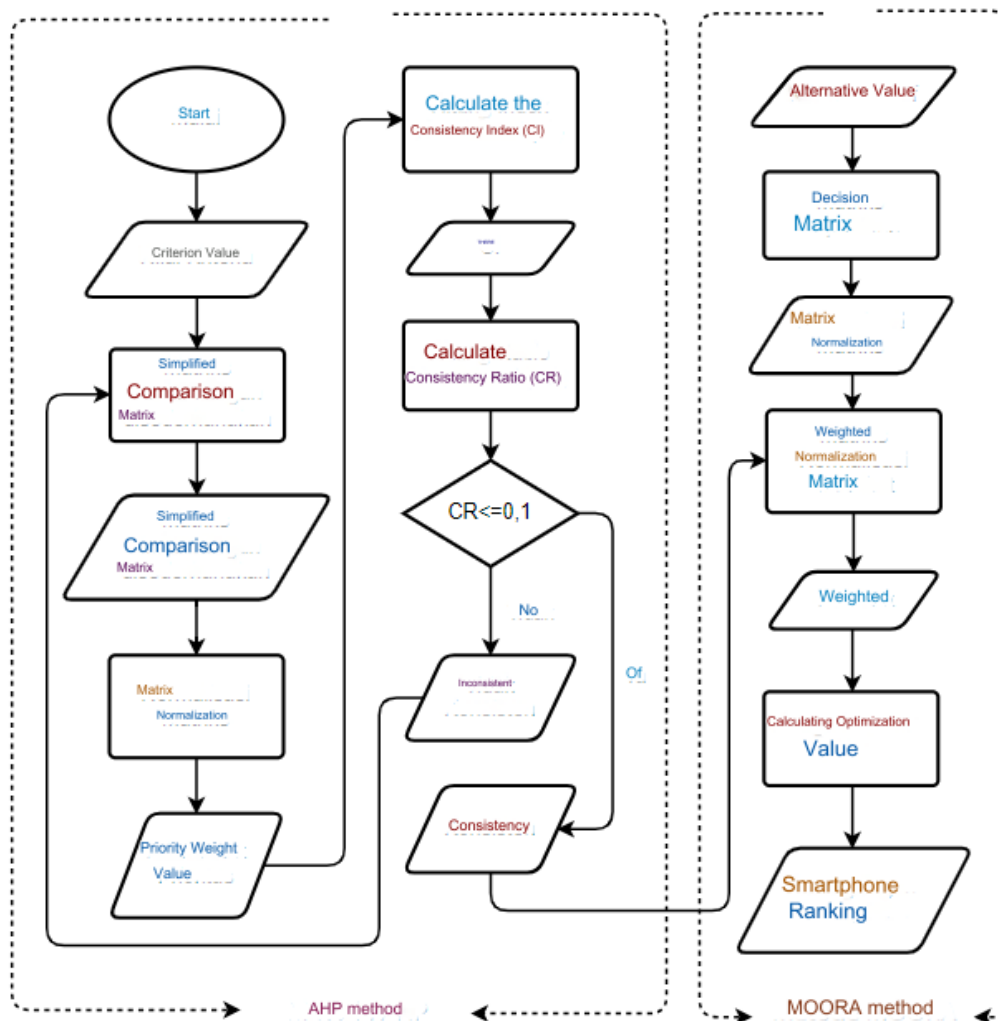


Figure 1. Flowchart sistem

The design of this system was carried out using two process methods, namely weighting using the AHP method and ranking using the MOORA method. The dotted line indicates the transfer of the calculation process from the AHP method to the MOORA method and marks the separation between the AHP process and the MOORA process.

In the AHP method, after the weight is obtained, it will continue with testing the consistency. The goal is whether the weight is consistent or not. If the weights are consistent then it will produce a weighting, and if not it will return to the pairwise comparison matrix. After the weight is obtained, it will continue with ranking using the MOORA method. The weights obtained using the AHP method will be included in the weighted normalization matrix.

Database Design

A database is a place to store data. In carrying out data processing operations, data storage is very important. Processing in data processing does not only have to be done in a fast process, and there is much more. For example, minimum time for data acquisition, capacity to store and update large amounts of data to update data.

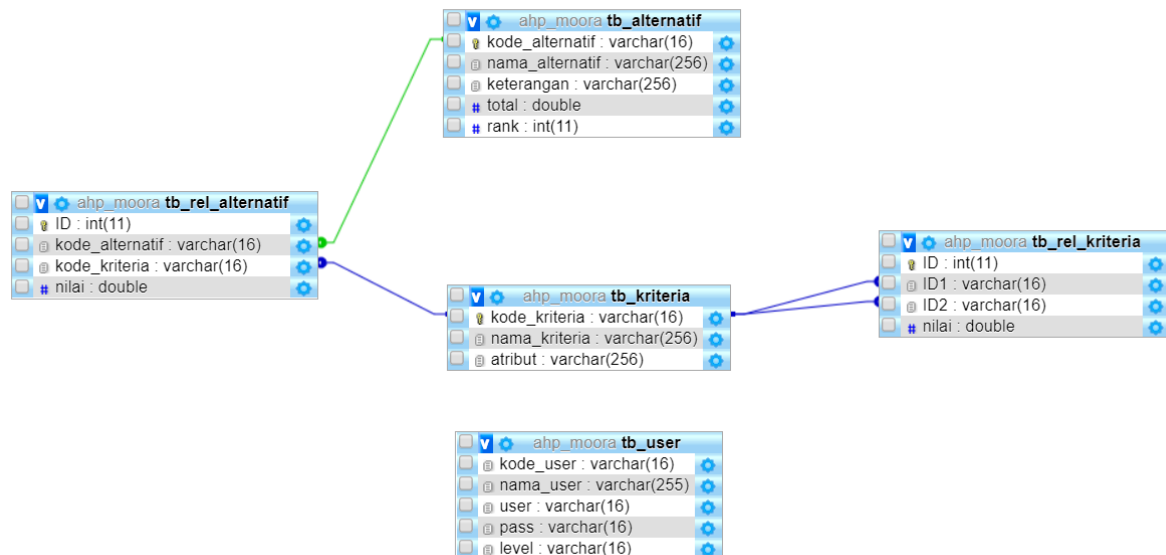


Figure 2. ERD AHP MOORA

In creating this system the database used is the MySQL database. The database created in this design is as follows:

User Table

This user table is used to store user data in the database. This table contains user_code, username, password and user level.

Criteria Table

The criteria table is used to store criteria data that will be used for data comparison.

Sub_criteria table

The sub_criteria table is used to store data on the weight values of the criteria which will be used as a reference for comparison of criteria.

Alternative Table

The alternative table is used to store alternative data which is used as test data in decision making.

Sub-alternative Table

The sub_alternative table is used to store data on alternative weight values which are used as values tested in decision making.

Interface Design

This input/output interface design aims to create an application interface that is integrated with the software so that the application design is easier to understand.

Testing

The testing stage is carried out with the aim of seeing the results of the decision support system application that has been built running as planned. This decision support system application helps users choose a mid-range smartphone based on their preferences. Key features include preference filters (budget, brand, screen size) and specification comparison (camera, processor, storage). Apart from that, the author also ensures that the applications that have

been built can be used and accessed easily, quickly and accurately. The display that will appear for the first time when running this system is as follows:

Login Menu Page Display

The first time it is used, the user will be directed to the login page. This page will display all the pages on the system.

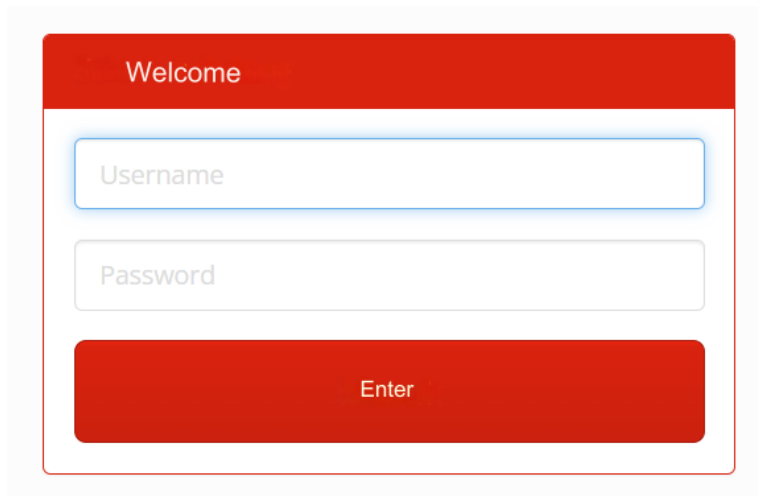


Figure 3. Login page

Main Page Display

After logging in, users are directed to the main page where all pages can be accessed here.

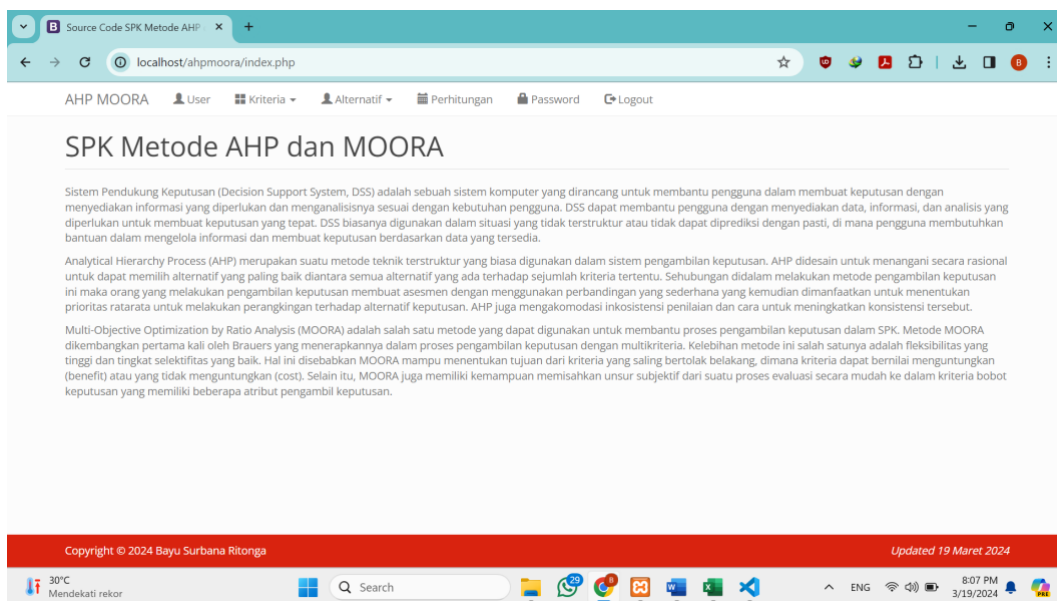


Figure 4. Main page

Criteria Page Views

On the criteria page, users can add or delete criteria. Users can also print the criteria data that has been added.

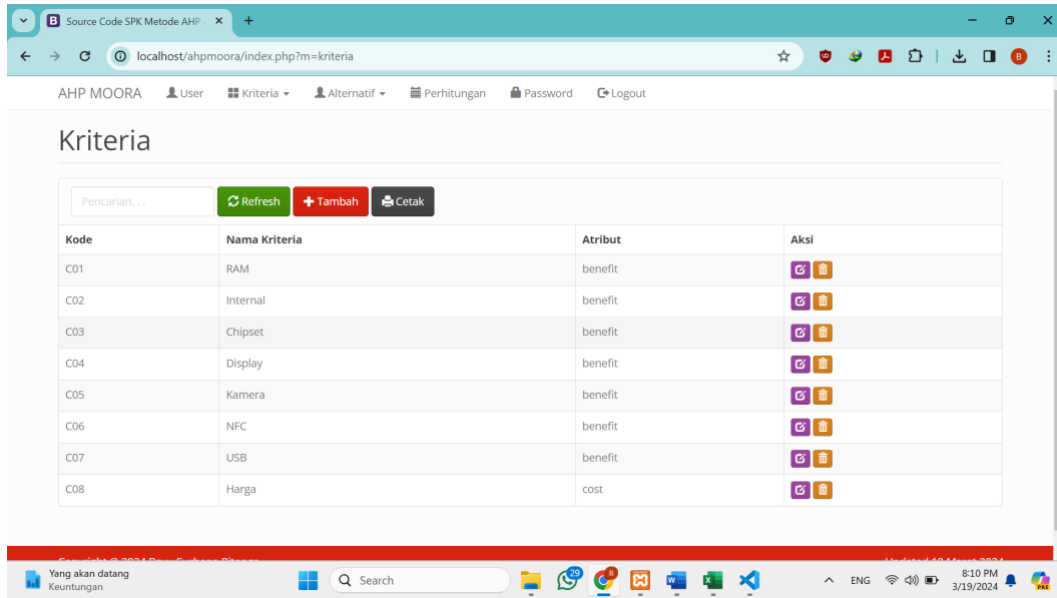


Figure 5. Criteria page

Page View Value Weight Criteria

On the criteria weight value page, users can change the weight value based on the pairwise comparison assessment scale according to the importance intensity value.

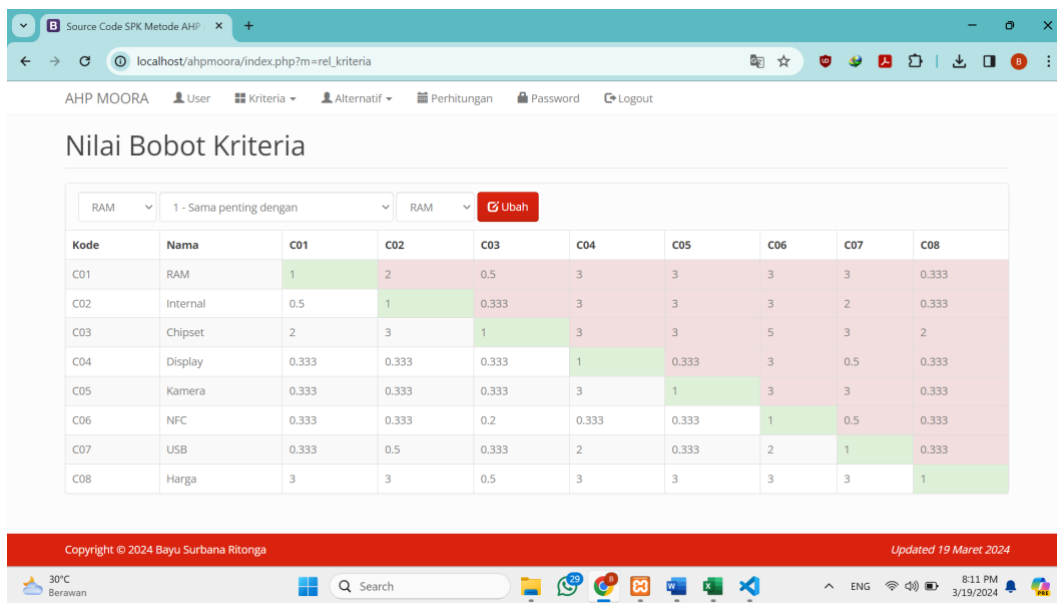


Figure 6. Criteria weight value page

Alternative Page Views

On alternative pages, users can add, delete, change and print the data that has been added.

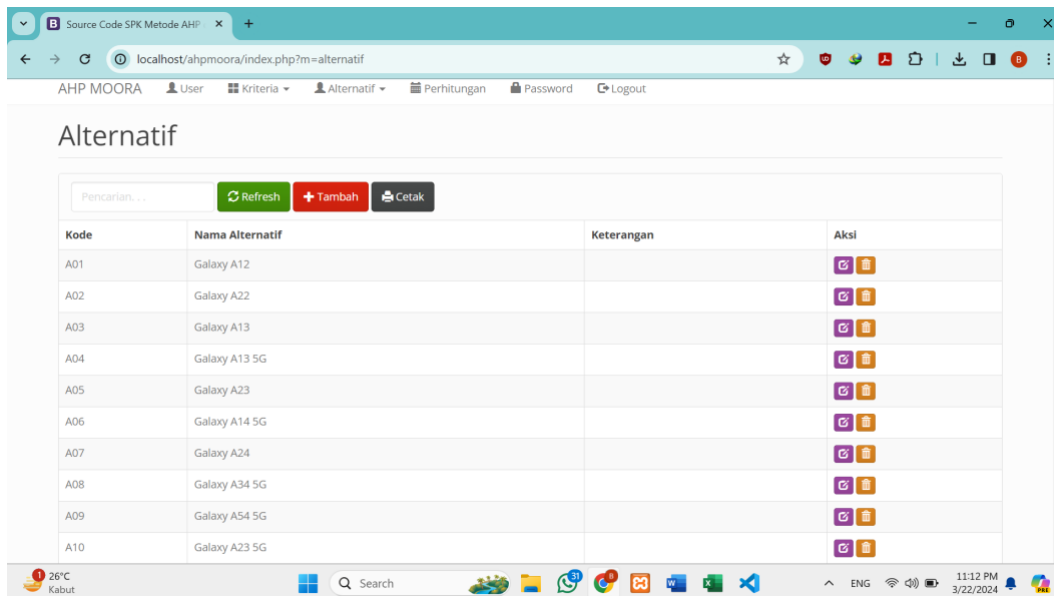


Figure 6. Alternative pages 1-10

Alternative Weight Value Page Views

On the alternative weight value page, users can change the weight value based on the assessment scale that corresponds to the alternative data that has been added.

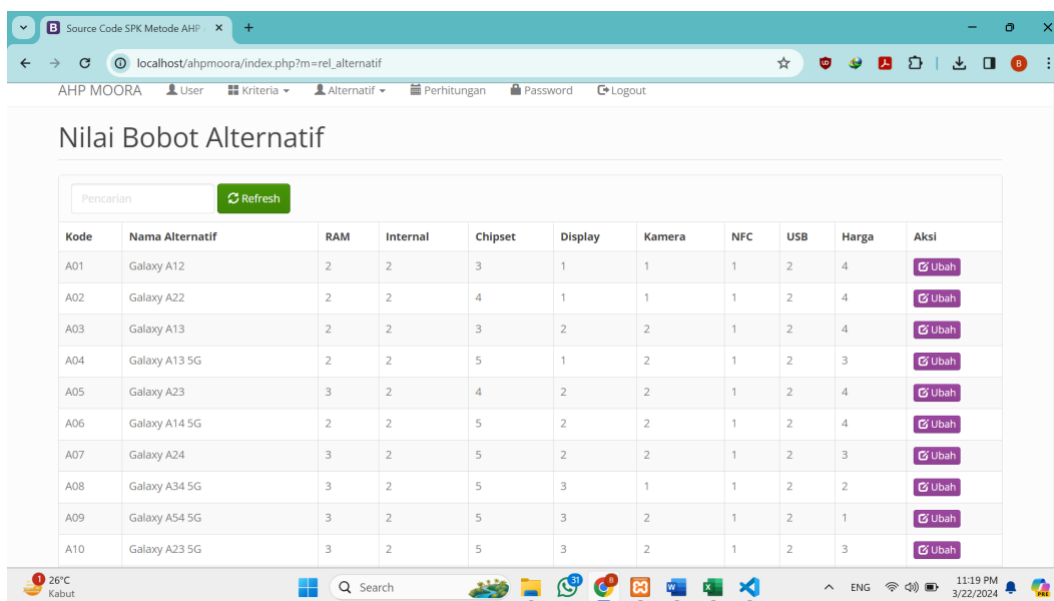


Figure 7. Alternative pages 1-10

Calculation Page View

On the calculation page, all values that have been added previously will be processed according to the system flow that has been designed.

Perangkingan			
Kode	Nama	Total	Rank
A64	Realme GT Neo 3T	0.089	1
A65	Realme GT Neo 3	0.089	2
A39	Poco F4	0.0818	3
A41	Poco F5	0.0818	4
A36	MI 11T	0.0815	5
A62	Realme 10 Pro 5G	0.0811	6
A40	MI 12 Lite	0.0811	7
A42	Poco X5 Pro	0.0811	8
A60	Realme 11 Pro 5G	0.0811	9
A56	Reno 8T 5G	0.0811	10
A76	Infinix GT 10 Pro	0.0795	11
A09	Galaxy A54 5G	0.0781	12
A46	Poco F3	0.0769	13
A73	Vivo V27e	0.0762	14

Figure 8. Ranking Results 1-14

Conclusion

Based on tests that have been carried out on decision support systems in selecting the best mid-range smartphone using the AHP and MOORA methods, there are several conclusions including: (1) Through the integration of the two methods, researchers succeeded in building a comprehensive framework for evaluating relevant criteria in selection smartphones; (2) The test results show that AHP is able to provide relative weights for each criterion used in this research. Meanwhile, MOORA succeeded in ranking smartphone alternatives based on normalized values for each criterion; (3) Based on the calculation results shown in the decision support system application, the first recommendation is Realme GT Neo 3T, followed by Realme GT Neo 3 and Poco F4 in ranks 2 and 3. Ranks 1-10 are dominated by the Realme and Xiaomi brands which are the parent brands. companies from Poco and Redmi; (4) The application that has been designed has a fairly good page display so as to provide convenience to users.

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