# Analysis Election Smartphone Best for Students UIN Sunan Kalijaga Using The Analytic Hierarchy Process (AHP) Method

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**Abstract:** The rapid development and advancement of digital technology has driven major changes in human life, including the use of technological devices such as smartphones. With the increasing need for smartphones to support academic activities, consumers sometimes face difficulties in determining choices that suit their needs. This study aims to identify smartphone features that are most considered by students in the purchasing decision-making process, using the Analytical Hierarchy Process (AHP) method. This study uses primary data obtained through questionnaires to active students with criteria used as a basis for comparison including price, storage capacity, camera quality, processor, and design. The results of the study show that the storage capacity feature is the main consideration in choosing a smartphon, followed by the processor feature and camera quality. Price and design are ranked next. This finding shows that the need for performance and efficiency in support activity academic become priority main for students. In conclusion, the results of this study can be a reference for students in determining their choice of smartphone. Which in accordance with need academic as well as provide manufacturers with an overview of current consumer preference.

**Keywords:** *Student, Digital, Smartphone, AHP, Technology.*

## Introduction

The use of digital technology has been very massive in our daily lives, this is a sign that the development of human civilization is very rapid. Looking at BPS data, the number of digital technology users in Indonesia reached 66.8% in a survey conducted in 2022. It is undeniable that almost every individual uses the help of technology in carrying out their activities, especially digital technology which has developed quite rapidly since the 2000s and continues to develop to this day. With the great interest of the public in using technology services, producers compete in creating excellence in each of their products in order to attract the public. One of the fastest growing technologies is telecommunications technology, this is based on the needs of modern humans to be able to interact with someone without any distance and time constraints.

Smartphones are the technology most widely used by the public. This is the reason why smartphone manufacturers improve the quality of their products in order to dominate the market which has quite high demand. In Indonesia itself, smartphones have become a basic need that must be owned by every individual from children to the elderly. Nowadays, almost all activities economy can be started with utilizing smartphones. Besides In this regard, smartphones are also used to support teaching and learning activities in schools and

universities. With the increasing knowledge using the help of smartphone very required For help effectiveness activity Study teach.

However, in practice, people tend to find it difficult to make a choice when purchasing a smartphone that suits their academic needs, considering that. the tight competition between several smartphone products that offer attractive features in their products. Things that are often compared in purchasing a smartphone include price, storage capacity, camera, processor, design. In this study, we will create a level of the most selected features in purchasing a smartphon. The purpose of this study is as a guide for students in determining choices in purchasing a smartphone. In this study we use the Analytical Hierarchy Process (AHP) method.

Research related to decision making in purchasing a smartphone using the analytical hierarchy process (AHP) method also been conducted by Sarifah & Nita Merlina in 2015. The research was conducted using primary data and secondary data. However, in this study we offer a novelty from previous studies, where in this study we only use primary data. With this, the research results will be more subjective. And in research This criteria that we make The comparison is very different and we adjust it to current technological developments.

**Literature Review**

The development of the era has progressed so rapidly that it has brought very significant changes to the way we search for information. In this modern era, smartphones have become one of the tools to access information and can also be a fairly compact supporting tool for student academic activities. Quoting from BPS data in 2022, the use of digital goods in Indonesia has reached 66.8%. Showing that people have a high dependence on digital goods. In terms of education, smartphones are one of the most widely used digital goods that can provide many facilities for lecture materials, storing documents, and communication that is so fast and smooth. Therefore, choosing a decent smartphone is also important for student productivity.

The decision to purchase a smartphone is influenced by many factors, such as features, needs, etc. Every group certainly has their own needs, especially in the topic we are discussing this time, namely in the realm of students and there are so many considerations such as storage capacity, price, camera quality, processor performance, and design. The decision was previously studied by Sarifah & Melina on smartphone purchasing decisions using the AHP method where in the study they used a combination of primary and secondary data. However, this study currently updates the approach so that the results are more contextual and up to date using only primary data.

This study uses the AHP method, which is a multi-criteria decision-making method developed by Thomas L. Saaty (Saaty, 1980), by breaking down complex problems into a structured hierarchy. AHP becomes one of the methods that solves many problems because the ultimate goal becomes the basic interest for each criterion and pairwise comparisons are carried out to find the weight of each criterion.

**Methodology**

In this study we use the Analytical Hierarchy Process (AHP) method. This method was first introduced by Thomas L. Saaty, where in this decision support method will describe multi-factor or multi-criteria problems that A complex become One hierarchy, Hierarchy defined as a representation of a complex problem in a multi-level structure where the first level is objectives followed by level factors, criteria, sub criteria and so on down to the last level of the alternative. With this method we can describe a problem become a well-structured hierarchy. As for the stages we do namely:

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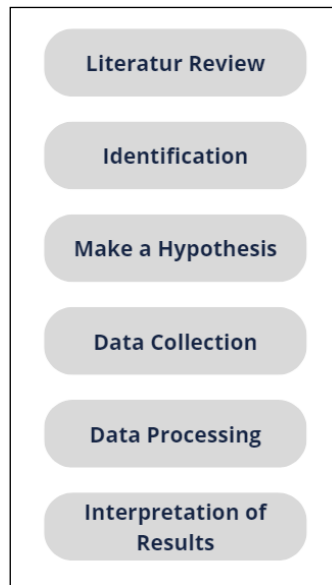✉ ihsansyamsul1@gmail.com (I. S. Maarif).

Figure 1. Analytical Hierarchy Process (AHP) Method

1. Literature Study: the next step that researchers do is to conduct a literature study through credible sources such as articles and journals. In this stage, researchers study the stages carried out in conducting research.
2. Problem identification: the initial step that researchers take in compiling a problem is to identify a problem or topic that exists in the surrounding environment. Identification of the problem or research topic to be studied is decided in context election smartphone brands. The variables that we determine include design, processor, storage space, price, and camera.
3. Make hypothesis: stage furthermore. Which researcher does that is to make hypothesis design of the problems that have been determined in the previous stage. The hope is that this hypothesis can help researchers in completing their research.
4. Data Collection: in the data collection stage, researchers use a questionnaire method which is distributed to parties included in the research object and use the help of websites which provide related reviews. with the research theme.
5. Data processing: in this study, the researcher used three stages in processing the data, namely:
    - Creating a comparison matrix: in this case the researcher creates a questionnaire which is distributed to respondents so that the respondents can choose between one of the options in the questionnaire.
    - Calculating priority weight: by using mathematical calculations in the AHP method, the priority score for each factor that has been determined. This shows the level of importance of each factor to the decision to choose a brand on a smartphone.
    - Calculating the score: after the priority weights have been determined, the next step is to calculate using the Analytical Hierarchy Process (AHP) method to show the priority scale results of the respondents' choices.
6. Interpretation of results: after the calculation results are complete, the researcher interprets the results of the existing calculations. Thus, making it easier for readers to understand the results of this study.

**Results and Discussion**

The aim or goal of the research is to implement the Analytical Hierarchy Process (AHP) method, which is one of the methods in the decision support system used For help process taking decision. (Hartini, 2020). In In this study, AHP is used to determine the best smartphone for students. In this study, we used 64 respondents who were students from the Sunan Kalijaga State Islamic University from various faculties. The alternatives determined in this study were three smartphone brands that are

most often used in Indonesia. The three alternatives are Samsung, Oppo, and Redmi. While the criteria in the hierarchical structure are determined from the processor, design, internal storage, camera, and price.
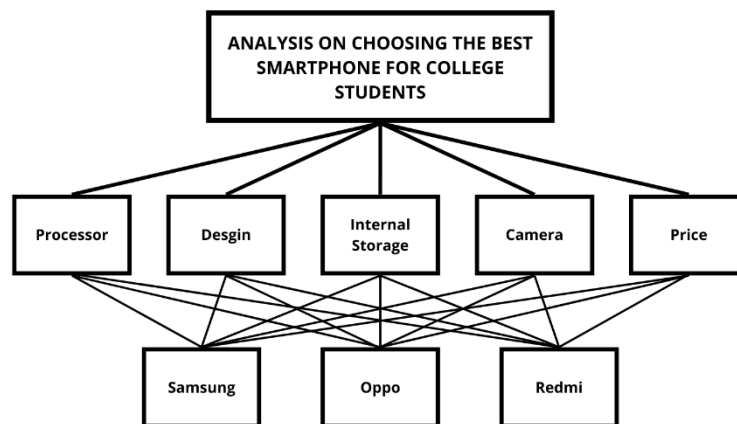


Figure 2. Analysis The Best Smartphone for College Student

**Results Processing Data Analytical Hierarchy Process (AHP)**

1. Weight Calculation Main Criteria

Table 1. Matrix Comparison Paired on Criteria Main

| Criteria | Processor | Design | Storage | Camera | Price |
|---|---|---|---|---|---|
| Processor | 1 | 4 | 0.5 | 1 | 3 |
| Design | 0.25 | 1 | 0.25 | 0.25 | 0.111111 |
| Storage | 2 | 4 | 1 | 2 | 4 |
| Camera | 1 | 4 | 0.5 | 1 | 3 |
| Price | 0.3333333333 | 9 | 0.25 | 0.33333333 | 1 |
| Amount | 4.25 | 22 | 2.5 | 4.58333333 | 11,11111 |

Table 2. Normalization on Criteria Main

| Criteria | Eigen Values | | | | | Amount | Average |
|---|---|---|---|---|---|---|---|
| Processor | 0.23529 | 0.18182 | 0,2 | 0,21818 | 0,27 | 1,10529 | 0,22106 |
| Desain | 0,05882 | 0,04545 | 0,1 | 0,05455 | 0,01 | 0,26882 | 0,05376 |
| Storage | 0,47059 | 0,18182 | 0,4 | 0,43636 | 0,36 | 1,84877 | 0,36975 |
| Camera | 0,23529 | 0,18182 | 0,2 | 0,21818 | 0,27 | 1,10529 | 0,22106 |
| Prices | 0,07843 | 0.40909 | 0.1 | 0.07273 | 0.09 | 0.75025 | 0.15005 |

After obtaining each criterion (Eigenvector), the data consistency is then re-checked, $\lambda$ max (Maximum Eigen) and Consistency Index (CI) are needed to calculate the Consistency Ratio (CR).

$$
\begin{vmatrix}
1 & 4 & 0.5 & 1 & 3 \\
0.25 & 1 & 0.25 & 0.25 & 0.111 \\
2 & 4 & 1 & 2 & 4 \\
1 & 4 & 0.5 & 1 & 3 \\
0.33 & 9 & 0.25 & 0.33 & 1
\end{vmatrix}
\begin{vmatrix}
0.22106 \\
0.05376 \\
0.36975 \\
0.22106 \\
0.15005
\end{vmatrix}
=
\begin{vmatrix}
4.25 \\
22 \\
2.5 \\
4,583 \\
11.11
\end{vmatrix}
$$

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Consistency Vector

$$
\begin{bmatrix}
4Q,25 \\
22A \\
2,5 \\
4,583 \\
11,11
\end{bmatrix}
\quad x \quad
\begin{bmatrix}
0,2216 \\
0,05376 \\
0,36975 \\
0,22106 \\
0,15005
\end{bmatrix}
$$

The next step is to determine the maximum eigenvalue (λ maximum), which is obtained by multiplying the eigenvalues of the vector by the total value of each pairwise comparison.

$$\lambda maksimum = (4{,}25 \; x \; 0{,}2216) + (22 \; x \; 0{,}05376) + (2{,}5 \; x \; 0{,}36975) + (4{,}583 \; x \; 0{,}22106)$$
$$+ (11{,}11 \; x \; 0{,}15005)$$

$$= 5{,}727116063$$

$$CI = \lambda maksimum - n \, / \, n - 1$$

$$= 5.727116063 - 5 \, / \, 5 - 1$$

$$= 0.181779016$$

After the CI value, it is then calculated with the CR (Consistency Ratio), namely by dividing the CI value by the Random index.

$$CR = CI/RI$$

$$= 0.181779016/1.12$$

$$= 0.162302693$$

Table 3. Matrix Comparison Paired Between Alternative on Criteria Price

| Price | Oppo | Samsung | Redmi | Eiden Value | | | Amount | Average |
|---|---|---|---|---|---|---|---|---|
| Oppo | 1 | 4 | 0.5 | 0.30769231 | 0.5 | 0.27273 | 1.08042 | 0,36014 |
| Samsung | 0,25 | 1 | 0,333333333 | 0,07692308 | 0,125 | 0,18182 | 0,38374 | 0,12791 |
| Redmi | 2 | 3 | 1 | 0,61538462 | 0,375 | 0,54545 | 1,53584 | 0,51195 |
| Amount | 3,25 | 8 | 1,833333333 | | | | | 1 |

After create matrix pairwise comparison, the next step is to calculate the eigenvector, which is the average value of each row in the matrix. The method is to normalize each column in the matrix, then divide each row element by the total value of its column. After obtaining the eigenvector value for each criterion, it is necessary to check the consistency of the data. For this, the value of λ max (eigen maximum) and Consistency Index (CI), which are then used to calculate the Consistency Ratio (CR).

Based on the calculation results, the value of λ max (maximum lambda) obtained is 3.132332945. From mark This Then counted Consistency Index (CI) with formula

$= \lambda maksimum - n \, /$ n-1, where n is the number of criteria. The CI result is 0.066166472 Furthermore, to determine the level of consistency in the pairwise comparison matrix, the Consistency Ratio (CR) is calculated using the formula CR=CI/IR and the CR value is 0.114080125

Table 4. Matrix Comparison Paired Between Alternative on Criteria Processor

| Processor | Oppo | Samsung | Redmi | Eiden Value | | | Amount | Average |
|---|---|---|---|---|---|---|---|---|
| Oppo | 1 | 0.2 | 1 | 0.14285714 | 0.137931 | 0.16667 | 0.44745 | 0.14915 |
| Samsung | 5 | 1 | 4 | 0.71428571 | 0.689655 | 0.66667 | 2.07061 | 0.6902 |
| Redmi | 1 | 0.25 | 1 | 0.14285714 | 0.172414 | 0.16667 | 0.48194 | 0.16065 |
| Amount | 7 | 1.45 | 6 | | | | | 1 |

Based on the calculation results on the Processor criteria, the value of λ max (maximum lambda) is obtained as big as 3.008730159. Mark This used For count Consistency Indeks (CI) with the formula $CI = \lambda maksimum - n / n-1$ which produces a CI of 0.004365079. Furthermore, the Consistency Ratio (CR) is calculated with the formula CR = CI / IR, and the CR value is obtained as 0.007525999. Because this CR value is much smaller than the tolerance limit of 0.1, it can be concluded that the comparison matrix in the Processor criteria is consistent, so that the assessment results can be accepted and used in the next decision-making process.

Table 5. Matrix Comparison Paired Between Alternative on Criteria storage

| Storage | Oppo | Samsung | Redmi | Eiden Value | | | Amount | Average |
|---|---|---|---|---|---|---|---|---|
| Oppo | 1 | 0.25 | 0.5 | 0.14285714 | 0.157895 | 0.11111 | 0.41186 | 0.13729 |
| Samsung | 4 | 1 | 3 | 0.57142857 | 0.631579 | 0.66667 | 1,86967 | 0.62322 |
| Redmi | 2 | 0.3333333 | 1 | 0.28571429 | 0.210526 | 0.22222 | 0.71846 | 0.23949 |

Based on the calculation results on the Storage criteria, the maximum λ value is obtained as 3.025480368. This value is used to calculate the Consistency Index (CI) of 0.012740184. Furthermore, the Consistency Ratio (CR) calculation is obtained CR value is 0.021965834. Because the CR value is smaller than 0.1, it can be concluded that the comparison matrix on the Storage criteria is consistent, so that the data used is acceptable and valid for decision making.

Table 6. Matrix Comparison Paired Between Alternative on Criteria Camera

| Camera | Oppo | Samsung | Redmi | Eiden Value | | | Amount | Average |
|---|---|---|---|---|---|---|---|---|
| Oppo | 1 | 0.2 | 1 | 0.14285714 | 0.146341 | 0.125 | 0.4142 | 0.13807 |
| Samsung | 5 | 1 | 6 | 0.71428571 | 0.731707 | 0.75 | 2,19599 | 0.732 |
| Redmi | 1 | 0.1666667 | 1 | 0.14285714 | 0.121951 | 0.125 | 0.38981 | 0.12994 |
| Amount | 7 | 1,3666667 | 8 | | | | | 1 |

Based on the calculation results on the Camera criteria, the maximum λ value is obtained as 3.006349206. This value is used to calculate the Consistency Index (CI) and the CI value is obtained as 0.003174603. Furthermore, the Consistency Ratio (CR) calculation is carried out and obtained mark CR as big as 0.005473454. Because mark CR more small from threshold limit 0.1, it can be concluded that the comparison matrix in the Camera criteria is consistent, so that the analysis results can be accepted and used for the decision-making process.

Table 7. Matrix Comparison Paired Between Alternative on Criteria Design

| Design | Oppo | Samsung | Redmi | Eiden Value | | | Amount | Average |
|---|---|---|---|---|---|---|---|---|
| Oppo | 1 | 0,2 | 1 | 0,14285714 | 0,137931 | 0,16667 | 0,44745 | 0,14915 |
| Samsung | 5 | 1 | 4 | 0,71428571 | 0,689655 | 0,66667 | 2,07061 | 0,6902 |
| Redmi | 1 | 0,25 | 1 | 0,14285714 | 0,172414 | 0,16667 | 0,48194 | 0,16065 |
| Amount | 7 | 1.45 | 6 | | | | | 1 |

Based on the calculation results on the Design criteria, the maximum λ value is 3.008730159. This value is used to calculate the Consistency Index (CI) and the CI value is 0.004365079. Furthermore, the Consistency Ratio is calculated and the CR value is 0.007525999. Because the CR value is smaller than 0.1, it can be concluded that the comparison matrix on the Design criteria is consistent, so that the resulting data can be accepted and used in the decision-making process.

So in this case it can be interpreted that in terms of product excellence, students prefer smartphones that have.

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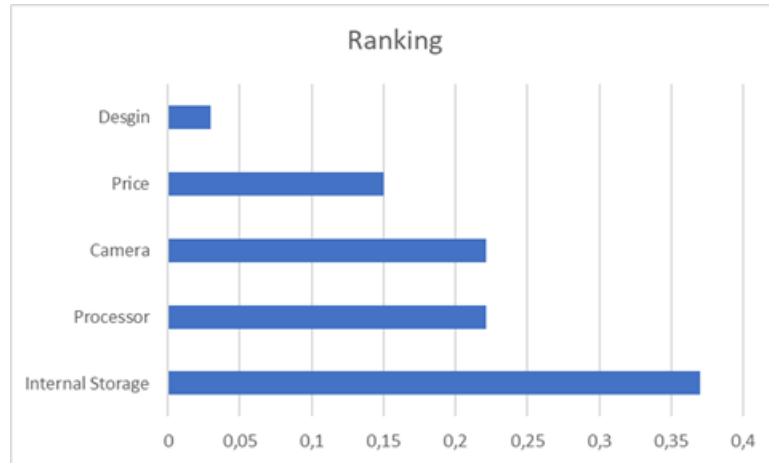
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Figure 3. Students' Preferences for Smartphones: A Ranking

a. Storage which is big with results calculation 0.36975.
b. Processor and camera own level which the same with results calculation 0.22106
c. Price with results calculation 0.15005
d. and which final that is design which good with results calculation 0.05376

and for the ranking of smartphone brands chosen by students, the results were as follows.



Figure 4. Total and Rank Replacement

a. ranked 1 student prefers samsung as product smartphone which is good with a calculation result of 0.17631274.
b. ranked to 2 student choose oppo as product the best choice with a calculated result of 0.60113173.
c. and in ranking to 3 redmi become smartphone choice student with calculation result 0.2382418

The AHP results show storage capacity (0.36975), processor (0.22106), and camera (0.22106) as the main criteria. This finding is in line with the features of the Samsung Galaxy A55 5G which offers 128/256GB storage (+ microSD expansion), Exynos 1480 processor, and 50MP camera with OIS. This product represents the manufacturer's response to student preferences, especially in supporting academic needs such as document storage and multitasking.

**Conclusion**

Based on AHP analysis, the main factor students consider when choosing a smartphone is storage capacity, followed by processor performance and camera quality. Price and design are less important. Among brands, Samsung is the top choice, followed by Oppo and Redmi. These results show that

students prefer smartphones that balance storage, speed, and camera features. This insight helps manufacturers focus on what students need most and guides students in choosing devices that support their academic activities.

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