JOURNAL OF APPLIED INFORMATION SYSTEMS AND INFROMATICS

Smartphone Selection Recommendation System for Streaming Needs Using the TOPSIS Method

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Choosing the optimal smartphone for streaming needs is a challenge for users amidst the rapid development of technology and the variety of choices on the market. The need for high performance in streaming, such as large battery capacity, adequate RAM, fast processor, high-quality screen, and stable network support, drives the need for an objective and measurable recommendation system. This study aims to develop a smartphone selection recommendation system using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method that focuses on streaming activity needs. The research process involves the stages of problem identification, collecting datasets from various trusted sources, preprocessing data to ensure completeness and consistency, and implementing the TOPSIS method through data normalization, weighting criteria, determining positive and negative ideal solutions, to calculating preference scores and alternative rankings. The dataset used includes 252 smartphones from popular brands in Indonesia such as Samsung, Oppo, Vivo, Apple, Realme, and Xiaomi, with specifications relevant to streaming. The results of the TOPSIS method implementation show that smartphones such as the iQOO Z9 Turbo Endurance, Redmi Turbo4, and Neo7 SE are ranked at the top with high preference scores, indicating the best combination of price, battery capacity, RAM, and network connectivity. The recommendation categories are arranged based on market segments, such as flagship, mid-range, budget-friendly , and based on each brand, to provide flexibility in selection. In general, Vivo, Xiaomi, and Realme dominate the best category, while Samsung and Oppo remain competitive in the middle class, and Apple maintains its stability in the premium ecosystem. The recommendation system is expected to help users make faster and more precise decisions according to technical needs and budget constraints in choosing a smartphone for high-quality streaming activities.

Keywords— **Digital Marketing; SWOT; PEST; Business Model Canvas.**

Manuscript received May 2025; revised May 2025; accepted May 2025. Date of publication May 2025.

I. INTRODUCTION

Smartphones have become a basic need for modern society, not only as a means of communication but also as a multifunctional device for entertainment, work, and education. One of the increasingly popular activities is watching or creating streaming content , both for entertainment purposes such as watching movies and music videos, and for professional purposes such as live streaming for content creators [1][2]. With the increasing consumption of high-quality video content, such as 4K or HDR resolution, the need for smartphones with specifications that support streaming activities is becoming increasingly important [3][4]. However, many users have difficulty choosing the right smartphone because of the variety of choices on the market, with different prices, performance, and features.

The development of internet network technology, especially with the presence of 5G, has further improved the quality and speed of streaming services . According to the Cisco Annual Internet Report (2023), more than 80% of internet data traffic is predicted to come from video-based services by 2025. [5]This phenomenon shows that the need for mobile devices that can support high-quality streaming activities will continue to increase significantly. In addition, with the increasing trend of remote working , online learning , and content creation over the past few years, smartphones are no longer just judged from the basic communication aspect, but as a multifunctional productivity and entertainment tool. This makes technical specifications such as large RAM capacity, high processor performance, screen quality, and internet connection stability as crucial factors in the user experience.

Smartphone for streaming activities needs to meet several criteria, such as a fast processor to process data in real-time , sufficient RAM capacity for multitasking , a large battery capacity, and a screen with high resolution and adequate refresh rate. In addition, for content creators, camera quality is an important factor in producing quality video content. The complexity of these choices often confuses users in determining the device that best suits their needs and budget [6].

While the smartphone market offers a wide range of options, not all devices meet the specific needs of streaming activities [7]. Some devices may excel in terms of camera, but lack in terms of display or connectivity. On the other hand, competitively priced smartphones may have limitations in terms of graphics performance or battery life when used for long-duration video streaming [8].
To overcome this problem, the development of a recommendation system is a relevant solution. The recommendation system aims to assist users in making decisions by analyzing individual preferences and needs. In the context of smartphone selection, the recommendation system can compare various alternatives based on certain technical criteria such as price, performance, and streaming support features , thus producing objective and measurable recommendations [9].

One of the methods widely used in decision support systems is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) [10]. This method has the advantage of evaluating alternatives based on proximity to the positive ideal solution and distance to the negative ideal solution, and considering the weight of each criterion. These advantages make the TOPSIS method suitable for application in smartphone selection by considering various technical and non-technical aspects [11].

Previous studies have developed smartphone selection recommendation systems using various approaches. Halawa et al. [12]used the Multi-Attribute Utility Theory (MAUT) method to select mid-range [1]smartphones based on criteria such as processor, RAM, and price. Fahlevi and Putri applied the TOPSIS method in a web-based system with a focus on price, RAM, and camera criteria. Another study by Wicaksono and Santoso [3]combined the Simple Additive Weighting (SAW) and Weighted Product (WP) methods to support smartphone selection under limited budget conditions. However, these studies have not specifically addressed the need for streaming activities , which require additional consideration of screen quality, graphics performance, battery life, and internet connection stability [13].

This study aims to develop a smartphone selection recommendation system based on the TOPSIS method that is specifically focused on streaming activity needs . It is hoped that the results of this study can help users, both streaming content lovers and content creators, in choosing the optimal smartphone according to their technical needs and budget constraints.

II. METHOD

Smartphone selection recommendation system based on streaming needs using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method [14]. The following stages were carried out, as can be seen in the research flow in Figure 1

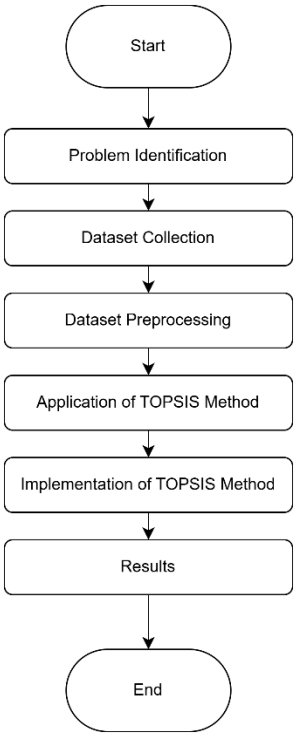

Figure 1Research Flow

A. *Identification of problems*

The initial stage begins with identifying the problem, namely the difficulty users have in choosing the optimal smartphone for streaming activities [14].Dataset Collection
Smartphone data is collected from various trusted sources, Using *Webscraper Tools.* The specification attributes taken consist of Release Year, Brand, Smartphone Name, Price, Battery, RAM, and Network. The dataset used in this study only takes popular smartphone brands in Indonesia with reference information sourced from *the topbrand-award.com website* , *smartphone brands* consist of Samsung, Oppo, Vivo, Apple, Realme, Xiaomi and the release year in the period 2024-2025 April [15].

B. *Dataset Preprocessing*

The collected data is *preprocessed* to ensure consistency and completeness. This stage includes data normalization, filling in incomplete data, and compiling criteria and alternatives to be used in the TOPSIS method.

C. *Application of TOPSIS Method*

Steps:

1. **Matrix Normalization (Vector Normalization):**

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}} \quad (1)$$

2. **Weights and Weighted Matrices, Multiplying the normalized matrix by the weights.**

3. **Ideal Solution: Positive/Negative Ideal Solution:**

A+ (Ideal):

Price: min(normalized)

Battery, RAM, Network: max(normalized)

A- (Anti-Ideal):

Price: max(normalized)

Battery, RAM, Network: min(normalized)

4. **Calculate Distance to Ideal Solution:**

Distance to A+:

$$D_i^+ = \sqrt{\sum_{j=1}^{k} (v_{1j} - A_j^+)^2} \quad (2)$$

Distance to A :

$$D_i^- = \sqrt{\sum_{j=1}^{k} (v_{ij} - A_j^+)^2} \quad (3)$$

5. **TOPSIS Score:**

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-} \quad (4)$$

E. Implementation of TOPSIS Method

The TOPSIS method is applied to evaluate and determine the priority order *of smartphones* based on predetermined criteria. The process of implementing the TOPSIS method includes the following steps:

1. Compilation of decision matrix based on the criteria value of each alternative.

```
def calculate_topsis(df, weights):
    matrix = df[['Harga(Juta)', 'Batrai(MaH)', 'RAM(GB)', 'Jaringan(4G/5G)']].values
```

Figure 2Compiling a decision matrix

Normalize the decision matrix to eliminate the influence of different units on each criterion.

```
# Normalisasi Vector
norm_matrix = matrix / np.sqrt((matrix ** 2).sum(axis=0))
```

Figure 3Vector Normalization

Normalize the decision matrix to eliminate the influence of different units on each criterion

```
# Bobot matriks
weighted_matrix = norm_matrix * weights
```

Figure 4. Matrix weights

2. Determination of positive ideal solutions and negative ideal solutions.

```
# Solusi ideal (A+ dan A-)
a_plus = np.array([
    np.min(weighted_matrix[:, 0]),  # Harga (cost)
    np.max(weighted_matrix[:, 1]),  # Baterai (benefit)
    np.max(weighted_matrix[:, 2]),  # RAM (benefit)
    np.max(weighted_matrix[:, 3])   # Jaringan (benefit)
])
a_minus = np.array([
    np.max(weighted_matrix[:, 0]),  # Harga (cost)
    np.min(weighted_matrix[:, 1]),  # Baterai (benefit)
    np.min(weighted_matrix[:, 2]),  # RAM (benefit)
    np.min(weighted_matrix[:, 3])   # Jaringan (benefit)
])
```

Figure 5. Ideal solution

1. Calculation of the distance of each alternative to the positive and negative ideal solutions.

```
# Hitung jarak
dist_plus = np.sqrt(((weighted_matrix - a_plus) ** 2).sum(axis=1))
dist_minus = np.sqrt(((weighted_matrix - a_minus) ** 2).sum(axis=1))
```

Figure 6. Calculate the distance

2. Calculation of preference values for each alternative and determination of ranking.

```
    # Skor TOPSIS
    df['TOPSIS Score'] = dist_minus / (dist_plus + dist_minus)
    return df

data = calculate_topsis(data, weights)
```

Figure 7Topsis Score

After applying the TOPSIS method, calculations are carried out to obtain the final score for each alternative (*smartphone*) which shows the level of suitability with the user's streaming needs.

Results

Figure 8. Final result

The final result is a list of *smartphone recommendations* sorted by highest to lowest preference values. The results displayed consist of several provisions, namely the first Top 5 *Smartphones* for *Streaming* overall *brands* , Top 5 *Flagship* , Top 5 *MidRange* , Top 5 *Budget-Friendly* , and Top 5 for each *Smartphone Brand.*

III. RESULT AND DISCUSSION

The results displayed consist of several provisions, namely the first Top 5 Smartphones for Streaming overall brands , Top 5 Flagship , Top 5 MidRange , Top 5 Budget-Friendly , and Top 5 for each Smartphone Brand.

Table 1. Top 5 Smartphones for Streaming

index	Smartphone Name	TOPSIS Score
194	iQOO Z9 Turbo Endurance	0.9136213231185708
114	Redmi Turbo 4	0.907790917101562
147	Neo7 SE	0.9076087339081435
234	iQOO Z9 Turbo	0.9043615273933929
209	iQOO Z9 Turbo+	0.9042254561543965

Table 2. Top 5 *Flagship*

index	Smartphone Name	TOPSIS Score
128	Xiaomi	0.817478
246	Lives	0.811279
58	Oppo	0.807654
193	Live	0.805813
237	Live	0.80385

Table 3. Top 5 *Mid Range*

index	Smartphone Name	TOPSIS Score
128	Redmi Turbo 4 Pro	0.8174782503661172
246	iQOO 13	0.8112786489861339
58	Find X8s	0.8076538819500089
193	iQOO Neo9S Pro+	0.8058131794425988
237	X200 Pro mini	0.8038505348666244

Table 4. Top 5 *Budget-Friendly*

Smartphone Name	Index	TOPSIS Score
142	Neo7x	0.8909372636612962
188	Y300 Pro	0.8873260740018771
235	iQOO Z9x	0.8832543651388501
179	Narzo 80 Pro	0.882174424496911
226	iQOO Z9s	0.8766308861796349

Table 5. Top 5 Apple

index	Smartphone Name	TOPSIS Score
37	iPhone 16e	0.7121183453213628
33	iPhone 16	0.6898063666193605
34	iPhone 16 Plus	0.672227983499829
35	iPhone 16 Pro	0.6421963281715303
36	16 Pro Max	0.5963783264517936

Table 6. Top 5 Samsung

index	Smartphone Name	TOPSIS Score
19	Galaxy C55	0.8544356635403829
27	Galaxy A36	0.8493498314910825
9	Galaxy A55 5G	0.8326465417708829
12	Galaxy M15 5G	0.8245225499355594
23	Galaxy F16	0.8181153629407237

Table 7. Top 5 Oppo

Smartphone Name	Index	TOPSIS Score
38	K12 Plus	0.8817292784267665
71	Reno13	0.8806997707255926
39	A5 Energy	0.8752153684412929
72	A5 Pro	0.872839250654028
46	K12	0.8712354367670821

Table 8. Top 5 Realme

Smartphone Name	Index	TOPSIS Score
147	Neo7 SE	0.9076087339081435
142	Neo7x	0.8909372636612962
133	GT Neo6 SE	0.8877361399459194
179	Narzo 80 Pro	0.882174424496911
160	P3 Pro	0.8752000676674739

Table 9. Top 5 Vivo

Smartphone Name	Index	TOPSIS Score
194	iQOO Z9 Turbo Endurance	0.9136213231185708
234	iQOO Z9 Turbo	0.9043615273933929
209	iQOO Z9 Turbo+	0.9042254561543965
192	S19	0.8917690756938672
188	Y300 Pro	0.8873260740018771

Table 10. Top 5 Xiomi

Smartphone Name	Index	TOPSIS Score
114	Redmi Turbo 4	0.907790917101562
96	Redmi K80	0.9020047960375199
97	Redmi Turbo 3	0.8936966514214841
75	Redmi Note 13R	0.8755860307513593
115	Poco X6 Pro	0.8707649166023678

Dataset

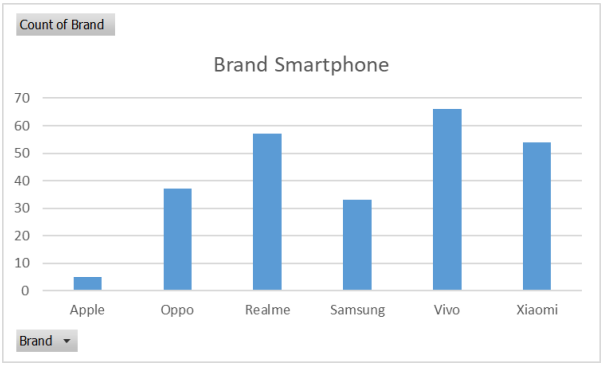

Figure 9. Dataset

The dataset used in this study consists of 252 types of *smartphones* from various popular brands in Indonesia, namely Apple, Samsung, Oppo, Realme, Vivo, and Xiaomi. Data was collected using *webscraper tools* from various trusted sources, focusing on *smartphones* released in 2024 to April 2025. The attributes collected include release year, brand, *smartphone name* , price, battery capacity, RAM capacity, and network type.

In terms of distribution, the Vivo *brand* dominates with 66 smartphone data, followed by Xiaomi (54 data), Realme (57 data), Oppo (37 data), Samsung (33 data), and Apple (5 data). The selection of this brand refers to popularity in Indonesia according to *topbrand-award.com data*.

The data preprocessing stages include normalizing data formats, filling in missing data, and adjusting attribute values to suit analysis needs using the TOPSIS method.

Application of TOPSIS Method

In this study, the *Technique for Order Preference by Similarity to Ideal Solution* (TOPSIS) method was applied to determine the ranking of *smartphones* based on their suitability to streaming activity needs. The initial stage of implementing the method begins with the normalization of the decision matrix, which aims to eliminate the influence of unit differences between attributes. Each value in criteria such as price, battery capacity, RAM, and network is normalized using the vector normalization method.

After the normalization process, the next step is to assign weights to each criterion. Weights are determined based on the level of importance of the criteria in supporting streaming activities, where battery capacity and RAM are given higher weights compared to *smartphone prices* . This process produces a weighted decision matrix that is the basis for determining positive ideal solutions and negative ideal solutions.

The positive ideal solution is determined based on the maximum value for the favorable criteria, such as battery capacity, RAM capacity, and network quality, while the negative ideal solution is determined based on the minimum value for the price criterion, since a lower price is more desirable.

The next step is to calculate the distance of each alternative to the positive ideal solution and the negative ideal solution. The preference value for each *smartphone* is calculated by comparing the distance to the positive and negative ideal solutions. The closer an alternative is to the positive ideal solution and the further it is from the negative ideal solution, the higher its preference score. The results of this calculation are then used to determine the ranking of *smartphones* in the recommendation list.

Implementation of TOPSIS Method

The results of the implementation of the TOPSIS method produce a list of smartphone recommendations arranged based on preference scores from highest to lowest. This list of recommendations is categorized into several groups to make it easier for users to choose *a smartphone* according to their needs and budget.

The first category is the Top 5 *Smartphones* for Streaming overall, which contains the five best smartphones based on the highest TOPSIS scores without considering the price class. The next category is the Top 5 *Flagship* , which focuses on high-end *smartphones with premium specifications that greatly support streaming activities* . In addition, there is the Top 5 *Mid-Range category* for mid-range *smartphones* , as well as the Top 5 *Budget-Friendly* which recommends *smartphones* with more affordable prices but are still adequate for streaming activities.

In addition to categories based on price class, a Top 5 list is also compiled for each brand such as Apple, Samsung, Oppo, Realme, Vivo, and Xiaomi. This provides alternative choices for users who have certain brand preferences.

Overall, the implementation results show that *smartphones* such as the iQOO Z9 Turbo Endurance, Redmi Turbo 4, and Neo7 SE dominate the highest scores in the overall category. These *smartphones have a combination of battery performance, RAM capacity, and network connectivity that greatly supports a high-quality video streaming* experience . With this recommendation system, users are expected to be able to make faster and more precise decisions in choosing *a smartphone* that suits their needs.

Results

Based on the results of the application of the TOPSIS method, the best *smartphone ranking for streaming* activity needs was obtained . The analysis was carried out on all results that had been categorized into several tables, including all *brands* , price class categories, and based on each *brand* .

In the overall Top 5 *Smartphones* for *Streaming category* , the iQOO Z9 Turbo Endurance smartphone ranked first with a TOPSIS score of 0.9136, followed by the Redmi Turbo 4 with a score of 0.9078, and the Neo7 SE with a score of 0.9076. These high scores indicate that the three *smartphones* have the best combination of large battery capacity, high RAM, competitive price, and network support for high-quality *streaming* .

In the Top 5 *Flagship category* , smartphones from the Xiaomi and Vivo *brands* dominate the list. *Smartphones* Xiaomi's *flagship* takes the top spot with a score of 0.8175, followed by Vivo (0.8113), Oppo (0.8077), Vivo back (0.8058), and Vivo (0.8039). This shows that even though the *flagship price* is relatively higher, there are options from Vivo and Oppo that offer very competitive specifications for premium *streaming needs* , including high performance, large battery capacity, and screen quality that supports maximum visual experience.

For the Top 5 *Mid-Range category* , Redmi Turbo 4 Pro leads with a score of 0.8175, followed by iQOO 13 (0.8113), Find X8s (0.8077), iQOO Neo9S Pro+ (0.8058), and X200 Pro Mini (0.8039). This shows that mid-range *smartphones from the Realme, Vivo, and Oppo brands* are able to provide optimal performance for *streaming activities* at relatively affordable prices.

In the Top 5 *Budget-Friendly category* , Realme's Neo7x took first place with a score of 0.8909, followed by Vivo's Y300 Pro (0.8873), iQOO Z9x (0.8833), Narzo 80 Pro (0.8822), and iQOO Z9s (0.8766). This shows that several *smartphones* in the budget price category are still able to compete in providing good performance for *streaming* , especially from the Realme and Vivo *brands* .

Analysis is also done based on *brand smartphone* . In the Top 5 Apple category, the iPhone 16e ranks highest with a score of 0.7121, indicating that while Apple's performance tends to be stable, for high-priced streaming needs, there are options from other brands with higher scores.

In Samsung's Top 5 category, the Galaxy C55 leads with a score of 0.8544, followed by the Galaxy A36 (0.8493) and the Galaxy A55 5G (0.8326). This shows that Samsung is still able to compete strongly in the mid-to-high class for *streaming activities* .

For the Oppo brand, the Top 5 Oppo is led by the K12 Plus with a score of 0.8817, while the Reno13, A5 Energy, A5 Pro, and K12 are also in the top five with scores closely below them. This confirms that Oppo is still a strong choice for users who need *a smartphone.* mid-range *streaming* .

In the Realme brand, the Top 5 Realme is led by the Neo7 SE with a score of 0.9076. Realme shows its dominance in the *mid-range* and *budget-friendly segment* with stable performance for *streaming needs* .

In the Vivo *brand* , the Top 5 Vivo is filled by the iQOO Z9 Turbo Endurance, iQOO Z9 Turbo, iQOO Z9 Turbo+, S19, and Y300 Pro. Vivo's score in this category is very competitive, even outperforming many other *brands* in the overall category.

Finally, for the Xiaomi *brand* , the Top 5 Xiaomi is led by the Redmi Turbo 4 with a score of 0.9078, followed by the Redmi K80 (0.9020) and the Redmi Turbo 3 (0.8937). Xiaomi shows its superiority in presenting high-performance *smartphones* in a more economical price class.

Overall, the analysis results show that Vivo, Xiaomi, and Realme *brands* dominate the best *smartphone category* for streaming activities, especially for users who prioritize high performance at affordable prices. Samsung and Oppo *brands* maintain their existence with several flagship products in the middle class, while Apple offers performance stability that focuses more on its ecosystem than on *streaming technical specifications* .

IV. CONCLUSION

smartphone selection recommendation system for *streaming* activity needs using the *Technique for Order Preference by Similarity to Ideal Solution* (TOPSIS) method. This system is able to sort *smartphones* based on the level of suitability to the criteria of battery performance, RAM capacity, price, and network support. The implementation results show that *smartphones* from the Vivo, Xiaomi, and Realme *brands* dominate the highest rankings in various categories, offering an optimal combination of performance and price for *streaming* . With this system, users can make decisions faster, more precisely, and according to their technical needs and budget..

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