



## Implementation of the Topsis Method in Determining Online Shopping Options in the Marketplace

**Tuslaela, Enok Tuti Alawiah, Helina Apriyani**

<sup>1</sup>Informatika, Teknik dan Informatika, Universitas Bina Sarana Informatika, DKI Jakarta, Indonesia

<sup>2,3</sup>Sistem Informasi Kampus Kota Bogor, Teknik dan Informatika, Universitas Bina Sarana Informatika, DKI Jakarta, Indonesia

### Abstract

The development of information technology changes the way customers view shopping. Currently, customers are more likely to make online shopping transactions through the marketplace. Significantly increased internet penetration, ease of transactions, seller reputation, speed of service, ease of access are factors that support customers in making shopping transactions in the marketplace. However, customers need to decide wisely before making a shopping transaction so that the products obtained are in accordance with expectations. This study uses the TOPSIS method, a method in the decision-making process to choose an ideal solution based on the criteria offered. The results of the study obtained a result of 0.85 for product reviews as an alternative preference in shopping online through the marketplace.

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#### Corresponding Author:

Enok Tuti Alawiah,  
Sistem Informasi Kampus Kota Bogor  
Teknik dan Informatika  
Universitas Bina Sarana Informatika, DKI Jakarta, Indonesia  
Jalan Merdeka 168 Bogor, 16124 West Java, Indonesia  
Enok.etw@bsi.ac.id

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### Introduction

By 2025, the number of e-commerce users in Indonesia is estimated to reach around 73.06 million people, an increase of around 11% from the previous year. Other projections put the figure at around 73.4 million users, up from 65.65 million in 2024. This growth reflects a positive trend in the adoption of online shopping in Indonesia driven by increased internet access, smartphone user penetration and ease of digital payments. The number of e-commerce users is estimated to continue to increase to reach 99.1 million users in 2029.

Consumers decide to shop online for a variety of interrelated reasons, including convenience, choice, price, and the overall shopping experience. The main factors that drive purchasing decisions include Convenience and Ease, accessibility, wide product variety, product availability, discounts, availability of purchase reviews, multiple methods of choice, competitive pricing, and return policies for unsuitable products. The development of new market features will almost certainly increase the complexity of the criteria in the decision model. Consumers in this case when making a purchase decision need to proactively identify, define, and measure new relevant criteria, and re-evaluate the relevance and weight of existing criteria to ensure the decision model remains accurate and effective in making decisions related to market development.

The development of new market features will almost certainly increase the complexity of the criteria in the decision model. Decision makers need to proactively identify, define, and measure relevant new criteria, and re-evaluate the relevance and weighting of existing criteria to ensure the decision model remains accurate and effective in making decisions related to market development.

Indonesia is the largest e-commerce user out of 10 countries, including the UK, Philippines, Thailand, Malaysia, Germany, Ireland, South Korea, Italy, and Poland. The percentage value is recorded at 88.1 percent of internet users in Indonesia who access e-commerce services to buy a particular product. Along with the development of e-commerce in Indonesia, various startups have emerged as online shopping places with the largest number of users, namely Shopee, Tokopedia, Lazada, Bukalapak, and Blibli.com (Ausat, A. M. A., Astuti, E. S., 2022).

The increasing number of users from year to year indicates that e-commerce is increasingly becoming an important part of people's consumption patterns, supported by technological advances and increasingly widespread internet penetration. This potential makes Indonesia one of the main markets for the e-commerce industry in the Asian region (Damayanti et al., 2025).

In addition, online shopping trends show a significant change in consumer behavior, where purchasing decisions are not only influenced by price, but also by other factors such as product reviews, seller reputation, shipping costs, and service speed. In this context, consumers are faced with many alternatives with diverse criteria, so that the decision-making process becomes increasingly complex. To determine the best e-commerce platform, various factors such as price offerings, product quality, customer service, and delivery speed play an important role in influencing consumer purchasing decisions (Maisya et al., n.d.).

The increasing number of users from year to year indicates that e-commerce is increasingly becoming an important part of people's consumption patterns, supported by technological advances and increasingly widespread internet penetration. This potential makes Indonesia one of the main markets for the e-commerce industry in the Asian region (Ramadhan et al., 2024).

The trend of online shopping creates complexity in decision making, and the TOPSIS method can be a very relevant tool to simplify the process through a mathematical and objective approach. To help consumers choose products or services that suit their needs, a systematic and measurable approach is needed. One solution that can be applied is the use of a Decision Support System (DSS) based on the TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution). Decision Support System is a computer-based information system that assists decision making by providing the necessary information, models and analysis tools (Marudut et al., 2024). A decision support system is a computer-based system that produces various decision alternatives to help management handle various structured or unstructured problems using data and models (Eniyati, 2011). Decision Support System functions to provide decision recommendations to users when facing a particular problem (Ramadhan et al., 2023). Decision support systems with TOPSIS can help in conducting data analysis, mathematical modeling, and decision-making techniques, as well as helping users to understand situations, evaluate various options, and choose the best alternative based on established criteria (Ardiansah, 2024).

This method is able to provide objective recommendations based on a comparison of several alternatives by considering various relevant criteria. TOPSIS is a decision support method used to find the best alternative that is selected not only to have the closest distance from the positive ideal solution (Alawiah & Sefrika, 2020). The TOPSIS method was first formulated by Hwang and Yoon. TOPSIS is a simple and efficient multi-criteria method to solve problems with various alternatives. TOPSIS method is a method that is widely used for the decision-making process so that policies will be selected based on the best choice and TOPSIS also has a simple and easy-to-understand concept (D. A. Putri et al., 2021). TOPSIS is an effective method that can be

used to select and decide the number of criteria that will be used as specific choices to solve a problem that requires valid calculations in the decision-making process (Alawiah<sup>1</sup>, Enok Tuti; Mardewi, 2023).

TOPSIS considers both, the distance to the positive ideal solution and the distance to the negative ideal solution by taking the relative proximity to the positive ideal solution. Based on the comparison of its relative distance, the priority arrangement of alternatives can be achieved (Alawiah & Putri, 2021). The Preference Order Technique based on Similarity to Ideal Solution (TOPSIS) emerged in the 1980s as a multi-criteria decision-making method. TOPSIS selects the alternative with the shortest Euclidean distance from the ideal solution and the furthest distance from the negative ideal solution (Ridho & Listiana, 2024). The TOPSIS method is used as an analytical tool in this effort to determine the best alternative in systematic decision making (Alawiah et al., 2020). The TOPSIS method consists of several systematic steps. First, a normalized decision matrix is created; second, the decision matrix is given weight; third, the positive and negative ideal solution matrices are found; and fourth, the distance between the value of each option and the positive and negative ideal solution matrices is calculated. The last step is to determine the preference value for each option (Sudarman, Kezia Grace Sudarman; Rochmoeljati, 2025). The analysis resulting from the data processing process using the TOPSIS method involves steps such as determining criteria and attributes, evaluating the level of suitability, forming a normalized decision matrix, multiplying weights by attribute values, identifying positive and negative ideal solution matrices, calculating the distance between alternative values and positive and negative ideal solution matrices, and determining preference values for each alternative (Librado & Prabawa, 2024).

Research shows that the TOPSIS method is used to determine the best electronic money payment method (Sefrika, 2021). Research shows that research using TOPSIS shows UAT results of 78.93% of users agree that it helps in choosing the most appropriate e-commerce for users (Pradana et al., 2025). Research (Pitaloka et al., 2023) shows that the TOPSIS method gets good ideal results for determining the best online shipping service with a value of 0.796. Research (Choirina et al., 2022) with TOPSIS helps consumers to choose the best e-commerce, an appropriate decision support system is needed. The employee performance appraisal system in this study uses TOPSIS with various assessment criteria that are effective for the decision-making process accurately and efficiently (Ayassy et al., 2025).

Analysis using the TOPSIS method resulted in Airline B as the best choice with a preference value of 0.6862, followed by Airline D (0.6623), Airline E (0.4406), Airline F (0.4289), Airline C (0.4278), and finally Airline A with a value of 0.2295. The results of the analysis show significant variations in airline performance, which provides important information for management in decision making (Sudarman, Kezia Grace Sudarman; Rochmoeljati, 2025). Research using the TOPSIS method in building a decision support system to assess performance shows that this system is able to provide objective and measurable assessments by analyzing data based on established criteria quickly and accurately, thus minimizing the subjectivity that often appears in conventional assessments (Faizal, 2025). Research using the TOPSIS method in building a decision support system to assess performance shows that this system is able to provide objective and measurable assessments by analyzing data based on established criteria quickly and accurately, thus minimizing the subjectivity that often appears in conventional assessments (Krisnawan et al., 2025). Research with TOPSIS shows that the results of testing the implementation of the TOPSIS method with varying weights without changing the result values have been proven to produce good preferences in research (N. A. Putri, 2025). The TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method is used to conduct the analysis, which involves data normalization, the formation of a decision matrix, and the calculation of the distance of proximity

to the ideal solution in objectively selecting the best employees (Fauziah et al., 2025). The first place in the TOPSIS method with a value of 0.7033 at sensitivity 3 and the lowest in the SMARTER method with a value of 0.1303 at the first sensitivity, and at the second sensitivity, all methods have the same value of 0.2. The conclusion is that TOPSIS is the best method compared to the SMARTER method as a decision support for the selection of freight forwarding services (Aini et al., 2024).

This study aims to design and implement a decision support system that can help consumers in determining the best choice in deciding on options in making online shopping transactions. TOPSIS is used as a basis for relevant calculations by calculating the distance of the best ideal solution from various options offered. This study aims to enable consumers to make decisions more rationally, efficiently, and in accordance with preferences in making online shopping wisely.

The criteria in this study are limited to Reviews (A1), Shipping (A2), Price (A3) and Payment (A4) by considering the top criteria that are usually the recommendations for consumer purchasing decisions in making online purchases. The study only uses these criteria so that the process of collecting respondent data becomes more directed and focused on specific research questions that explicitly cover aspects such as the variables studied and understand the limitations and context of the study.

### Research Method

TOPSIS is a method in multiple criteria decision making that assesses each alternative based on its distance from the positive ideal solution (best solution) and the negative ideal solution (worst solution). Reliability refers to the consistency and stability of the normalized data. If the normalization process is reliable, applying it to the same original decision matrix multiple times will produce consistent normal values. Validity refers to the extent to which the normalized data accurately represent the original data on a comparable scale suitable for TOPSIS analysis. A valid normalization method maintains the relative relationships between the values of each criterion and ensures fair comparisons across criteria.

TOPSIS produces a scalar value for each alternative that reflects its relative performance to the ideal solution. TOPSIS can facilitate the ranking and selection of the best alternatives in determining online shopping choices in the marketplace effectively.

The following are the stages in using the TOPSIS method:

- a. Calculating the normalized decision matrix.

Creating a normalized decision matrix is a stage in the TOPSIS method that requires a performance rating of each alternative  $A_i$  on each normalized criterion  $C_i$ .

With the following provisions:

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \dots\dots\dots 1$$

$i=1,2,\dots,m$

$j=1,2,\dots,n$

$r_{ij}$ = normalized decision matriks

$X_{ij}$ = weight criteria to  $j$  pada alternative  $-i$

$I$ = alternative to  $i$

$J$ = alternative to  $j$

- b. Perform normalized decision matrix calculations by calculating the weight of each criterion offered. Calculate the normalized matrix (R) with the following formula:

Formula :

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \dots\dots\dots 2$$

where :  $i = 1, 2, \dots, m$ ; and  $j = 1, 2, \dots, n$

- c. Perform calculations for matrices with positive ideal solution values and matrices with negative ideal solutions for each criterion.

Calculate positive ideal solutions (A+) and negative (A-) with the following formula:  
Formula:

$$\begin{aligned} A^+ &= \max(y_1^+, y_2^+, \dots, y_n^+) \\ A^- &= \max(y_1^-, y_2^-, \dots, y_n^-) \dots\dots\dots 3 \end{aligned}$$

- d. Perform calculations to determine the distance between the value of each alternative with the positive ideal solution matrix and the negative ideal solution matrix.

$$\sqrt{\sum_{j=1}^n (y_i^+ - y_{ij}^-)^2} \dots\dots\dots 4$$

$$D_i^+; i = 1, 2, \dots, m.$$

- e. Perform calculations to determine the preference value of each alternative by determining the value of the Decision Matrix D and the i-th alternative solution and j-th attribute of the criteria offered for selection.

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}, \text{ where } i = 1, 2, 3, \dots, m \dots\dots\dots 5$$

### Main Title

To facilitate the research, a criteria weight assessor is needed for each alternative to be calculated. The following are the criteria weight values. The criteria in this study are: (a) Reviews (A1), (b) . Shipping (A2), (c) Price (A3), (d) Payment (A4)

The following is a table of criteria weights

C1	C2	C3	C4
5	5	4	3

Source: Research Data

After getting the weight value of each tested criteria, the next step is to calculate the normalization decision matrix based on the research results. The following data is presented in the table.

Criteria	C1	C2	C3	C4
A1	5	5	4	3
A2	5	4	4	4
A3	5	4	3	4
A4	4	4	3	3

Source: Research Data

TOPSIS Then calculate the normalization decision matrix by calculating the weights obtained based on the research results.

Table 3. Weight Normalized Decision Matrix

Criteria	C1	C2	C3	C4
A1	5	5	4	3
A2	5	4	4	4
A3	5	4	3	4
A4	4	4	3	3
Score	91	73	50	30
Result	9,5	8,5	7,0	5,4

Source: Research Data

The following are the calculation steps using TOPSIS Then the next step is to calculate the normalized decision matrix by calculating the weights of each criterion C1 C2, C3, C4 and C5. The following are the results obtained based on the research data. The following is the normalized matrix data for C1.

Table 4. Normalized Matrix C1

Criteria	C1	Score	Result
A1	5	9,5	0,52
A2	5	9,5	0,52
A3	5	9,5	0,52
A4	4	9,5	0,42

Source: Research Data

The following is the normalized matrix for the C2 criterion.

Table 5. Normalized Matrix C2

Criteria	C2	Score	Result
A1	5	8,5	0,58
A2	4	8,5	0,47
A3	4	8,5	0,47
A4	4	8,5	0,47

Source: Research Data

The following is the normalized matrix for the C3 criterion.

Table 6. Normalized Matrix C3

Criteria	C3	Score	Result
A1	4	7,0	0,57
A2	4	7,0	0,57
A3	3	7,0	0,42
A4	3	7,0	0,42

Source: Research Data

The following is the normalized matrix for the C4 criterion.

Table 7. Normalized Matrix C4

Criteria	C4	Score	Result
A1	3	5,4	0,55
A2	4	5,4	0,74
A3	4	5,4	0,74
A4	3	5,4	0,55

Source: Research Data

The following is the normalized matrix data for all criteria C1, C2, C3 and C4 which is summarized in table 8, namely:

Table 8. Normalized Data

Criteria	C1	C2	C3	C4
A1	0,52	0,58	0,57	0,55
A2	0,52	0,47	0,57	0,74
A3	0,52	0,47	0,42	0,74
A4	0,42	0,47	0,42	0,55

Source: Research Data

Then the value is calculated with the results of the criteria weight values that have been obtained since the beginning of the study.

Table 9. Normalized Weight

Criteria	C1	C2	C3	C4
A1	2,6	2,9	2,2	1,6
A2	2,6	2,3	2,2	2,2
A3	2,6	2,3	1,6	2,2
A4	2,1	2,3	1,6	1,6

Source: Research Data

Here is the final result in the table 10:

Table 10. Final Result

Criteria	C1	C2	C3	C4
A1	2,6	2,9	2,2	1,6
A2	2,6	2,3	2,2	2,2
A3	2,6	2,3	1,6	2,2
A4	2,1	2,3	1,6	1,6
Min	2,1	2,3	1,6	2,2
Max	2,6	2,9	2,2	2,2

Source: Research Data

Based on the data obtained above, the last stage is to determine the Positive Ideal Solution and Negative Ideal Solution matrices. The concept of positive ideal solutions and negative ideal solutions is the main key in determining the best alternative based on the criteria tested in the study. Here are the results:

Table 11. Ideal Solution Matrix

Criteria	C1	C2	C3	C4	Preference
A1	2,6	2,9	2,2	1,6	0,85
A2	2,6	2,3	2,2	2,2	0,25
A3	2,6	2,3	1,6	2,2	0,50
A4	2,1	2,3	1,6	1,6	0,50

Source: Research Data

## Conclusion

Currently, online shopping through the marketplace is a trend among the public, but not all online shopping offers a pleasant shopping experience. The results are expected to be a reference so that consumers can make decisions more rationally, efficiently, and in accordance with their preferences in making online shopping wisely.

Based on the research conducted, the highest criteria obtained are Reviews (A1), Shipping (A2), Price (A3) and Payment (A4). Then the weight of the criteria based on the research is C1 of 5, C2 of 5, C3 of 4, and C4 of 3. The values obtained are then calculated using the TOPSIS method to determine the preference value.

The preference value (often denoted by  $V_i$ ) obtained in this study is a scalar value calculated for each alternative ( $A_i$ ). This value indicates the relative closeness of an alternative to the positive ideal solution and its relative distance to the negative ideal solution. Conceptually, the preference value  $V_i$  ranges between 0 and 1, where a  $V_i$  value approaching 1 indicates that the  $A_i$  alternative is very close to the positive ideal solution and very far from the negative ideal solution. Therefore, alternatives with higher preference values are considered superior or more preferred. A  $V_i$  value close to 0 indicates that the  $A_i$  alternative is close to the negative ideal solution and far from the positive ideal solution, so it is considered less good. The  $V_i$  preference value effectively summarizes the overall performance of the  $A_i$  alternative based on all criteria considered. The alternative with the highest  $V_i$  value is considered the best choice because it has the greatest proximity to the desired ideal condition and the greatest distance to the undesirable ideal condition. After calculating the preference values for all alternatives, the alternatives can be sorted based on the  $V_i$  value from the highest to the lowest. This order provides recommendations or priorities for alternatives based on preferences that have been analyzed using the TOPSIS method to obtain assessment data that is close to the ideal solution results from the various alternatives offered. Based on research on respondents, the largest preference value was obtained for criterion A1 of 0.85 for Product Review, followed by Price of 0.50 and Payment of 0.50 and Shipping of 0.25. This shows that respondents in making purchases decided to choose product reviews as an ideal solution that is contradictory to each other in online purchasing decisions.

This assessment was obtained based on the results of a survey of respondents to determine the ideal criteria for customers in online shopping in the marketplace so that they can shop more wisely. The results of the TOPSIS calculation show that the decisions that customers can use to shop in the marketplace are based on reviews of the products sold as the most ideal alternative.

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