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# Comparative Analysis Of E-Commerce For Student Shopping Optimization Using The SAW And SMART Methods

**Rifqi Mahdhika Rindani[1], Yaslinda Lizar[2]**

[1]Information Systems Study Program, Imam Bonjol State Islamic University, Padang
[2]Imam Bonjol State Islamic University, Padang

Corresponding Author : rifqirindani@gmail.com

**Abstract**

*The growth of e-commerce platforms in Indonesia encourages students to actively shop online. However, the large number of platform choices makes it difficult to determine which one is most optimal according to students' needs and budget constraints. This study aims to analyze and compare five e-commerce platforms, namely Shopee, TikTok Shop, Tokopedia, Lazada, and Blibli, using two multi-criteria decision-making methods, namely Simple Additive Weighting (SAW) and Simple Multi-Attribute Rating Technique (SMART). This type of research is a comparative descriptive quantitative study with a population of active student e-commerce users. Data were collected through a questionnaire survey to 11 active student respondents with eight assessment criteria including product price, promo/discount, free shipping, delivery speed, ease of use of the application, product completeness, transaction security, and service quality. The results of the SAW calculation show that Shopee obtained the highest score of 0.9744, followed by TikTok Shop (0.9656), Tokopedia (0.8455), Blibli (0.7964), and Lazada (0.7331). The SMART method produced a ranking identical to Shopee's utility value of 0.8962. The Spearman correlation between the two methods reached rs = 1.0000, indicating perfect consistency of results. These findings confirm that Shopee is the most optimal platform for college students, followed by TikTok Shop as a competitive alternative.*

***Keywords :E-commerce, Decision Support System, SAW, SMART, Students, Shopee, TikTok Shop***



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## INTRODUCTION

The development of digital technology in recent years has significantly transformed the interaction patterns and consumption behavior of Indonesians. One manifestation of this transformation is the increasing use of e-commerce platforms in daily trading and transactions. According to a survey by the Indonesian Internet Service Providers Association (APJII), Indonesia's internet penetration rate is projected to reach 79.5% by 2024, with the number of internet users exceeding 221 million. This increase demonstrates the expanding public access to digital services and has a direct impact on the growth of internet-based economic activity.

College students are one group of internet users who actively utilize e-commerce platforms. The high level of internet usage among young people makes them more likely to purchase products online. In addition to ease of access, students' decisions in selecting an e-commerce platform are generally influenced by various considerations, such as product price, promotions and discounts, free shipping, delivery speed, and ease of use of the application. This makes the process of selecting an e-commerce platform a multi-criterion issue.

Each e-commerce platform has distinct service characteristics. Shopee is known for its superior promotions and free shipping programs, TikTok Shop thrives through video content integration and live shopping, while Tokopedia, Lazada, and Blibli have distinct approaches to attracting customers. These differences in characteristics require students to make more informed decisions when choosing the platform that best suits their needs and financial capabilities.

Several previous studies have applied the MCDM method in the context of e-commerce evaluation, but with limited scope. Pratama and Wijaya (2021) used the SAW method to compare e-commerce services based on general consumer perceptions without focusing on the student segment. Rahmawati et al. (2022) applied the SMART method to evaluate online shopping apps, but only covered four platforms and did not compare them with other methods. This research gap underpins this study.

This study aims to: (1) identify and establish e-commerce evaluation criteria relevant to students' needs based on primary survey data; (2) calculate and compare the rankings of five e-commerce platforms using the SAW and SMART methods simultaneously; and (3) analyze the level of consistency between the two methods to validate the reliability of the results. Thus, this study is expected to provide a scientific contribution in the form of an e-commerce evaluation framework based on empirical student data and become a practical reference for online shopping decision-making among Indonesian students.



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## RESEARCH METHODS

### Research Design

This research uses a descriptive quantitative approach with a comparative study design. The research subjects are the five e-commerce platforms with the largest market share in Indonesia: Shopee, TikTok Shop, Tokopedia, Lazada, and Blibli. These platforms were selected based on the iPrice Group (2023) report regarding transaction volume and the highest number of monthly active visitors. The analysis was conducted by applying two MCDM methods simultaneously to obtain comparable and cross-validated results.

### Population and Sample

The study population was active students who had used at least one e-commerce platform in the last three months. The sampling technique used was purposive sampling with the following criteria: (a) active students enrolled in college; (b) having experience using online shopping applications; and (c) being willing to complete the questionnaire completely. The study successfully collected data from 11 respondents, consisting of 7 women (63.6%) and 4 men (36.4%). The age distribution of respondents was dominated by the 18–20 year group (63.6%), followed by 21–23 year groups (27.3%), and under 18 years (9.1%). The majority of respondents were from semesters 3–4 (81.8%). A total of 45.5% of respondents shopped online very often and 45.5% frequently, indicating a high level of involvement in e-commerce activities.

### Instruments and Data Collection

The research instrument was an online questionnaire consisting of two parts: (1) demographic and general preference questions, and (2) an assessment of each platform based on eight criteria using a 5-point Likert scale (1 = Very Poor to 5 = Very Good). The questionnaire was distributed via Google Forms. The survey results showed that Shopee was the most frequently used platform (72.7% of respondents), followed by TikTok Shop (54.5%). When asked to choose the most optimal platform for students, 7 respondents (63.6%) chose Shopee and 4 respondents (36.4%) chose TikTok Shop.

### Determination of Criteria and Weight

Eight evaluation criteria were established based on an analysis of the primary reasons for choosing e-commerce collected from respondents. The criteria were weighted proportionally based on the frequency of each aspect's appearance in respondents' open-ended responses,



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resulting in the weights presented in Table 1. All criteria are benefit-based (the higher the value, the better).

**Table 1. Criteria and Weighting for E-commerce Platform Evaluation**

| Code | Criteria | Type | Weight (%) | Symbol |
|---|---|---|---|---|
| C1 | Product Price | Benefits | 30 | $w_1$=0.30 |
| C2 | Promo/Discount | Benefits | 15 | $w_2$=0.15 |
| C3 | Free Shipping | Benefits | 20 | $w_3$=0.20 |
| C4 | Delivery Speed | Benefits | 10 | $w_4$=0.10 |
| C5 | Ease of Use of Application | Benefits | 10 | $w_5$=0.10 |
| C6 | Product Completeness | Benefits | 5 | $w_6$=0.05 |
| C7 | Transaction Security | Benefits | 5 | $w_7$=0.05 |
| C8 | Quality of Service | Benefits | 5 | $w_8$=0.05 |

*Source: Survey Analysis Results (2026)*

**SAW Method (Simple Additive Weighting)**

The SAW method is used to determine the ranking of alternatives based on the weighted sum of normalized ratings. All criteria in this study are benefit-based, so normalization is carried out using equation (1):

$r_{ij} = x_{ij} / max_i(x_{ij})$ (1)

Description: $r_{ij}$ = normalized value; $x_{ij}$ = original value of the i-th alternative on the j-th criterion; $max_i(x_{ij})$ = maximum value on the j-th criterion. The final preference value is calculated using equation (2):

$V_i = \Sigma_j w_j \times r_{ij}$ (2)

Description: $V_i$ = final value of the i-th alternative; $w_j$ = weight of the j-th criterion.

**SMART Method (Simple Multi-Attribute Rating Technique)**

The SMART method converts performance values into utility values using a linear value function according to equation (3):

$u_j(a_i) = (x_{ij} - x_j^{man}) / (x_j^{max} - x_j^{man})$ (3)



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Description: $u_j(a_i)$ = utility value of the i-th alternative on the j-th criterion; $x_j^{man}$ = minimum value; $x_j^{max}$ = maximum value on the j-th criterion. The aggregate utility value is calculated using equation (4):

$U(a_i) = \Sigma_j [w_j \times u_j(a_i)]$ (4)

Description: $U(a_i)$ = total utility value of the i-th alternative; $w_j$ = normalized weight of the j-th criterion.

## RESULTS AND DISCUSSION

### Respondent Profile

The study respondents consisted of 11 active students. In terms of gender, 63.6% were female and 36.4% were male. The age group dominated by the 18–20 age group (63.6%), consistent with the characteristics of students in their first and second years of study. The majority were from semesters 3–4 (81.8%). A total of 90.9% of respondents reported frequent to very frequent online shopping, indicating that e-commerce has become an integral part of the student lifestyle.

### Initial Decision Matrix

The initial decision matrix was compiled from the average of 11 respondents' ratings of each platform across eight criteria. The value in each cell represents the arithmetic mean of the Likert scores (1–5) given by all respondents, as presented in Table 2.

**Table 2. Initial Decision Matrix (Average Likert Score)**

| Platform | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
|---|---|---|---|---|---|---|---|---|
| Shopee | 4,0909 | 4,0909 | 4,0909 | 3.6364 | 3.6364 | 4,0909 | 3,9091 | 3,9091 |
| Tokopedia | 3.4545 | 3.5455 | 3.3636 | 3.3636 | 3.3636 | 3,7273 | 3.6364 | 3.4545 |
| Lazada | 2,8182 | 3,1818 | 3,0000 | 3,0909 | 3,0909 | 3,0909 | 3,0000 | 3,0000 |
| TikTok Shop | 3,9091 | 3,9091 | 3,8182 | 4,0909 | 4,0909 | 4,0000 | 4,0000 | 4,0909 |
| Blibli | 3,2727 | 3.3636 | 3.3636 | 3,0909 | 3,1818 | 3,0909 | 3,0000 | 3,2727 |
| **Max** | 4,0909 | 4,0909 | 4,0909 | 4,0909 | 4,0909 | 4,0909 | 4,0000 | 4,0909 |

*Source: Survey Data Processing Results (2026)*



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**Matrix Normalization and SAW Results**

Normalization is performed by dividing each value in a column by the maximum value of that column (equation 1). The results of the normalization are shown in Table 3. After normalization, the SAW preference value is calculated by multiplying the normalized value by the weight of each criterion (equation 2).

**Table 3. Normalized SAW Matrix**

| Platform | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
|---|---|---|---|---|---|---|---|---|
| Shopee | 1,0000 | 1,0000 | 1,0000 | 0.8889 | 0.8889 | 1,0000 | 0.9773 | 0.9556 |
| Tokopedia | 0.8444 | 0.8667 | 0.8222 | 0.8222 | 0.8222 | 0.9111 | 0.9091 | 0.8444 |
| Lazada | 0.6889 | 0.7778 | 0.7333 | 0.7556 | 0.7556 | 0.7556 | 0.7500 | 0.7333 |
| TikTok Shop | 0.9556 | 0.9556 | 0.9333 | 1,0000 | 1,0000 | 0.9778 | 1,0000 | 1,0000 |
| Blibli | 0.8000 | 0.8222 | 0.8222 | 0.7556 | 0.7778 | 0.7556 | 0.7500 | 0.8000 |
| **Weight** | 0.30 | 0.15 | 0.20 | 0.10 | 0.10 | 0.05 | 0.05 | 0.05 |

*Source: SAW Calculation Results (2026)*

***1.*** **Utility Value Calculation**

Using equation (3):

$$Uij = \frac{xmax - xmin}{xij - xmin}$$

Example of product price criteria (C1):

$$u11 = \frac{4.0909 - 2.8182}{4.0909 - 2.8182} = 1.0000$$

Example of delivery speed criteria (C4):

$$u14 = \frac{4.0909 - 3.0909}{3.6364 - 3.0909} = 0.5455$$

2. Calculation of Preference Value

Using equation (2):

$$Vi = \sum(wj \cdot rij)$$



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For Shopee: V1
=(1.0000×0.30)+(1.0000×0.15)+(1.0000×0.20)+(0.8889×0.10)+(0.8889×0.10)+(1.0000×0.05)+(0.9773×0.05)+(0.9556×0.05)
V1 = 0.9744

**Table 4. SAW Method Ranking Results**

| No | Platform | SAW Value ($V_i$) | Normalized Score | Ranking |
|---|---|---|---|---|
| 1 | Shopee | 0.9744 | 1,0000 | 1 |
| 2 | TikTok Shop | 0.9656 | 0.9910 | 2 |
| 3 | Tokopedia | 0.8455 | 0.8678 | 3 |
| 4 | Blibli | 0.7964 | 0.8173 | 4 |
| 5 | Lazada | 0.7331 | 0.7523 | 5 |

*Source: SAW Calculation Results (2026)*

Shopee achieved the highest SAW score of 0.9744. This superiority was supported by a perfect score (1.0000) on the three highest-weighted criteria: product price (C1, weighted at 30%), promotions/discounts (C2, weighted at 15%), and free shipping (C3, weighted at 20%). TikTok Shop followed in second place with a score of 0.9656, excelling in aspects of delivery speed, ease of application, and service quality. The narrow difference between Shopee and TikTok Shop (0.0088) indicates the tight competition between these two platforms in the eyes of students.

**SMART Utility Value Calculation and Results**

The SMART method uses a linear value function (equation 3) to transform each performance value into a utility score on a scale of 0–1. A utility score of 0 is assigned to the alternative with the lowest performance on a criterion, and a utility score of 1 to the highest. This makes the SMART method more sensitive to performance differences between alternatives than SAW.

**Table 6. SMART Method Utilities**

| No | Platform | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
|---|---|---|---|---|---|---|---|---|---|
| **1** | Shopee | 1,0000 | 1,0000 | 1,0000 | 0.5455 | 0.5455 | 1,0000 | 0.7500 | 0.6667 |
| **2** | Tokopedia | 0.5000 | 0.6000 | 0.2857 | 0.2727 | 0.2727 | 0.4444 | 0.5000 | 0.3333 |



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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **3** | Lazada | 0.000 | 0.000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| **4** | TikTok Shop | 0.8571 | 0.8571 | 0.7857 | 1,0000 | 1,0000 | 0.8889 | 1,0000 | 1,0000 |
| **5** | Blibli | 0.3571 | 0.4000 | 0.2857 | 0.0000 | 0.0909 | 0.0000 | 0.0000 | 0.2222 |

*Source: SMART Calculation Results (2026)*

**1. Utility Value Calculation**

Using equation (3):

$$Uij = \frac{xij - xmin}{xmax - xmin}$$

Example of product price criteria (C1):

$$u11 = \frac{4.0909 - 2.8182}{4.0909 - 2.8182} = 1.0000$$

Example of delivery speed criteria (C4):

$$u14 = \frac{3.6364 - 3.0909}{4.0909 - 3.0909} = 0.5455$$

**2. Calculation of Final Utility Value**

Using equation (4):

$U(ai) = \sum(wj \cdot uij)$

For Shopee:

U(a1) = (1.0000×0.30)+(1.0000×0.15)+(1.0000×0.20)+(0.5455×0.10)+(0.5455×0.10)+(1.0000×0.05)+(0.7500×0.05)+(0.6667×0.05)

U(a1) = 0.8962

This value indicates the highest level of utility on the Shopee alternative.

**Table 7. SMART Method Ranking Results**

| No | Platform | SMART value ($U(a_i)$) | Normalized Score | Ranking |
|---|---|---|---|---|
| 1 | Shopee | 0.8962 | 1,0000 | 1 |
| 2 | TikTok Shop | 0.8726 | 0.9737 | 2 |



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| | | | | |
|---|---|---|---|---|
| 3 | Tokopedia | 0.4157 | 0.4638 | 3 |
| 4 | Blibli | 0.2254 | 0.2515 | 4 |
| 5 | Lazada | 0.0000 | 0.0000 | 5 |

*Source: SMART Calculation Results (2026)*

Shopee regained the top spot with a utility value of 0.8962, followed by TikTok Shop (0.8726). The larger difference between the 2nd and 3rd place rankings compared to the SAW results reflects the higher sensitivity of the SMART method in capturing relative differences between alternatives. Lazada received a utility value of 0.0000 because it was at the minimum performance position across almost all criteria. This does not mean that Lazada has no value, but rather that it is the lowest reference point on the comparison scale.

**Comparative Analysis and Validation**

Both methods produced identical ranking orders: Shopee > TikTok Shop > Tokopedia > Blibli > Lazada. To quantify the level of consistency, a Spearman correlation test was performed on the final scores of the five alternatives from both methods. The Spearman correlation result was rs = 1.0000 ($p < 0.01$), indicating excellent agreement between SAW and SMART in the context of this study. Table 6 summarizes a comprehensive comparison of the results of the two methods.

**Table 8. Comparison of SAW and SMART Results**

| Platform | SAW Value | Rank | SMART Values | Rank | Difference in Value | ΔR |
|---|---|---|---|---|---|---|
| Shopee | 0.9744 | 1 | 0.8962 | 1 | 0.0782 | 0 |
| TikTok Shop | 0.9656 | 2 | 0.8726 | 2 | 0.0930 | 0 |
| Tokopedia | 0.8455 | 3 | 0.4157 | 3 | 0.4298 | 0 |
| Blibli | 0.7964 | 4 | 0.2254 | 4 | 0.5710 | 0 |
| Lazada | 0.7331 | 5 | 0.0000 | 5 | 0.7331 | 0 |



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| | | |
|---|---|---|
| **Spearman Correlation (rs)** | 1.0000 (p<0.01) | |

*Source: SAW and SMART Calculation Results (2026)*

Although the ranking order is identical, the absolute value difference increases as the ranking decreases. This is an inherent characteristic of SMART, which uses a range-based linear value function—so performance differences between alternatives are more explicitly represented. SAW, which uses ratio normalization, tends to provide tighter values because its reference scale is the maximum value, not the full range.

The findings of this study are consistent with respondents' subjective preferences: 63.6% of respondents chose Shopee as the most optimal platform and 36.4% chose TikTok Shop. These two choices precisely align with the top two rankings generated by both MCDM methods, confirming the perceptual validity of the quantitative approach used. This aligns with research by Andriani and Setiawan (2021) that ranked Shopee as the top preference of young Indonesian consumers, as well as a study by Rahmawati et al. (2022) regarding the dominance of video-commerce platforms in the shopping behavior of the younger generation.

## CONCLUSION

This study found that both MCDM methods provided consistent e-commerce platform rankings for the student sample studied, with Shopee as the most optimal alternative followed by TikTok Shop, Tokopedia, Blibli, and Lazada. Quantitatively, Shopee obtained the highest SAW value (0.9744) and the highest SMART utility value (0.8962), while the Spearman correlation between the SAW and SMART results reached rs = 1.0000, indicating perfect ranking agreement. This key finding indicates that for student respondents, product price, free shipping, and promo/discount criteria have a significant contribution to platform preference, so that platforms that excel in high-value criteria tend to occupy the top positions in both methods. Practically, these results provide initial guidance for students to prioritize platforms based on criteria weights relevant to budget constraints and service preferences.

This study has limitations that should be considered when generalizing the results. The sample size was relatively small and purposive (11 respondents), thus limiting representativeness across regions, study programs, and demographic groups. The use of frequency-based weighting is also susceptible to subjective bias; the use of objective weighting methods such as Entropy or AHP could enhance the validity of the weights in subsequent studies.



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Therefore, it is recommended that future research expand the sample size and diversity, test the sensitivity of the results to alternative weighting scenarios, and consider additional dimensions such as product variety, payment method availability, and regional preferences. Practically, these results can assist campus policymakers or student service managers in developing cost-effective online shopping guides, as well as assist platform developers in designing promotional strategies and features that better suit the needs of the student segment.

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