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Decision Support System for Choosing the Best Marketplace Platform Using the Simple Additive Weighting (SAW) Method

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Abstract. *The rapid growth of e-commerce in Indonesia has triggered intense competition among major marketplace platforms, such as Shopee, Tokopedia, TikTok Shop, and Lazada. Users often face multi-criteria dilemmas when choosing the best platform that aligns with their preferences, which involving product quality, transaction security, price variation, and application interface usability. This study aims to implement a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method to evaluate and determine the best marketplace platform based on consumer preferences. Research data were collected through structured digital questionnaires assessing four main criteria: Product Quality, Trust and Transaction Security, Price Diversity and Variation, and Application Usability. The results of this study deliver a mathematical ranking of the four alternative marketplaces by prioritizing product quality and price variation as the primary parameters. Through these priority weights, an objective recommendation is provided for online consumers alongside strategic insights for e-commerce developers to optimize their service quality based on empirical consumer data.*

Keywords: Decision Support System, Marketplace, Simple Additive Weighting (SAW), Online Shopping.

INTRODUCTION

The rapid advancement of information and communication technology in recent decades has brought fundamental changes to the way society conducts economic transactions. The transformation of shopping behavior from conventional methods to digital platforms (online shopping) has driven the massive growth of the electronic commerce (e-commerce) ecosystem in Indonesia (Okta Saputra & Sidiq Purnomo, 2024; Wiriadikusumah & Permana, 2021). Interestingly, this shift from physical retail to virtual marketplaces (e-marketplaces) is no longer limited to physical product transactions but has expanded significantly into the integrated service provider sector (Firdaus & Novita, 2021). This digital expansion phenomenon is characterized by the dominance of various giant marketplace platforms such as Shopee, Tokopedia, TikTok Shop, and Lazada, which compete fiercely in presenting added value to attract consumer preferences (Fajrianto Anggara Sakti et al., 2025; Matheos Sarimole & Karim, 2022).

However, the abundance of platform options often confuses consumers in determining the best choice. This constraint is generally triggered by price variations, discrepancies between the received products and their descriptions, and package delivery delays (Ginting, 2020). To generate objective and fair platform recommendations, a Decision Support System (DSS) based on Multi-Attribute Decision Making (MADM) is required (Okta Saputra & Sidiq Purnomo, 2024). This MADM approach has also proven reliable in

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solving various other multi-criteria optimization challenges, such as determining strategic locations to support successful business expansion (Sari & Novita, 2025).

This study utilizes the Simple Additive Weighting (SAW) method as the primary algorithm. This method is considered highly useful for calculating weighted additions in evaluating several essential factors, namely product quality criteria, transaction trust, price variation, and application usability based on questionnaire data from actual consumer preferences (Hadistra & Supriyanto, 2026; Wiriadikusumah & Permana, 2021). By employing this SAW mathematical model, the resulting platform ranking is expected to provide an accurate shopping guide for the public, as well as a strategic reference for e-commerce businesses to evaluate and improve their service competitiveness (Ulum et al., 2024).

The unique aspect of this research is its attention to how consumer habits have changed in Indonesia after the pandemic, especially focusing on the elements that come with Live-Streaming Interactive Commerce. Although earlier research has thoroughly used Multi-Criteria Decision Making (MCDM) ideas for choosing e-commerce platforms, this study brings in new behavioral patterns into the assessment process. By looking at both qualitative and quantitative factors at the same time, this method fits with modern MCDM models that rank options from best to worst based on organized customer choices (Taherdoost & Madanchian, 2023).

LITERATURE REVIEW

A. Decision Support System (DSS)

A Decision Support System (DSS) is a computer-based information system that is interactive, flexible, and adaptable, designed to assist in solving semi-structured or unstructured management problems by utilizing data and decision models (Okta Saputra & Sidiq Purnomo, 2024). A DSS acts as a supporting tool to enhance the effectiveness and quality of decisions objectively, without completely replacing the role and judgment of the decision-maker (Ikmah et al., 2023; Matheos Sarimole & Karim, 2022).

Structurally, a DSS consists of several components, such as data management, model management, and the user interface (Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024). Its operational process takes place systematically through four main stages: the intelligence stage (fact-finding), the design stage (formulating alternative solutions), the choice stage (selecting an alternative action), and the implementation stage (executing and reporting the solution results) (Wiriadikusumah & Permana, 2021).

B. Simple Additive Weighting (SAW) Method

The Simple Additive Weighting (SAW) method, also known as the weighted addition method, is an algorithm used for multi-criteria decision-making. This method searches for the total weighted performance rating of all alternatives across all available criteria (Ginting, 2020; Matheos Sarimole & Karim, 2022; Wiriadikusumah & Permana, 2021). To implement the SAW method, a normalization process is required to transform the decision matrix (X) into a normalized matrix scale (R), ensuring that all alternatives can be compared fairly (Frieyadie et al., 2020; Matheos Sarimole & Karim, 2022; Wiriadikusumah & Permana, 2021).

The method of systematic problem assessment needs a precise explanation of the factors involved, where aligning selected options with the standards is key to finding the best balanced answer (Bhole, 2018). In this research, selecting four particular marketplace platforms as options and four assessment qualities as benefit measures guarantees that the data framework stays easy to understand and dependable within the Simple Additive Weighting system.

The formula used to normalize the performance rating elements (r_{ij}) is adjusted based on the criteria type, specifically whether it is classified as a benefit attribute or a cost attribute, which is expressed as follows (Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024):

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\max\limits_{i} x_{ij}} & \text{if } j \text{ is a benefit criterion} \\ \dfrac{\min\limits_{i} x_{ij}}{x_{ij}} & \text{if } j \text{ is a cost criterion} \end{cases}$$

Where: r_{ij} is the normalized performance rating, x_{ij} is the attribute value of the alternative, $max_i\, x_{ij}$ is the maximum value for a benefit criterion, and $min_i\, x_{ij}$ is the minimum value for a cost criterion (Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024). After the normalized matrix (R) is formed, the final preference value, (V_i) for each alternative is calculated as follows:

$$V_i = \sum_{j=1}^{n} w_j\, r_{ij}$$

Where: (V_i) represents the final preference ranking of the alternative, and w_j represents the importance weight of criterion j. The final ranking stage is determined by ordering the preference values (V_i) from the highest to the lowest, where the largest value indicates the optimal alternative as the solution (Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024).

The SAW method is chosen for this system because it is efficient, easy to understand, and mathematically straightforward when dealing with decision-making problems that involve multiple attributes. According to global decision studies, MADM focuses on problems that have a clear and limited set of choices. In this study, all the criteria used for evaluation are focused on benefits, so the basic SAW algorithm provides a strong evaluation framework. This method intentionally avoids the complicated hierarchical checks that come with mixed models, making it very effective for real-world systems where objectives, attributes, and options are already well-defined (Taherdoost & Madanchian, 2023).

C. Marketplace Platform Selection Criteria

An analysis of consumer preferences regarding service quality on online shopping platforms is conducted through four main criteria:

1) **Product Quality (C_1):** Identifies the quality of physical goods, product authenticity, and the accuracy of the actual condition of the items compared to what is described or displayed by the seller in photographs (Ginting, 2020; Okta Saputra & Sidiq Purnomo, 2024; Wahyuni & Kurniawati, 2023).
2) **Trust and Transaction Security** (C_2): Evaluates the security of the payment system, the reliability of the refund policy, the legitimacy of official stores, and the quality of customer service in handling complaints (Ginting, 2020; Hadistra & Supriyanto, 2026; Okta Saputra & Sidiq Purnomo, 2024).
3) **Price Diversity and Variation** (C_3): Analyzes the extent to which product prices are affordable compared to competitors, the frequency of discount offers or cashback schemes, and the availability of promotional vouchers for free shipping (Hadistra & Supriyanto, 2026; Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024).
4) **Application Usability** (C_4): Observes how practical, convenient, and responsive the application interface is from product search to the checkout process, as well as the availability of features to track the package position by the courier (Hadistra & Supriyanto, 2026; Okta Saputra & Sidiq Purnomo, 2024; Wahyuni & Kurniawati, 2023).

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METHODS

A. Data Collection Method

The various types of data utilized in this study consist of primary and secondary data to ensure the accuracy of the formulated decision support system model (Matheos Sarimole & Karim, 2022). Primary data were gathered directly by distributing structured digital questionnaires to active respondents (Matheos Sarimole & Karim, 2022). These primary data encompass the respondents' evaluations regarding the operational performance of each alternative marketplace platform. Meanwhile, secondary data were collected through a literature review comprising books, articles, literature, and previous journals highly relevant to the investigated issue, serving to establish the foundation for criterion determination and calculation methods (Matheos Sarimole & Karim, 2022).

B. Data Processing Method (Population and Sample)

Population refers to the entire subject or object situated within a specific area that meets particular criteria related to the research topic. Conversely, a sample is a small subset or representative of the larger population selected to serve as the object of observation in this study(Matheos Sarimole & Karim, 2022).

In this study, the sampling technique employed was purposive sampling, which is based on specific inclusion criteria. Data collection was conducted by distributing questionnaires via Google Forms utilizing a 1–5 Likert scale (Score 1 = Very Poor, up to Score 5 = Very Good). From the data collection results, a total of 32 valid respondent samples were obtained, all of whom possessed prior transaction experience across the four major marketplace platforms in Indonesia.

C. Formulation of System Components (Alternatives, Criteria, and Indicators)

This study establishes the core components of the system, which consist of platform alternatives, evaluation criteria, and their corresponding questionnaire indicators (Matheos Sarimole & Karim, 2022). The objects serving as eligible candidates in this decision support system include four major marketplace platform alternatives in Indonesia, which are outlined in Table 1.

TABLE 1. Marketplace Platform Alternative Data $(m = 4)$

Alternative	Description
A_1	Shopee
A_2	Tokopedia
A_3	TikTok Shop
A_4	Lazada

An evaluation of the four alternatives mentioned above is assessed based on 4 main criteria extracted from a total of 10 question items on the formulated questionnaire instrument (Matheos Sarimole & Karim, 2022). All criteria in this study are contextually designated as benefit attributes, as they measure the users' positive perception levels based on the Likert scale. The correlation among the criteria, attribute types, and questionnaire question indicators is elaborated in detail in Table 2.

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TABLE 2. Structure of Criteria, Properties, and Indicators of the Questionnaire

Criteria	*Criteria Description*	*Attribute Property*	*Source of Questionnaire Question Indicators*
C_1	Product Quality	*Benefit*	Average of Indicator 1 (Photo/Description Suitability) & Indicator 2 (Product Authenticity Quality).
C_2	Trust and Transaction Security	*Benefit*	Average of Indicator 3 (Refund Security), Indicator 4 (Official Store Credibility), & Indicator 5 (Customer Service Reliability).
C_3	Price Diversity and Variation	*Benefit*	Average of Indicator 6 (Price Affordability & Cheapness), Indicator 7 (Discount/Cashback Intensity), & Indicator 8 (Ease of Free Shipping Vouchers).
C_4	Application Usability	*Benefit*	Average of Indicator 9 (UI/Checkout Practicality) & Indicator 10 (Package Tracking Feature Accuracy).

D. Simple Additive Weighting (SAW) Algorithm Calculation Workflow

The ranking process is structured systematically through eight stages within the Simple Additive Weighting (SAW) algorithm, adapted directly from the JINTEKS methodology (Matheos Sarimole & Karim, 2022):

1) **Establishing the alternatives:** Specifying the marketplace platforms to be evaluated as decision choices (A_1 to A_4).
2) **Identifying the Criteria (C_j):** Determining the foundational parameters used in the decision-making process (C_1 to C_4).
3) **Determining preference weights (W):** Assigning the importance level or weight for each criterion in the form of a row vector, with a total accumulated weight of $\sum wj = 1.00$.
4) **Calculating suitability ratings:** Computing the average scores from the 32 respondents' answers for each alternative platform based on the available criteria.
5) **Constructing the Decision Matrix (X):** Compiling all the obtained suitability rating values of the alternatives into a comprehensive matrix format.
6) **Executing the normalization process:** Transforming the decision matrix (X) into a Normalized Matrix (R) by applying the benefit attribute formula, where each performance rating element is divided by the maximum value (max) of the respective column.
7) **Calculating the final preference values (V_i):** Multiplying the row elements of matrix (R) by the criteria importance weight vector (W).
8) **Compiling the final ranking:** Structuring the alternatives in descending order based on their final preference values (V_i) from the highest to the lowest to identify the optimal alternative solution.

RESULTS AND DISCUSSION

A. Result of Decision Matrix Formulation

The survey responses from the 32 respondents were aggregated and averaged to define the suitability rating elements in the 4×4 Decision Matrix (X) (Matheos Sarimole & Karim, 2022). Based on the extraction of raw numerical data from the questionnaires, the average performance results of the alternatives are presented in Table 3.

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TABLE 3. Match Rating Value Based on Questionnaire Average (X Matrix)

Alternative	C_1	C_2	C_3	C_4
A_1	4.13	4.11	4.42	4.23
A_2	3.81	3.86	3.76	3.97
A_3	4.06	3.95	4.26	3.98
A_4	3.19	3.52	3.53	3.67

Based on the descriptive data structure in Table 3 above, the data layout is formally initialized into the rows and columns of the Decision Matrix (X) elements as follows:

$$X = \begin{bmatrix} 4.13 & 4.11 & 4.42 & 4.23 \\ 3.81 & 3.86 & 3.76 & 3.97 \\ 4.06 & 3.95 & 4.26 & 3.98 \\ 3.19 & 3.52 & 3.53 & 3.67 \end{bmatrix}$$

B. Criteria Weight Vector Formulation

In accordance with the guidelines for determining attribute importance priorities, the criteria weight levels are configured based on specific importance ratings from digital consumers, with the total accumulated sum of all weights equaling 1.00. The weighting allocation for each criterion is detailed in a row vector format in Table 4.

TABLE 4. Value Allocation of Weighting Criteria Vector (W Vector)

Criteria	*Attribute Description*	*Percentage*	*Weight Value* W_j	*Attribute Property*
C_1	Product Quality	35%	0.35	*Benefit*
C_2	Trust and Transaction Security	20%	0.20	*Benefit*
C_3	Price Diversity and Variation	30%	0.30	*Benefit*
C_4	Application Usability	15%	0.15	*Benefit*

Based on the value allocation in Table 4 above, the Weighting Vector (W) format is mathematically formulated as follows:

$$W = [0.35 \;\; 0.20 \;\; 0.30 \;\; 0.15]$$

C. Decision Matrix Normalization Process

The next step is to transform the elements of the decision matrix X into a Normalized Matrix (R). Since all criteria (C_1 to C_4) act as benefit attributes, the normalization computation utilizes the formula where each element is divided by the maximum value $max_i\, x_{ij}$ within its respective criterion column.

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The following is the detailed row-by-row calculation of the normalization process for the decision matrix elements:

- Normalization of Row 1 Elements (Alternative A_1 - Shopee):

$$r_{11} = \frac{4.13}{4.13} = 1.00 \,;\ r_{12} = \frac{4.11}{4.11} = 1.00$$

$$r_{13} = \frac{4.42}{4.42} = 1.00 \,;\ r_{14} = \frac{4.23}{4.23} = 1.00$$

- Normalization of Row 2 Elements (Alternative A_2 - Tokopedia):

$$r_{21} = \frac{3.81}{4.13} = 0.92 \,;\ r_{22} = \frac{3.86}{4.11} = 0.94$$

$$r_{23} = \frac{3.76}{4.42} = 0.85 \,;\ r_{24} = \frac{3.97}{4.23} = 0.94$$

- Normalization of Row 3 Elements (Alternative A_3 - TikTok Shop):

$$r_{31} = \frac{4.06}{4.13} = 0.98 \,;\ r_{32} = \frac{3.95}{4.11} = 0.96$$

$$r_{33} = \frac{4.26}{4.42} = 0.96 \,;\ r_{34} = \frac{3.98}{4.23} = 0.94$$

- Normalization of Row 4 Elements (Alternative A_4 - Lazada):

$$r_{41} = \frac{3.19}{4.13} = 0.77 \,;\ r_{42} = \frac{3.52}{4.11} = 0.86$$

$$r_{43} = \frac{3.53}{4.42} = 0.80 \,;\ r_{44} = \frac{3.67}{4.23} = 0.87$$

All the resulting division ratings above are subsequently compiled into the element structure of the Normalized Matrix (R) in Table 5.

TABLE 5. Normalized Rating Value Results for All Benefits (R Matrix)

Alternative	C_1	C_2	C_3	C_4
A_1	1.00	1.00	1.00	1.00
A_2	0.92	0.94	0.85	0.94
A_3	0.98	0.96	0.96	0.94
A_4	0.77	0.86	0.80	0.87

The visual notation of the element arrangement for the Normalized Matrix (R) above is expressed as follows:

$$R = \begin{bmatrix} 1.00 & 1.00 & 1.00 & 1.00 \\ 0.92 & 0.94 & 0.85 & 0.94 \\ 0.98 & 0.96 & 0.96 & 0.94 \\ 0.77 & 0.86 & 0.80 & 0.87 \end{bmatrix}$$

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D. Calculation of Final Preference Values (V_i) and Ranking

The final stage of the SAW algorithm implementation involves calculating the accumulated preference value (V_i) through a dot product multiplication between the row elements of the normalized matrix R and the Weighting Vector ($W = [0.35\ \ 0.20\ \ 0.30\ \ 0.15]$). The detailed steps for the weighted summation computation are elaborated comprehensively as follows:

- Preference Value of Alternative A_1 (Shopee):

$$V_1 = (1.00\ x\ 0.35) + (1.00\ x\ 0.20) + (1.00\ x\ 0.30) + (1.00\ x\ 0.15)$$
$$= 0.35 + 0.20 + 0.30 + 0.15 = 1.00$$

- Preference Value of Alternative A_2 (Tokopedia):

$$V_2 = (0.92\ x\ 0.35) + (0.94\ x\ 0.20) + (0.85\ x\ 0.30) + (0.94\ x\ 0.15)$$
$$= 0.32 + 0.19 + 0.26 + 0.14 = 0.91$$

- Preference Value of Alternative A_3 (TikTok Shop):

$$V_3 = (0.98\ x\ 0.35) + (0.96\ x\ 0.20) + (0.96\ x\ 0.30) + (0.94\ x\ 0.15)$$
$$= 0.34 + 0.19 + 0.29 + 0.14 = 0.96$$

- Preference Value of Alternative A_4 (Lazada):

$$V_4 = (0.77\ x\ 0.35) + (0.86\ x\ 0.20) + (0.80\ x\ 0.30) + (0.87\ x\ 0.15)$$
$$= 0.27 + 0.17 + 0.24 + 0.13 = 0.81$$

The final ranking results constructed based on the descending order of these preference scores are presented systematically in Table 6.

TABLE 6. End-Result of Preference Values and Alternative Ranking Battles

Alternative	*Platform Marketplace*	*Final Preference Value (V_i)*	*Ranking*
A_1	Shopee	1.00	1
A_3	TikTok Shop	0.96	2
A_2	Tokopedia	0.91	3
A_4	Lazada	0.81	4

The leading position of Shopee in the last standings confirms that changing how important different criteria are can significantly shift the way choices are viewed. This is an essential feature of thorough Multi-Criteria Decision Making systems (Bhole, 2018). The findings show that when there is a strong focus on product quality and variety in pricing, the SAW method successfully points out the platform that meets the decision-maker's varied preferences the best.

E. Discussion

Based on the data processing results using the Simple Additive Weighting (SAW) method presented in Table 6, Shopee (A_1) dominantly secures the top position with a perfect preference score of 1.00. Shopee's strategy of combining the superiority of product quality (4.13) with aggressive price discounts and free shipping promotions (4.42) proves to be the most preferred variable combination for Indonesian digital consumers. This outcome is heavily supported by the newly configured weighting scheme that prioritizes product quality (35%) and price variation (30%) (Matheos Sarimole & Karim, 2022; Okta Saputra & Sidiq Purnomo, 2024).

In the second position, TikTok Shop (A_3) achieves a final preference value of 0.96. The success of this social commerce platform in closely following Shopee is driven by high consumer satisfaction scores in the product quality criterion (C_1), which reaches 4.06, and the price diversity criterion (C_3), which reaches 4.26. Interactive selling models via live streaming and short videos deliver a dual advantage: consumers obtain clear visual representations of the goods alongside exclusive discount incentives during live broadcasts. This approach closely aligns with the substantial weight contribution assigned to these two primary criteria in this study (Fajrianto Anggara Sakti et al., 2025; Ulum et al., 2024).

Meanwhile, Tokopedia (A_2) manages to occupy the third position with a final preference value of 0.91. Tokopedia actually demonstrates excellent performance in the product quality aspect (C_1) with a score of 3.81 and the transaction security aspect (C_2) which reaches 3.86 (Wahyuni & Kurniawati, 2023). Tokopedia's ecosystem is highly trusted by consumers regarding official store authenticity and the reliability of their refund procedures. However, its rank is constrained to the third spot due to the price diversity criterion (C_3), which only obtains a score of 3.76; consequently, Tokopedia fails to gain maximum advantage from the price-focused weighting system implemented in this decision model.

Lastly, Lazada (A_4) rests in the fourth position with the lowest preference value of 0.81. The decline in Lazada's preference score is triggered by the product quality criterion (C_1 = 3.19) and the price diversity criterion (C_3 = 3.53), both of which received the lowest evaluations from the 32 respondents. Because these two criteria possess the largest weight constraints (accumulating to 65% of the total system importance), Lazada's shortcomings in offering authentic item quality and direct promotions heavily penalize its final standing, placing it in the last position (Hadistra & Supriyanto, 2026).

CONCLUSION

Based on the analysis and discussion of the survey data processing using the Simple Additive Weighting (SAW) method, it is concluded that this algorithm successfully evaluates various marketplace platforms in a measurable, mathematical, and objective manner in accordance with digital user preferences. The assessment conducted based on empirical data from 32 respondents toward four platform alternatives indicates that Shopee (A_1) emerges as the best marketplace platform in the first rank with an absolute preference value of 1.00. This is due to its superiority across all criteria, particularly in offering discount programs and the ease of claiming free shipping vouchers (C_3).

Subsequently, TikTok Shop (A_3) occupies the second position with a preference value of 0.96 due to its superior interactive features, followed by Tokopedia (A_2) in the third rank with a preference score of 0.91, showing strength in official transaction security aspects. Meanwhile, Lazada (A_4) rests in the final position with a preference value of 0.81 due to low user satisfaction levels regarding product quality and customer service responsiveness. The results of this ranking are expected to assist the public in selecting the appropriate digital shopping platform and serve as a strategic reference for e-commerce developers to enhance their service quality.

This research recognizes a constraint related to its sample of 32 participants, which limits wide-ranging statistical applicability. Nevertheless, the method of purposive sampling guarantees reliable, high-quality information from users engaged on various platforms. Future studies ought to widen the demographic range and include a larger number of participants to confirm these rankings based on multiple criteria.

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