International Journal of Management Science and Information Technology
IJMSIT

E-ISSN: 2774-5694 P-ISSN: 2776-7388 OPEN ACCESS

Volume 6 (2), July-December 2026, 1733-1746
DOI: https://doi.org/10.35870/ijmsit.v6i2.8145

Decision Support System for Selecting the Best Smartphone Using the Multi Attribute Utility Theory (MAUT) Method at Sinar Mas Selluler Kudus

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Article history:
Received July 22, 2026
Revised July 28, 2026
Accepted August 10, 2026

Abstract

The increasing variety of smartphone products with different specifications and prices makes the selection process more difficult for customers and often results in subjective recommendations from sales personnel. This study aims to develop a web-based Decision Support System (DSS) for smartphone selection at Sinar Mas Selluler Kudus using the Multi Attribute Utility Theory (MAUT) method. The system evaluates smartphone alternatives based on five criteria: Random Access Memory (RAM), Internal Storage, Screen Size, Battery Capacity, and Price. The research employed the System Development Life Cycle (SDLC) approach, including planning, analysis, design, implementation, and testing. The MAUT method was applied through criteria weighting, utility normalization, preference value calculation, and ranking to generate objective recommendations. The developed system was functionally validated using Black Box Testing to ensure that all system features operated according to the specified functional requirements. The developed system successfully automated the evaluation process, reduced subjective decision-making, and improved the efficiency of smartphone selection. The calculation results showed that Huawei (A3) achieved the highest preference value of 0.7215, indicating that it is the most suitable smartphone alternative according to the predefined criteria and weights. The implementation results demonstrate that the proposed system can assist sales personnel in providing objective recommendations while helping customers compare smartphone alternatives more efficiently based on their preferences and budget constraints. Therefore, the proposed system provides accurate, transparent, and consistent recommendations to support customers and sales personnel in making better purchasing decisions.

Keywords:
Decision Support System; MAUT; Multi Attribute Utility Theory; Smartphone Selection; Web-Based System.

1. INTRODUCTION

The rapid advancement of information and communication technology has significantly transformed various aspects of human life, particularly through the widespread adoption of smartphones. Smartphones are no longer limited to communication devices but have evolved into multifunctional tools that support education, business, entertainment, financial transactions, and professional activities. As interactive digital devices, smartphones have also become important tools for improving information accessibility, productivity, and decision-making in various sectors. Consequently, the increasing demand for smartphones has encouraged manufacturers to introduce numerous models with diverse specifications, features, and price ranges. While this diversity provides consumers with many alternatives, it also creates challenges in identifying the most appropriate smartphone according to individual needs and financial capability.

Sinar Mas Selluler Kudus, one of the smartphone retail stores in Kudus, Indonesia, experiences similar challenges in assisting customers during the purchasing process. Customers generally possess different preferences regarding smartphone specifications, including Random Access Memory (RAM), internal storage capacity, screen size, battery capacity, and price. In practice, product recommendations are still largely determined by the salesperson's personal experience and subjective judgment. Such a manual decision-making process often results in inconsistent recommendations, requires considerable comparison time, and may not accurately represent customer preferences. Therefore, an intelligent and systematic Decision Support System (DSS) is required to assist sales personnel in providing objective, consistent, transparent, and efficient smartphone recommendations based on customer preferences.

A Decision Support System (DSS) is a computer-based information system designed to support decision-making in semi-structured problems by processing available data into meaningful information that serves as the basis for generating appropriate decision recommendations (Kayati et al., 2022). By utilizing a Decision Support System (DSS), decision makers can evaluate alternatives more objectively, integrate empirical data, and develop decision models that improve the accuracy and consistency of decision outcomes (Suhandi, A., & Kurniati, R. 2026). Decision support system applications are extensively utilized to address challenges in decision-making across various domains (Ardiansyah et al. 2025). A Decision Support System (DSS) has been widely recognized as an effective approach for solving semi-structured and multi-criteria decision-making problems.

Various Multi-Criteria Decision Making (MCDM) methods have been successfully implemented in recommendation systems, including Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Weighted Product (WP), and Multi Attribute Utility Theory (MAUT). AHP is widely used for determining criterion priorities through pairwise comparisons; however, the method becomes increasingly complex as the number of criteria grows and requires consistency testing. TOPSIS identifies the best alternative based on its distance from the ideal and negative-ideal solutions but is highly dependent on the normalization process. In contrast, MAUT converts all evaluation criteria into standardized utility values ranging from 0 to 1, allowing benefit and cost attributes to be evaluated within a unified framework while preserving the relative importance of each criterion. This capability makes MAUT particularly suitable for smartphone selection problems involving heterogeneous specifications and multiple evaluation criteria. Another advantage of the Multi Attribute Utility Theory (MAUT) method is that both benefit and cost attributes can be evaluated within a unified utility framework, eliminating the need for separate ranking procedures for each attribute type (Silalahi et al. 2023). The MAUT method is particularly suitable for problems involving multiple conflicting criteria because it transforms different attribute measurements into comparable utility values while maintaining the importance weight of each criterion (Dari et al. 2023).

Several previous studies have demonstrated the effectiveness of MAUT in supporting decision-making across various application domains. MAUT has been successfully implemented for employee recruitment, scholarship recipient selection, supplier evaluation, educational decision support, and product recommendation systems because of its ability to evaluate multiple criteria simultaneously while producing objective ranking results. Previous studies also reported that MAUT improves transparency, decision accuracy, recommendation consistency, and computational efficiency in various Decision Support System applications (Widyawati, et al. 2024; Yulinawati, et al. 2022). However, most previous studies focused on limited datasets or application domains other than smartphone retail. Furthermore, only a few studies have integrated MAUT into a web-based decision support system using a large-scale dataset obtained from an actual smartphone retail environment. Consequently, there remains a research gap regarding the practical implementation of MAUT for smartphone recommendation systems that support both customers and sales personnel during the purchasing process.

Based on these conditions, this study aims to design and develop a Decision Support System for selecting the best smartphone using the Multi Attribute Utility Theory (MAUT) method at Sinar Mas Selluler Kudus. The system evaluates smartphone alternatives based on five decision criteria, namely RAM, internal storage, screen size, battery capacity, and price. A dataset consisting of 350 smartphone products was collected from Sinar Mas Selluler Kudus and used to develop and evaluate the proposed system. The MAUT algorithm performs criteria weighting, utility normalization, preference value calculation, and final ranking to generate objective recommendations.

The contribution of this research lies in the implementation of a web-based decision support system that integrates the MAUT algorithm into the smartphone selection process using real-world product data obtained from Sinar Mas Selluler Kudus. The proposed system minimizes subjective assessment during product recommendation, improves the efficiency of decision-making, and provides transparent ranking results that assist both sales personnel and customers in selecting smartphones according to technical specifications and budget constraints. Furthermore, the proposed system demonstrates the practical implementation of Multi-Criteria Decision-Making techniques in retail environments, providing a systematic recommendation mechanism that supports more objective and reliable purchasing decisions (Aprianto, A., 2023). In addition, this study contributes to the growing body of knowledge on Decision Support Systems by demonstrating the applicability of MAUT in smartphone retail and providing a practical reference for future research involving multi-criteria decision-making methods in consumer product recommendation systems.

2. RESEARCH METHOD

This study employed a quantitative research approach combined with the System Development Life Cycle (SDLC) framework to design and implement a Decision Support System (DSS) for smartphone selection using the Multi Attribute Utility Theory (MAUT) method. The MAUT method is based on the utility theory proposed by Von Neumann and Morgenstern and was further developed by Keeney and Raiffa, making it suitable for solving multi-criteria decision-making problems involving multiple evaluation attributes (Ferdiansyah et al. 2025). The quantitative approach was selected because the evaluation process involves numerical calculations, criteria weighting, utility normalization, and preference value computation to generate objective ranking results. The MAUT method was selected because it has been widely recognized as an effective Multi-Criteria Decision-Making technique capable of evaluating multiple attributes simultaneously while producing transparent ranking results (Fikri et al. 2022). Furthermore, the SDLC framework was adopted because it provides a systematic and structured development process, ensuring that each stage of system development is completed sequentially from planning to testing, thereby improving system reliability and maintainability.

The research was conducted at Sinar Mas Selluler Kudus, a smartphone retail store that offers various smartphone brands and models. The primary problem identified during the preliminary observation was the absence of a structured recommendation system. Product recommendations were generally determined based on the salesperson's experience, resulting in subjective decisions that could differ between employees and required considerable time when comparing multiple smartphone alternatives. Consequently, a web-based decision support system was proposed to improve recommendation accuracy and consistency. The implementation of a computerized decision support system is expected to improve recommendation quality while reducing human subjectivity during the smartphone selection process (Putra et al. 2022). The proposed system was developed as a web-based application to enable easier access for administrators, store owners, and sales personnel through a standard web browser without requiring additional software installation.

Data collection was carried out through several techniques. Observation was conducted to understand the existing smartphone recommendation process within the store. Interviews were performed with the store owner and employees to determine the importance level of each decision criterion and to identify problems encountered during the recommendation process. Documentation was used to collect smartphone specification data, while literature studies were conducted to review previous research related to Decision Support Systems, Multi-Criteria Decision Making (MCDM), and the Multi Attribute Utility Theory (MAUT) method. The interview results also served as the primary basis for determining the relative importance of each evaluation criterion used in the MAUT calculation process.

The research utilized two categories of data. Primary data consisted of the criterion weights obtained from interviews with the management of Sinar Mas Selluler Kudus. Secondary data consisted of technical specifications collected from 350 smartphone products available in the store database. Five evaluation criteria were adopted in this research, namely Random Access Memory (RAM), internal storage capacity, screen size, battery capacity, and product price. The first four criteria were classified as benefit attributes, whereas price was treated as a cost attribute. Each smartphone alternative was evaluated based on these criteria so that every alternative could be assigned an objective utility value for determining the final recommendation (Supiya, et al,. 2025). These criteria were selected because they represent the technical specifications most frequently considered by customers when purchasing smartphones and are commonly employed in product recommendation research (Dari et al. 2023). The selected criteria reflect both technical performance (RAM, internal storage, screen size, and battery capacity) and economic considerations (price), thereby providing a balanced evaluation model for smartphone selection.

The software development process followed the System Development Life Cycle (SDLC), consisting of five stages. The planning stage identified user requirements and research objectives. The analysis stage examined the current recommendation process and determined the decision criteria. The system architecture consists of three categories of users, namely administrators, owners, and customers. Administrators are responsible for managing smartphone data, criteria, user accounts, and MAUT calculations. Owners are provided with reporting features to monitor recommendation results, while customers can access smartphone information and recommendation results. The implementation stage translated the design into a web-based application using PHP, HTML, CSS, JavaScript, and MySQL. Visual Studio Code was utilized as the integrated development environment (IDE), while XAMPP functioned as the local web server during system development and testing. Bootstrap was employed to improve user interface responsiveness across different devices. Finally, the testing stage evaluated the system functionality using the Black Box Testing method to verify that every feature operated correctly according to the specified requirements.

The decision-making process was implemented using the Multi Attribute Utility Theory (MAUT) algorithm. Initially, a decision matrix containing all smartphone alternatives and evaluation criteria was established. The initial criterion weights were determined through interviews with the store owner and experienced sales personnel at Sinar Mas Selluler Kudus. The respondents assessed the relative importance of each criterion based on their experience in assisting customers during smartphone purchasing decisions. Price was considered the most influential criterion, followed by RAM, Internal Storage, Battery Capacity, and Screen Size. Consequently, the initial weights were assigned as RAM = 4, Internal Storage = 4, Screen Size = 3, Battery Capacity = 4, and Price = 5. These initial weights were subsequently normalized before being applied in the MAUT calculation to ensure proportional contribution of each criterion. The relative weight for each criterion was calculated using Equation (1).

$$W_i = \frac{W_i'}{\sum W_i'} \quad (1)$$

Where (Wi') represents the initial importance value of criterion (i), while (Wi) denotes the normalized weight. Weight normalization was performed to convert the initial weights into proportional values whose total equals one. This process ensures that the contribution of each criterion is maintained consistently during the preference value calculation.

After determining the criterion weights, all alternative values were normalized into utility values ranging from 0 to 1. Benefit criteria were normalized using Equation (2), whereas cost criteria were normalized using Equation (3).

Benefit Criterion

$$U(x) = \frac{X - X_{i^-}}{X_{i^+} - X_{i^-}} \quad (2)$$

Cost Criterion

$$U(x) = \frac{X_{i^+} - X}{X_{i^+} - X_{i^-}} \quad (3)$$

Where (x) represents the actual value of an alternative, (Xi^+) is the maximum value, and (Xi^-) is the minimum value for each criterion. The normalization process converts different measurement units, such as gigabytes (GB), inches, milliampere-hours (mAh), and Indonesian Rupiah (IDR), into comparable utility values ranging from 0 to 1. This enables all evaluation criteria to be processed simultaneously within a single decision model.

The final preference value for every smartphone alternative was calculated by multiplying each utility value by its corresponding normalized weight and summing the results, as shown in Equation (4).

$$V(x) = \sum_{i=1}^{n} w_i \,.\, U_i(x) \quad (4)$$

A higher preference value indicates that a smartphone alternative better satisfies the predefined evaluation criteria according to their respective importance weights. Therefore, the alternative with the highest preference value is recommended as the most suitable smartphone for customers.

The smartphone with the highest preference value was ranked first and recommended as the most suitable alternative. This ranking process enables the system to objectively evaluate all smartphone alternatives while considering both technical specifications and product prices simultaneously.

The overall research procedure is illustrated in Figure 1. The workflow begins with problem identification, followed by data collection, determination of evaluation criteria, calculation using the MAUT algorithm, system implementation, Black Box Testing, and finally the generation of smartphone recommendation rankings. System validation was conducted using the Black Box Testing method, covering login authentication, smartphone data management, criteria management, MAUT calculations, normalization, preference value generation, ranking, reporting, and user management. The testing results confirmed that all system functions operated successfully according to the specified functional requirements. This systematic procedure ensures that the proposed decision support system produces objective, consistent, and reliable recommendations for smartphone selection.

3. RESULTS AND DISCUSSION

This section presents the implementation of the Multi Attribute Utility Theory (MAUT) method in the proposed Decision Support System (DSS) for smartphone selection at Sinar Mas Selluler Kudus. The implementation process consists of several sequential stages, beginning with determining smartphone alternatives and decision criteria, followed by criteria weighting, utility normalization, preference value calculation, and ranking generation. The calculation results are then implemented into a web-based application to facilitate objective and efficient smartphone recommendations. The final output of the MAUT implementation is a ranking of all smartphone alternatives based on their preference values, where the alternative with the highest preference value is identified as the best recommendation for users (Trisudarmo, et al. 2024). The discussion presented in this section not only describes the MAUT calculation process but also interprets the obtained results to demonstrate how the proposed system supports objective smartphone selection in a retail environment.

3.1. Implementation of MAUT Method

The implementation of the Multi Attribute Utility Theory (MAUT) method aims to evaluate smartphone alternatives based on multiple criteria simultaneously. The proposed method converts each criterion into a normalized utility value, assigns weights according to the importance of each criterion, and calculates a final preference value to determine the best smartphone recommendation. The complete calculation process consists of several stages as follows.

3.1.1. Determination of Smartphone Alternatives

The first stage in implementing the MAUT method is determining the smartphone alternatives that will be evaluated. Each alternative represents a smartphone available at Sinar Mas Selluler Kudus and serves as the object of the decision-making process. The collected alternatives have different technical specifications and selling prices, allowing the MAUT method to compare various products objectively. The smartphone data were obtained through direct observation and documentation from the store inventory.

The collected data consist of five evaluation attributes: RAM, Internal Storage, Screen Size, Battery Capacity, and Price. These attributes are used as the basis for evaluating each smartphone in the subsequent calculation stages.

Table 1. Smartphone Alternatives

Kode	Type HP	RAM (GB)	Memory Internal (GB)	Layar (inch)	Baterai (mAh)	Harga (Rp)
A1	ADVAN Macha 5G	8	256	6,67	5000	3.099.000
A2	ADVAN X1	8	128	6,78	5000	1.899.000
A3	Huawei	16	512	6,75	5750	16.799.000
A4	Huawei mate X6	12	512	7,93	5110	24.999.000
A5	Huawei mate X7	16	512	8,00	5600	27.799.000
A6	Huawei nova 14 pro	12	512	6,78	5500	8.499.000
A7	Huawei pura 80	12	256	6,60	5170	9.999.000
A8	Huawei pura 80 pro	12	512	6,80	5170	13.499.000
A9	Huawei pura 80 ultra	16	512	6,80	5170	20.799.000
A10	Infinix GT 30	8	256	6,78	5500	3.399.000
A11	Infinix GT 30 pro	8	256	6,78	5500	3.799.000
A12	Infinix GT 30 pro	12	512	6,78	5500	4.399.000
A13	Infinix hot 60 pro	8	128	6,78	5160	2.099.000
A14	Infinix hot 60 pro	8	256	6,78	5160	2.549.000
A15	Infinix hot 60 pro+	8	128	6,78	5160	2.699.000
A16	Infinix hot 60 pro+	8	256	6,78	5160	2.899.000
A17	Infinix hot 60i	6	128	6,70	5160	1.699.000
A18	Infinix hot 60i	8	256	6,70	5160	2.099.000
A19	Infinix note 50	8	256	6,78	5200	2.699.000
A20	Infinix note 50 pro	8	256	6,78	5200	3.049.000

From Table 1, it can be observed that each smartphone has different specifications and prices. These variations provide the basis for the MAUT method to distinguish the performance of each alternative according to the predefined evaluation criteria.

3.1.2. Determination of Decision Criteria

After determining the smartphone alternatives, the next stage is identifying the evaluation criteria used in the decision-making process. The criteria were determined based on interviews with the owner of Sinar Mas Selluler Kudus regarding the specifications most frequently considered by customers when purchasing smartphones.

The selected criteria include RAM, Internal Storage, Screen Size, Battery Capacity, and Price. The first four criteria are categorized as benefit attributes, meaning higher values indicate better performance. Conversely, Price is categorized as a cost attribute because lower prices provide greater utility for customers.

Table 2. Decision Criteria

Code	Criterion	Attribute
C1	RAM	Benefit
C2	Internal Storage	Benefit
C3	Screen Size	Benefit
C4	Battery Capacity	Benefit
C5	Price	Cost

The determination of these criteria ensures that the recommendation process considers both smartphone performance and purchasing affordability, resulting in recommendations that are more aligned with customer needs.

3.1.3. Criteria Weight Determination

After determining the evaluation criteria, each criterion was assigned an importance weight according to the preferences of the owner of Sinar Mas Selluler Kudus. The weighting process reflects the relative importance of each criterion in influencing smartphone purchasing decisions. The assigned weights were then normalized to ensure that the total weight equals one, allowing each criterion to contribute proportionally to the final preference value. The normalized weight is calculated using Equation (1).

Based on Equation (1), the normalized weight of each criterion is obtained by dividing the initial weight by the total weight. The results are presented in Table 3.

Table 3. Criteria Weights

Code	Criterion	Attribute	Initial Weight	Normalized Weight
C1	RAM	Benefit	4	0.20
C2	Internal Storage	Benefit	4	0.20
C3	Screen Size	Benefit	3	0.15
C4	Battery Capacity	Benefit	4	0.20
C5	Price	Cost	5	0.25
Total			20	1.00

Table 3 shows that Price has the highest normalized weight (0.25), indicating that affordability is considered the most influential factor in smartphone purchasing decisions. Meanwhile, RAM, Internal Storage, and Battery Capacity each receive a normalized weight of 0.20, reflecting their equal importance in evaluating smartphone performance. Screen Size has the lowest normalized weight (0.15), indicating that it is considered less influential than the other criteria while still contributing to the overall evaluation. The normalized weights are subsequently used in the utility normalization and preference value calculation stages of the MAUT method.

3.1.4. Determination of Maximum and Minimum Values

Before utility normalization, the maximum and minimum values of each criterion must be identified. These values serve as reference points for transforming the original smartphone specifications into utility values with a common scale ranging from 0 to 1. This process eliminates differences in measurement units among criteria and enables direct comparison between smartphone alternatives.

Table 4. Maximum and Minimum Values

Criterion	Minimum	Maximum
RAM	6	16
Internal Storage	128	512
Screen Size	6.60	8.00
Battery Capacity	5000	5750
Price	1,699,000	27,799,000

The maximum values are used as the ideal reference for benefit criteria, while the minimum value becomes the ideal reference for the cost criterion.

3.1.5. Utility Normalization

The normalization stage converts the original specification values into utility values between 0 and 1. This conversion is necessary because each criterion has a different measurement scale. The MAUT method uses separate normalization equations for benefit and cost criteria. The Utility Normalizationvalue is calculated using Equation (3). For example, the utility values of smartphone A1 are calculated as follows.

a. $U(C1)A1 = \frac{8-6}{16-6} = \frac{2}{10} = 0,2$

b. $U(C2)A1 = \frac{256-128}{512-128} = \frac{128}{384} = 0{,}33$

c. $U(C3)A1 = \frac{6{,}67-6{,}6}{8-6{,}6} = \frac{0{,}07}{1{,}4} = 0{,}05$

d. $U(C4)A1 = \frac{5000-5000}{5750-5000} = \frac{0}{750} = 0$

e. $U(C5)A1 = \frac{27.799.000-3.099.000}{27.799.000-1.699.000} = \frac{24.700.000}{26.100.000} = 0{,}9463$

The same normalization procedure is applied to all smartphone alternatives.

Table 5. Utility Normalization Results

Kode	Type HP	U(RAM)	U(Memory)	U(Layar)	U(Baterai)	U(Harga)
A1	ADVAN Macha 5G	0,2	0,333333333	0,05	0	0,946360153
A2	ADVAN X1	0,2	0	0,128571429	0	0,992337165
A3	Huawei	1	1	0,107142857	1	0,421455939
A4	Huawei mate X6	0,6	1	0,95	0,146666667	0,107279693
A5	Huawei mate X7	1	1	1	0,8	0
A6	Huawei nova 14 pro	0,6	1	0,128571429	0,666666667	0,739463602
A7	Huawei pura 80	0,6	0,333333333	0	0,226666667	0,681992337
A8	Huawei pura 80 pro	0,6	1	0,142857143	0,226666667	0,54789272
A9	Huawei pura 80 ultra	1	1	0,142857143	0,226666667	0,268199234
A10	Infinix GT 30	0,2	0,333333333	0,128571429	0,666666667	0,9348659
A11	Infinix GT 30 pro	0,2	0,333333333	0,128571429	0,666666667	0,91954023
A12	Infinix GT 30 pro	0,6	1	0,128571429	0,666666667	0,896551724
A13	Infinix hot 60 pro	0,2	0	0,128571429	0,213333333	0,98467433
A14	Infinix hot 60 pro	0,2	0,333333333	0,128571429	0,213333333	0,96743295
A15	Infinix hot 60 pro+	0,2	0	0,128571429	0,213333333	0,961685824
A16	Infinix hot 60 pro+	0,2	0,333333333	0,128571429	0,213333333	0,954022989
A17	Infinix hot 60i	0	0	0,071428571	0,213333333	1
A18	Infinix hot 60i	0,2	0,333333333	0,071428571	0,213333333	0,98467433
A19	Infinix note 50	0,2	0,333333333	0,128571429	0,266666667	0,961685824
A20	Infinix note 50 pro	0,2	0,333333333	0,128571429	0,266666667	0,948275862

The normalization results indicate that smartphones with higher technical specifications obtain utility values closer to 1 for benefit criteria, while smartphones with lower prices obtain higher utility values for the cost criterion. Consequently, all alternatives can be compared objectively using the same measurement scale.

3.1.6. Preference Value Calculation

After obtaining the normalized utility values, the final preference value for each smartphone is calculated. This stage combines the utility value of each criterion with its normalized weight, resulting in a single score that represents the overall performance of the smartphone. The preference value is calculated using Equation (4).

As an example, the preference value for smartphone A1 is calculated by multiplying each utility value by its corresponding weight and summing all weighted utilities.

$$V(C1)A1 = (0{,}20 \text{ X } 0{,}2) + (0{,}20 \text{ X } 0{,}333) + (0{,}15 \text{ X } 0{,}05) + (0{,}20 \text{ X } 0) + (0{,}25 \text{ X } 0{,}9463)$$

$$= 0{,}04 + 0{,}0667 + 0{,}0075 + 0 + 0{,}2365$$

$$= 0{,}3507$$

The calculation process is repeated for all smartphone alternatives.

Table 6. Preference Values

Kode	Type HP	U(RAM)×w1	U(Mem)×w2	U(Layar)×w3	U(Bat)×w4	U(Hrg)×w5	V(x) Total
A1	ADVAN Macha 5G	0,04	0,066666667	0,0075	0	0,236590038	0,350756705

A2	ADVAN X1	0,04	0	0,019285714	0	0,248084291	0,307370005
A3	Huawei	0,2	0,2	0,016071429	0,2	0,105363985	0,721435413
A4	Huawei mate X6	0,12	0,2	0,1425	0,029333333	0,026819923	0,518653257
A5	Huawei mate X7	0,2	0,2	0,15	0,16	0	0,71
A6	Huawei nova 14 pro	0,12	0,2	0,019285714	0,133333333	0,1848659	0,657484948
A7	Huawei pura 80	0,12	0,066666667	0	0,045333333	0,170498084	0,402498084
A8	Huawei pura 80 pro	0,12	0,2	0,021428571	0,045333333	0,13697318	0,523735085
A9	Huawei pura 80 ultra	0,2	0,2	0,021428571	0,045333333	0,067049808	0,533811713
A10	Infinix GT 30	0,04	0,066666667	0,019285714	0,133333333	0,233716475	0,493002189
A11	Infinix GT 30 pro	0,04	0,066666667	0,019285714	0,133333333	0,229885057	0,489170772
A12	Infinix GT 30 pro	0,12	0,2	0,019285714	0,133333333	0,224137931	0,696756979
A13	Infinix hot 60 pro	0,04	0	0,019285714	0,042666667	0,246168582	0,348120963
A14	Infinix hot 60 pro	0,04	0,066666667	0,019285714	0,042666667	0,241858238	0,410477285
A15	Infinix hot 60 pro+	0,04	0	0,019285714	0,042666667	0,240421456	0,342373837
A16	Infinix hot 60 pro+	0,04	0,066666667	0,019285714	0,042666667	0,238505747	0,407124795
A17	Infinix hot 60i	0	0	0,010714286	0,042666667	0,25	0,303380952
A18	Infinix hot 60i	0,04	0,066666667	0,010714286	0,042666667	0,246168582	0,406216201
A19	Infinix note 50	0,04	0,066666667	0,019285714	0,053333333	0,240421456	0,41970717
A20	Infinix note 50 pro	0,04	0,066666667	0,019285714	0,053333333	0,237068966	0,41635468

The preference values indicate the overall suitability of each smartphone based on all evaluation criteria. A higher preference value indicates that the smartphone better satisfies customer requirements.

3.1.7. Ranking Results

The final stage of the MAUT method is ranking all smartphone alternatives according to their preference values. The smartphone with the highest preference value is selected as the best recommendation because it provides the optimal balance between technical specifications and price.

Table 7. Ranking Results

Rank	Kode	Type HP	RAM (GB)	Memory (GB)	Layar (inch)	Baterai (mAh)	Harga (Rp)	Nilai V(x)
1	A3	Huawei	16	512	6,75	5750	16.799.000	0,721435413
2	A5	Huawei mate X7	16	512	8,00	5600	27.799.000	0,71
3	A12	Infinix GT 30 pro	12	512	6,78	5500	4.399.000	0,696756979
4	A6	Huawei nova 14 pro	12	512	6,78	5500	8.499.000	0,657484948
5	A9	Huawei pura 80 ultra	16	512	6,80	5170	20.799.000	0,533811713
6	A8	Huawei pura 80 pro	12	512	6,80	5170	13.499.000	0,523735085
7	A4	Huawei mate X6	12	512	7,93	5110	24.999.000	0,518653257
8	A10	Infinix GT 30	8	256	6,78	5500	3.399.000	0,493002189
9	A11	Infinix GT 30 pro	8	256	6,78	5500	3.799.000	0,489170772
10	A19	Infinix note 50	8	256	6,78	5200	2.699.000	0,41970717
11	A20	Infinix note 50 pro	8	256	6,78	5200	3.049.000	0,41635468
12	A14	Infinix hot 60 pro	8	256	6,78	5160	2.549.000	0,410477285
13	A16	Infinix hot 60 pro+	8	256	6,78	5160	2.899.000	0,407124795
14	A18	Infinix hot 60i	8	256	6,70	5160	2.099.000	0,406216201
15	A7	Huawei pura 80	12	256	6,60	5170	9.999.000	0,402498084
16	A1	ADVAN Macha 5G	8	256	6,67	5000	3.099.000	0,350756705
17	A13	Infinix hot 60 pro	8	128	6,78	5160	2.099.000	0,348120963
18	A15	Infinix hot 60 pro+	8	128	6,78	5160	2.699.000	0,342373837
19	A2	ADVAN X1	8	128	6,78	5000	1.899.000	0,307370005
20	A17	Infinix hot 60i	6	128	6,70	5160	1.699.000	0,303380952

The ranking process identifies the smartphone alternative with the highest preference value after the utility calculation, which is selected as the best recommendation generated by the proposed Decision Support System (Rizki et al. 2025). The ranking results show that Huawei (A3) achieved the highest preference value of 0.7215, making it the most recommended smartphone. This result was influenced by its superior RAM, Internal Storage, and Battery Capacity, which significantly increased its overall utility value despite its relatively high price. In contrast, smartphones with lower specifications obtained lower rankings even though some of them had more affordable prices. This demonstrates that the MAUT method evaluates all criteria simultaneously, producing recommendations that are balanced, objective, and consistent.

3.2. System Implementation

After implementing the MAUT calculation process, the proposed Decision Support System was developed as a web-based application using PHP, HTML, CSS, JavaScript, Bootstrap, and MySQL. The system was designed to assist administrators, owners, and customers in managing smartphone data and generating recommendation results automatically. The implementation consists of several interfaces that support each stage of the MAUT method, from data input to ranking generation.

3.2.1. Login Page

The login page is the initial interface of the system and functions as an authentication mechanism before users can access the application. Administrators and owners are required to enter a valid username and password to ensure that only authorized users can manage the data and perform the MAUT calculation process.

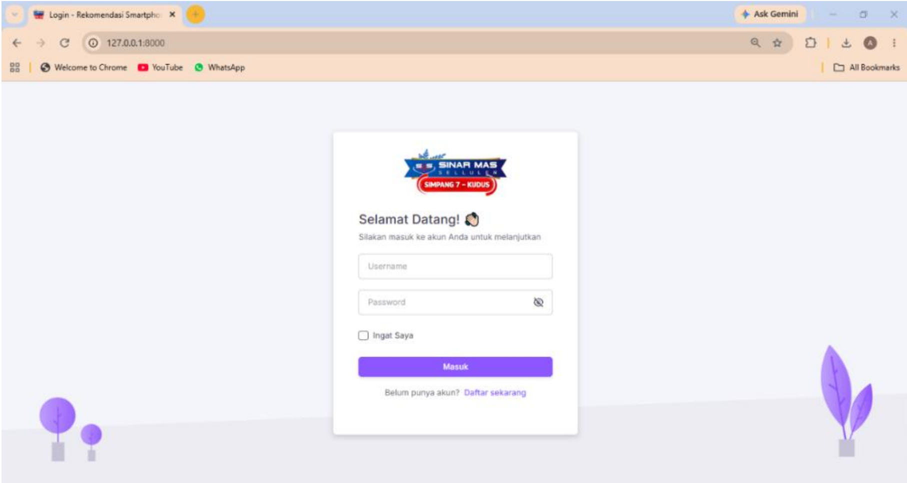

Figure 1. Login Page

As shown in Figure 1, the login interface provides username and password fields along with a login button. After successful authentication, users are redirected to the dashboard according to their access level. This authentication process improves system security by preventing unauthorized access to smartphone data and recommendation results.

3.2.2. Dashboard Page

The dashboard serves as the main page after users successfully log into the system. It provides summary information related to smartphone data, evaluation criteria, user accounts, and MAUT calculation sessions. The dashboard also functions as the primary navigation menu for accessing all available features.

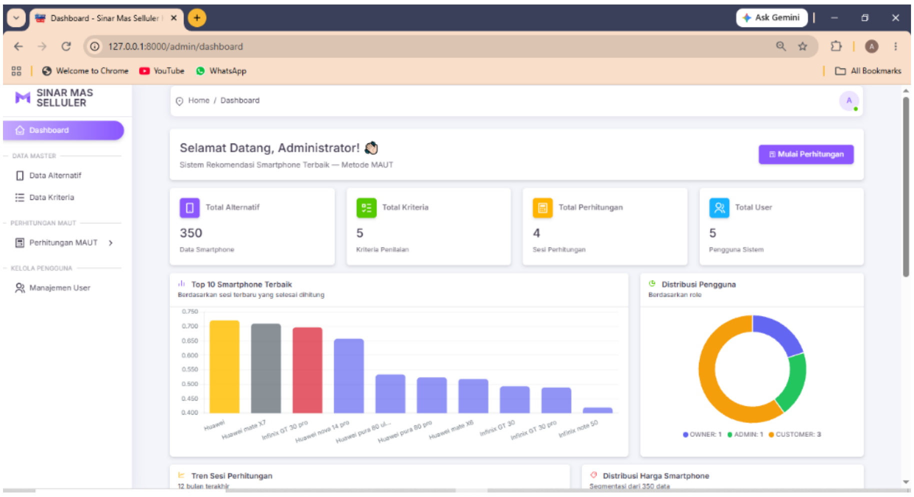

Figure 2. Dashboard Page

Figure 2 shows that the dashboard presents statistical information in a concise and organized manner. Users can quickly monitor the overall system condition and access each module without navigating through multiple pages, thereby improving usability and operational efficiency.

3.2.3. Alternative Data Page

The Alternative Data page is used to manage smartphone alternatives that will be evaluated by the MAUT method. Administrators can add new smartphone data, modify existing specifications, or remove alternatives that are no longer available.

Volume 6 (2), July-December 2026, 1733-1746, DOI: https://doi.org/10.35870/ijmsit.v6i2.8145

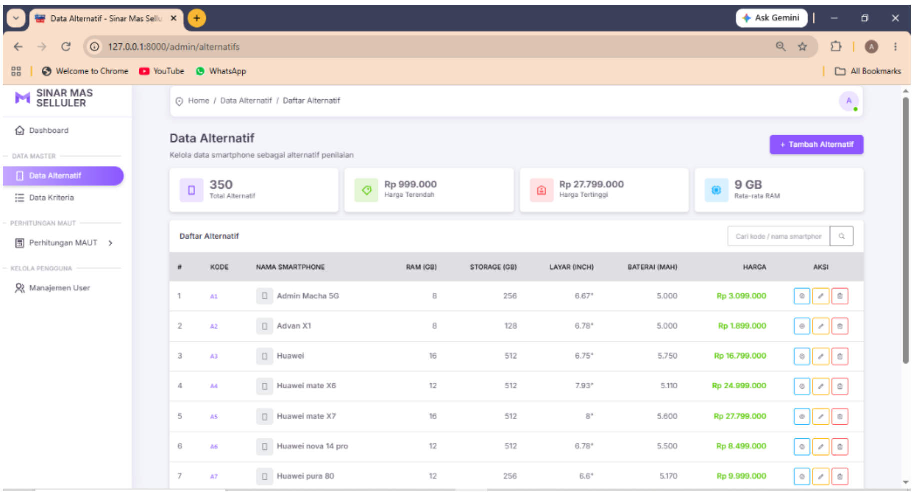

Figure 3. Alternative Data Page

As illustrated in Figure 3, each smartphone record contains information regarding the product name, RAM capacity, internal storage, screen size, battery capacity, and selling price. These data become the primary input for the MAUT calculation process. Therefore, maintaining accurate alternative data is essential for generating reliable recommendation results.

3.2.4. Criteria Data Page

The Criteria Data page enables administrators to manage the evaluation criteria and their corresponding weights. This interface allows users to define whether a criterion belongs to the benefit or cost category and to adjust the importance of each criterion according to customer preferences or business requirements.

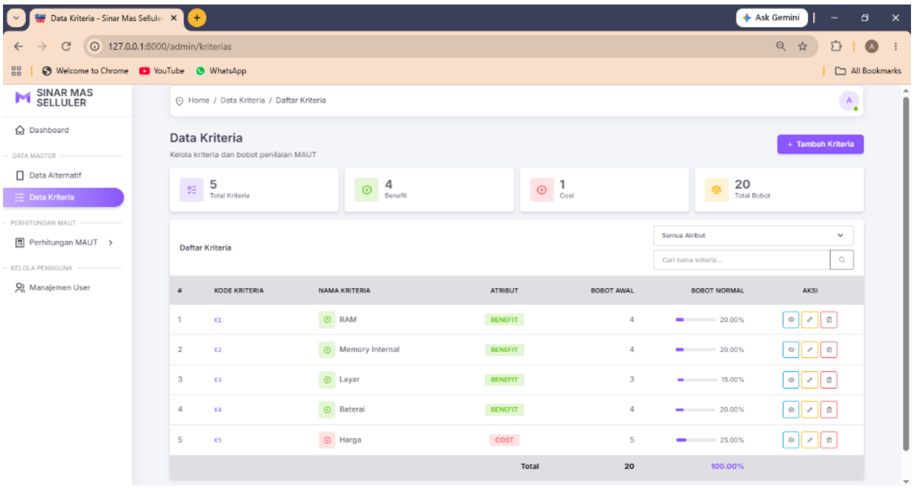

Figure 4. Criteria Data Page

Figure 4 demonstrates that the system provides flexibility in modifying evaluation criteria. Consequently, the recommendation model can easily adapt to changes in smartphone technology or market demand without requiring modifications to the calculation algorithm.

3.2.5. Utility Normalization Page

The Utility Normalization page displays the normalized utility values of every smartphone alternative. The normalization process converts the original specification values into comparable values ranging from 0 to 1 according to the criterion type.

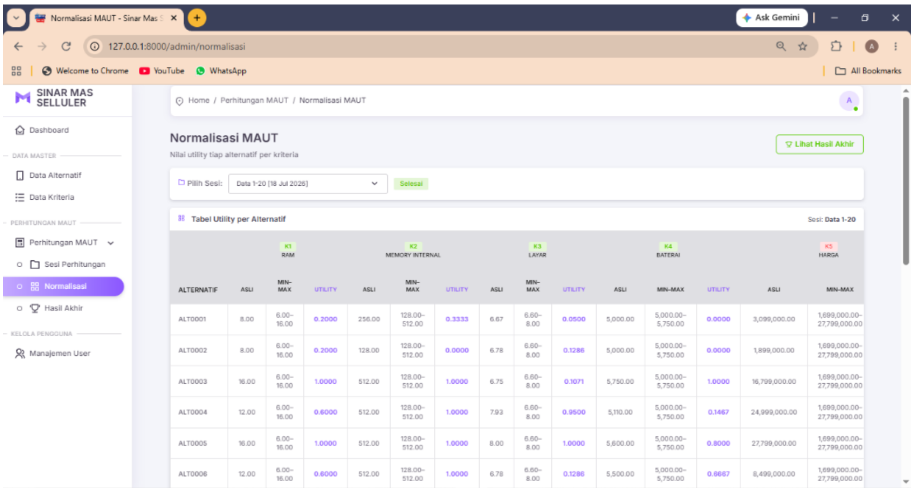

Figure 5. Utility Normalization Page

As presented in Figure 5, the normalized values clearly indicate the performance of each smartphone for every evaluation criterion. This transformation enables all criteria with different measurement units to be compared fairly during the preference calculation stage.

3.2.6. Preference Value Page and Ranking Page

The Preference Value and Ranking page presents the final stage of the Multi Attribute Utility Theory (MAUT) calculation. This page displays the weighted utility values, the final preference value of each smartphone alternative, and the ranking results generated automatically by the system. The preference value represents the overall suitability of each smartphone based on all evaluation criteria and their respective weights.

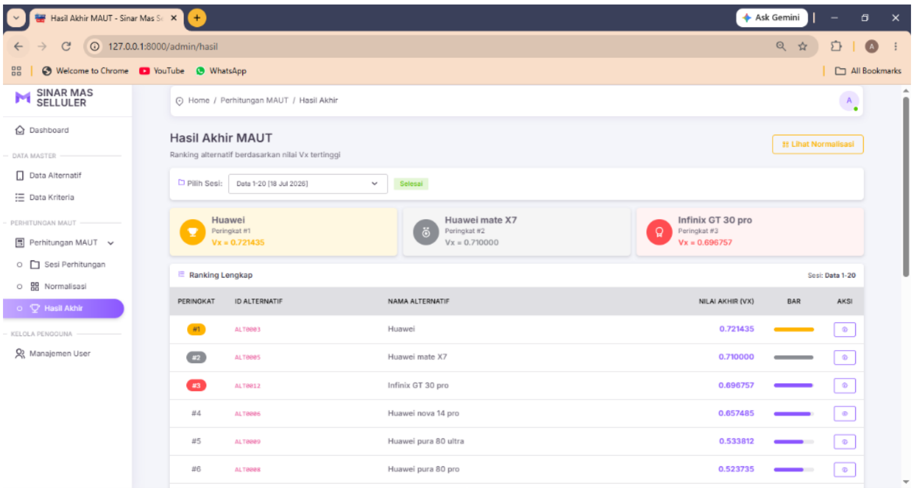

Figure 6. Preference Value and Ranking Page

Based on Figure 6, the system automatically multiplies each normalized utility value by its corresponding criterion weight and sums the results to obtain the final preference value for every smartphone alternative. After all preference values are calculated, the system sorts the smartphone alternatives from the highest to the lowest score to produce the final ranking. Smartphones with higher preference values indicate better overall performance according to the predefined decision model. In this study, Huawei (A3) occupies the first position because it achieved the highest preference value. This ranking mechanism enables customers to compare smartphone alternatives objectively, efficiently, and accurately without manually analyzing individual specifications, thereby supporting faster and more reliable purchasing decisions.

4. CONCLUSION

This study successfully designed and implemented a web-based Decision Support System (DSS) for smartphone selection using the Multi Attribute Utility Theory (MAUT) method at Sinar Mas Selluler Kudus. The proposed system evaluates smartphone alternatives objectively based on five decision criteria, namely RAM, Internal Storage, Screen Size, Battery Capacity, and Price, through the stages of criteria weighting, utility normalization, preference value calculation, and ranking. The implementation results demonstrate that the system is capable of generating objective, consistent, and transparent smartphone recommendations while reducing the time and subjectivity associated with manual decision-making. Based on the MAUT calculation, Huawei (A3) obtained the highest preference value of 0.7215, indicating that it is the most suitable smartphone alternative according to the predefined criteria and weights. Therefore, the developed system can effectively support both sales personnel and customers in selecting smartphones that best meet user requirements and budget constraints, while also improving the efficiency and quality of the decision-making process.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Sinar Mas Selluler Kudus for providing the research data and supporting the implementation of this study. The authors also thank the Department of Information Systems, Faculty of Engineering, Universitas Muria Kudus, for the academic guidance and support throughout the research process. Appreciation is extended to all lecturers, supervisors, and everyone who contributed valuable suggestions and encouragement, making this research possible. Their support has been invaluable in completing this study successfully.

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