DECISION SUPPORT SYSTEM TO DETERMINE THE BEST ONLINE SHOP FOR COLLEGE STUDENTS USING THE TOPSIS METHOD

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Abstract— Internet users in Indonesia aged 16 to 64 years who access the internet on mobile phones as many as 195.3 million. In 2015 the number of online shops was 7.4 million people. Convenience and customer service today are key in improving an online shop. The number of online shop applications available for MSME has difficulty in determining the online shop to determine the right online shop in marketing products among students. The TOPSIS method is used as a method for decision-making because it has a simple and easy-to-understand the concept. This study has five criteria, namely product completeness, interface design, service response, delivery services, and transaction processes. And has 5 alternatives namely shopee, tokopedia, bukalapak, lazada and blibli. In this study obtained from the 5 alternatives, the online shop that is most in demand by students is shopee, this can be seen from the pretension value of 0.89.

Keywords: Online shop, TOPSIS, Decision Support System

Abstrak—*Pengguna internet di Indonesia yang berusia 16 hingga 64 tahun yang mengakses internet di telepon genggam sebanyak 195,3 juta. Pada tahu 2015 jumlah online shop sebanyak 7,4 juta orang. Kemudahan dan pelayanan konsumen saat ini merupakan kunci dalam meningkatkan sebuah online shop. Banyaknya aplikasi online shop yang tersedia membuat para UMKM mengalam kesulitan dalam menentukan online shop untuk menentukan online shop yang tepat dalam memasarkan produk dikalangan mahasiswa. Metode TOPSIS digunakan sebagai metode untuk pengambilan keputusan karena memiliki konsep yang sederhana dan mudah dipahami. Pada penelitian ini memiliki lima kriteria yaitu kelengkapan produk, desain interface, respon pelayanan, jasa pengiriman dan proses transaksi. Serta memiliki 5 alternatif yaitu shopee, tokopedia, bukalapak, lazada dan blibli. Pada penelitian ini didapatkan dari 5 alternatif tersebut, online shop yang paling diminati oleh mahasiswa yaitu shopee, hal ini dapat dilihat dari nilai prefensinya sebesar 0.89.*

Kata Kunci*: Online shop, TOPSIS, Sistem Penunjang Keputusan*

INTRODUCTION

A total of 143.26 million Indonesians as internet users. Indonesia is the fifth country as an internet user in Indonesia (Juwita, 2020)At the beginning of 2021 experienced a significant increase with the record of 202.6 million internet users in Indonesia Internet users in Indonesia aged 16 to 64 years who have mobile phones of 98.3 percent, from 98.3 percent recorded as many as 195.3 million who access the internet on their mobile phones (Kompas.com, 2021)

Online shopping is the transaction of selling and purchasing goods or services through online shop media. In 2015 the number of online shops amounted to 7.4 million people (Harahap & Amanah, 2018). Convenience and customer service are currently one of the keys to increasing sales at an online shop. Positive assessments from consumers are considered to have a very large influence on the reputation of an online shop (Dzulhaq, Sidik, & Ulhaq, 2019).

MSMEs are one way to support economic growth in Indonesia. The growth of MSMEs affects other business sectors, namely banking services (Suci, 2017). Micro, small and medium enterprises have an impact on the Indonesian economy and the majority of Indonesian people earn their income from this sector (Ukkas, 2017). MSMEs help in absorbing labor and reducing poverty, in 2019 60%

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of gross domestic product in Indonesia was contributed by MSMEs and MSMEs contributed 14% (Santosa & Budi, 2020).

With the development of technology, MSMEs must also be able to compete and can be easily accessed by the public because consumers are currently conducting online buying and selling transactions, which is a new challenge faced by MSMEs.(Idah & Pinilih, 2020).

The number of online shop applications available, makes MSMEs (Micro and Medium Small Businesses) have difficulty in determining the right online shop in marketing the products they sell. Proper decision-making is needed to make increased sales to an MSME.

The Decision support system is a system used for decision-making in support of management (Amida & Kristiana, 2019)), to support solutions to problems or for one (Mubarok, Suherman, Ramdhani, & Topiq, 2019).

The TOPSIS method is one of the methods for making decisions on multicriteria problems and using alternative principles that have the closest distance from the ideal solution positive and farthest distance and negative ideal solution (Handayani & Wironoto, 2021), TOPSIS has good accuracy (Borman, Megawaty, & Attohiroh, 2020)), TOPSIS has a simple and easy-to-understand the concept (Kristina, 2018).

The TOPSIS method sorts alternatives based on the nearest relative score priority of the alternative to a positive ideal solution. To decide in determining the best solution is viewed from the alternative ranking (Fistiana, Evanita, & Riadi, 2021)

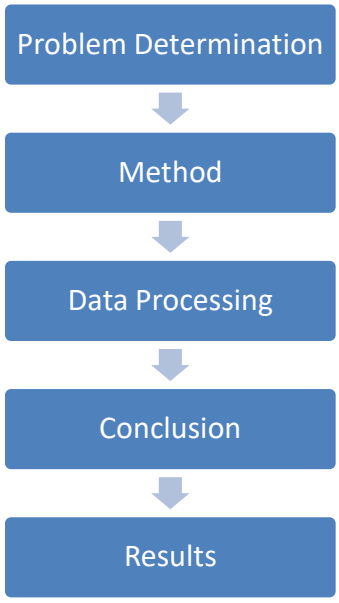
TOPSIS is widely used because it has a simple and easy-to-understand concept and efficient computing and can to measure the performance of alternative decisions in simple mathematical form (Hertyana, 2018). TOPSIS has a good level of accuracy, judging from previous research showing accuracy above 80%(Borman et al., 2020)

Previous research has been done, that the TOPSIS method is more appropriate than the Simple Additive Weighting method in determining the recipient of the reward (Wibisono, Amrulloh, & Ujianto, 2019). The the study entitled the support system for the determination of tourist locations with the TOPSIS method has criteria that are divided into criteria of benefit and cost. The TOPSIS method pays attention to both types of criteria while the AHP method does not pay attention to the type of criteria(P. A. W. Santiary, P. I. Ciptayani, N. G. A. P. H. Saptarini, 2018).

This research aims to make it easier for MSMEs (Micro and Medium Small Businesses) to determine which online shop will be used to market products. The TOPSIS method is used as decision support in helping the decision-making of the best online shop determination among students.

MATERIALS AND METHODS

In this study, several stages can be seen in the picture.



Source: (Marlina & Sari, 2022)
Figure 1 Research Stage

The stages of research are carried out as follows:

1. Problem Determination
   The first step is to determine the problem. The problem studied is about the system supporting the best online shop selection decisions among students. The purpose of this study is to find out which online shops are most in-demand by students.
2. Method
   The method used in this study is using the TOPSIS (Technique For Order Preference by Similarity) method. The TOPSIS method was chosen because it was able to fight against selected alternatives (Kristina, 2018).
3. Data processing
   At this stage, determination of criteria, assessment weights, and online shop alternatives used and conducting questionnaire dissemination to students.
4. Conclusion
   At this stage, you can find out the best online shop from the combined value of each criterion that has the highest value. In this last stage can be conclued from the results of data analysis as advice or proposals for sellers of the needs of students in online shops that are most in-demand by students.
5. Results

At this stage, you can find out the count using the TOPSIS method.

In the TOPSIS method there are several steps in determining the value of pretensions and final results, namely (Priambadha & Mustafidah, 2018):

a. Determine a normalized decision matrix using equation (1)

$$rij = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}, with\ i = 1,2,\dots m;\ and\ j = 1,2,\dots,n \quad \text{..... (1)}$$

where:

$r_{ij} = normalized\ matrix\ [i][j]$

$x_{ij} = decision\ matrix\ [i][j]$

b. Determining a weighted normalized decision matrix can use equation (2) and (3)

$y_{ij=w_i r_{ij}}; dengan\ i = 1,2,\dots,n.$

$A^+ = (y^+1, y^+2, \dots, y^+n);$

$A^- = (y^-, y^-2, \dots, y^-n);$ .....(2)

Where:

$y_{ij} = normalized\ matrix\ weighted[i][j]$

$w_i = vector\ weight\ [i]$

$r_{ij} = normalized\ matrix\ [i][j]$

$y_j^+ = \max y_{ij}\ ; if\ j\ is\ an\ advantage\ attribute$

$= \min y_{ij}\ ; if\ j\ is\ the\ cost\ attribute$

$y_j^- = \min y_{ij}\ ; if\ j\ is\ an\ advantage\ attribute$

$= \max y_{ij}\ ; if\ j\ is\ the\ cost\ attribute$

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

with

$$y_j^+ = \begin{cases} \max y_{ij}\ if\ j\ is\ an\ advantage\ attribute \\ \min y_{ij}\ ; if\ j\ is\ the\ cost\ atribute \end{cases}$$

$$y_j^- = \begin{cases} \min y_{ij}\ ; if\ is\ an\ advantage\ attribute \\ \max y_{ij}\ ; if\ j\ is\ the\ costr\ atribute \end{cases}$$

$j = 1,2,\dots,n$ (3)

c. Determine the positive ideal solution matrix and the negative ideal solution matrix using equation (4) and (5)

The distance between alternative A1 and positive ideal solution is formulated as in the following equation.

$$D_j^+ = \sqrt{\sum_{j=1}^{n}(y_{ij} - y_i^-)}, dengan\ i = 1,2,\dots,n. \quad \text{..... (4)}$$

where:

$D_i^+ = alternative\ distance\ with\ a\ positive\ ideal\ solution$

$y_{ij} = weighted\ normalization\ matrix\ [i][j]$

$y_i^+ = Positive\ ideal\ solution[i]$

The distance between alternative A1 and the negative ideal solution is formulated as in the following equation.

$$D_j^- = \sqrt{\sum_{j=1}^{n}(y_{ij} - y_i^-)}, dengan\ i = 1,2,\dots,n. \quad \text{..... (5)}$$

dimana:

$D_i^- = alternative\ distance\ with\ a\ negative\ ideal\ solution$

$y_{ij} = weighted\ normalization\ matrix\ [i][j]$

$y_i^- = negative\ ideal\ solution[i]$

d. Determine the value of pretensions in each alternative using equattion (6)

$$V_{1=\frac{D_i^-}{D_I^- + D_I^+}, with\ i=1,2,\dots,m} \quad \text{.....(6)}$$

RESULTS AND DISCUSSIONS

In this study, the marketplace was selected using the TOPSIS method. The study data was taken in the results of questionnaires filled out by 59 respondents. As for the following steps:

1. Determine the criteria used as a reference in determining decision-making.
   The table of decision making criteria can be seen in table 1.

Table 1 Decision Making Criteria

Criteria Code	Criteria	Bobot
K1	Product completeness	25%
K2	Interface Design	25%
K3	Service Response	30%
K4	Delivery Services	10%
K5	Transaction Process	10%

Source :(Chaeruddin, Sukarsih, & Respitawulan, 2021)

2. Deteremine Alternatif
   There are alternatives used and can be seen in table 2.

Tabel 2 Alternatif

Alternative Code	Alternative Name
C1	Shopee
C2	Tokopedia
C3	Bukalapak
C4	Lazada
C5	Blibli

Source :(Marlina & Sari, 2022)

Questionnaire results in 59 respondents using the Likert scale, obtained attribute values for each alternative.

3. Determining Numbered Decisions
   At this stage determine the matrix of the numbered decision using the formula (7):

$$R_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} x_y^2}} \quad \text{..... (7)}$$

The alternative ranking of each criterion can be seen in table 3

Table 3. Alternative ranking of each criterioa

	K1	K2	K3	K4	K5
C1	242	230	237	233	244
C2	234	237	237	234	239
C3	203	208	210	216	215
C4	219	224	218	226	224
C5	214	216	217	220	226

Source :(Marlina & Sari, 2022)

The normalized value is obtained from the value of each criterion divided by the value of the divisor. The results of normalized values can be seen in the table of normalized values of R in table 4.

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Table 4 Normalized Value of R

	K1	K2	K3	K4	K5
C1	0,485668	0,46077	0,47301	0,46125	0,47476
C2	0,469613	0,47479	0,47301	0,46323	0,46504
C3	0,407399	0,4167	0,41912	0,4276	0,41834
C4	0,439509	0,44875	0,43509	0,44739	0,43585
C5	0,429475	0,43272	0,43309	0,43551	0,43974

Source: (Marlina & Sari, 2022)

4. Determine the weighted normalization

How to determine weighted normalization is normalized data x weight criteria.

The weights on the criteria are obtained from research that has been done previously. The weight of the criteria can be seen in table 5.

Table 5 Criterion Weight

Criteria	K1	K2	K3	K4	K5
Weight	0.25	0.25	0.3	0.1	0.1

Source: (Marlina & Sari, 2022)

The normalization calculation has been carried out and the normalization is obtained which can be seen in table 6.

Table 6 Normalized

Kriteria	K1	K2	K3	K4	K5
C1	12,14169	11,5193	14,1902	4,61249	4,74764
C2	11,74032	11,8698	14,1902	4,63228	4,65035
C3	10,18497	10,4174	12,5736	4,27595	4,18337
C4	10,98773	11,2188	13,0526	4,47391	4,35849
C5	10,73687	10,8181	12,9927	4,35514	4,3974

Source: (Marlina & Sari, 2022)

5. Determine max and min

The value of each criterion is calculated and the largest and smallest values are determined. The largest and smallest values can be seen in table 7.

Table 7 Max Value and Min

	K1	K2	K3	K4	K5
Max	12,14169	11,8698	14,1902	4,63228	4,74764
Min	10,18497	10,4174	12,5736	4,27595	4,18337

Source: (Marlina & Sari, 2022)

6. Determining the ideal alternative distance positive and negative ideal

From the alternative distance value to the positive ideal solution and the alternative distance value to the negative ideal solution, calculations are carried out to determine the distance between the alternative and the ideal solution. After the calculations have been made, the positive and negative ideal alternative distance values can be seen in table 8.

Table 8 Alternative distances are ideal positive and ideal negative

Alternatif	D+	D-
C1	0,351144423	2,843918385
C2	0,413000515	2,736254039
C3	2,999513075	0
C4	1,796169202	1,259306589
C5	2,170983934	0,832385851

Source: (Marlina & Sari, 2022)

7. Determine the pretension value

The preference value is obtained from the quotient between the alternative distance value and the positive ideal solution by the sum of the alternative distance values with the positive ideal solution and the alternative distance value with the negative ideal solution. The results of the calculations obtained preference values and alternative results which can be seen in table 9.

Table 9 Pretensions and Alternative Outcomes

Alternative	Preference	Ranking
C1	0,890097803	1
C2	0,868857691	2
C3	0	5
C4	0,412147461	3
C5	0,277150638	4

Source : (Marlina & Sari, 2022)

Can be seen in the pretension table and the final results above found that online shop shopee is the most in-demand among students with a pretension value of 0.89, tokopedia in the second rank with a pretension value of 0.87.

CONCLUSION

From the results of research that has been done from 59 samples. To determine the best online shop among students with 5 alternatives, namely shopee, tokopedia, bukalapak, lazada and blibli. After calculating the TOPSIS method, from the five alternatives, the best alternative was Shopee with a preference value of 0.89, for the second alternative was occupied by Tokopedia with a preference value of 0.87. Shopee is considered the most widely used among students.

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