

# Decision Support System for Selection of Online Shopping Applications for MSME Product Marketing Using AHP and TOPSIS Methods

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## Abstract

MSMEs are business actors who support economic growth and create new jobs for the community. Currently, many business actors use online shopping applications to market their products. One of the reasons is because now many buyers are switching to online shopping. There are many types of online shopping applications. However, research needs to be done to choose the right online shopping application to market their products so that they are right on target and can increase sales turnover. The AHP Topsis method is used to assist the decision making process. AHP is used to calculate comparison values and create a hierarchical structure, while topsis helps in the decision-making process based on the criteria and alternatives offered. The results showed that the final preference value was 0.51 for attractive promotions and the number of active users of the application. Then the alternative applications that can be used are the Shopee and Tokopedia shopping applications based on the five alternatives offered.

**Keywords:** AHP TOPSIS, decision support system, online shopping app.

## 1. Introduction

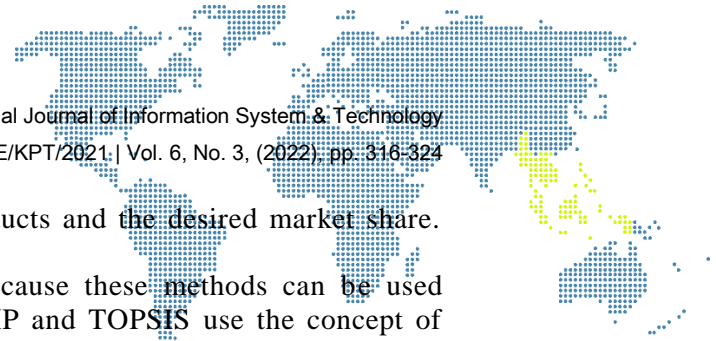
Technological developments have brought about major changes in the socio-economic life of the community, including changes in lifestyle and ways of shopping. People today tend to shop through online shopping applications. One of the contributing factors is the ease of access, free shipping, certain promotions and time efficiency. This is certainly a new opportunity for entrepreneurs in the field of micro, small and medium enterprises to expand their market and increase their sales turnover.

Bank Indonesia recorded the value of e-commerce transactions in Indonesia in February 2022 of 30.8 trillion, an increase of 27 percent compared to the previous year. This is certainly a positive stigma for economic improvement in Indonesia. And in the future, this value is predicted to continue to increase in line with the growth of online application users and the ease of digital payments that participate in increasing online sales.

In 2020, Indonesia recorded 65 million entrepreneurs in the field of small, micro and medium enterprises [1] MSMEs have a major influence on the economy in Indonesia and participate in moving the Indonesian economy to rise and recover from the pandemic [2]. Therefore, good innovation is needed from MSME entrepreneurs so that they can make sales in a better way according to market needs.

For entrepreneurs in the MSME sector, of course this is a good opportunity to be able to use online sales applications as the right marketing media to expand the market and increase income turnover. However, it is necessary to be careful in choosing the right online sales application so that the sales of MSME products are according to the expected target.

Before expanding marketing through online sales applications, further research is needed to select the appropriate application so that it can be used optimally to increase income turnover. The selection of the right online sales application is expected to help MSMEs in determining which applications are appropriate and in



accordance with the characteristics of their products and the desired market share. The study used the AHP TOPSIS method.

The AHP and TOPSIS methods are used because these methods can be used practically for the decision-making process. AHP and TOPSIS use the concept of computational calculations that are simple, easy to understand and complete in solving problems that involve many criteria in the decision-making process. AHP TOPSIS can be used appropriately by offering various alternative criteria in the decision-making process [3].

The AHP method is used to determine the weight of the criteria and the value of each criterion that is owned. Then TOPSIS is used to find the results of the appropriate ranking of the alternatives offered. Research with AHP TOPSIS produces alternative ranking values more objectively and efficiently. The Hamming distance is 96.2% and the Euclidean distance is 0.8096 with a total of 95 student scores [4].

A decision support system is used to help simplify the work and minimize errors that might occur in the decision-making process for new employees. The decision support system is carried out using the AHP-TOPSIS method. The AHP TOPSIS method helps in calculating the weight value of the criteria and provides an assessment of the resulting criteria and then ranks the values according to the alternatives. TOPSI and AHP produce a range of positive and negative ideal solutions and assist in the decision-making process more easily and efficiently [5].

The TOPSIS method used in research on employee performance at the Maja Baru Village government office helps in the process of evaluating employee performance as the basis for the decision-making process. The TOPSIS method helps in determining values and generating employee performance criteria according to alternative solutions [6].

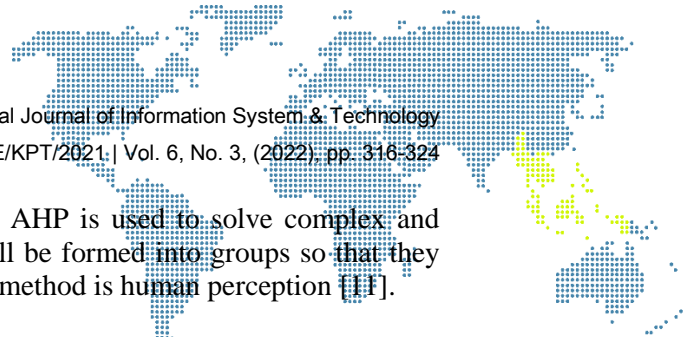
The Analytical Hierarchy Process (AHP) method is used to determine the weight of each criterion, and the Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) method is used to provide alternative rankings for student data cases. The AHP method is used to determine the weight value for each attribute then rank and produce the best selection value. The results of the assessment will be used to determine students to enter the superior class more efficiently according to predetermined criteria [7].

Research on the proper placement of ATM locations using the AHP and TOPSIS methods. This research was conducted to avoid vandalism, card trapping and card skimming in order to avoid mistakes that could result in major waste of money, investment, and time. Based on 76 alternative data for ATM placement locations and what are sought are 38 alternatives that will be used. The assessment is based on the following criteria, namely ATM availability, security, land prices and customer requests. The accuracy of the recommendation results compared to the ATM placement realization data based on the geometric average of the weighting criteria for all decision makers is 84.21% and the error rate is 15.79% [8].

Research using AHP TOPSIS is used to test the decision support system in the acceptance of computer laboratory assistants. The results of the study get 100 percent accuracy and can help the head of the laboratory to have laboratory assistants more objectively and transparently [9]. This research is expected to help MSMEs in determining the decision-making process in choosing online shopping applications to market their products.

## 2. Research Methodology

The research method uses AHP and TOPSIS. AHP and TOPSIS are used because this model is the most appropriate method for solving multi-criteria problems for the decision-making process. TOPSIS is a model used for the decision-making process with a simple process. TOPSIS uses a simple approach by calculating criteria and looking for alternative ideal solutions from the criteria offered [10].



AHP is a method that is functional hierarchical. AHP is used to solve complex and unstructured problems. These complex problems will be formed into groups so that they become a hierarchical model. The main input of this method is human perception [11].

The AHP stages used are:

- a) Identify the problem then create a hierarchical structure of the problem
- b) Compare elements in pairs according to the specified criteria
- c) The pairwise comparison matrix is filled with numbers that describe the relative importance of each element.
- d) Sum the values of each column in the matrix
- e) Find the normalized matrix by dividing each value from the column by the total column.
- f) Add up the values of each row and then divide by the number of elements to get the average value.

The following are the TOPSIS stages, namely:

- a) Normalized Decision Matrix Analysis  
 Creating a normalized decision matrix is a step in the TOPSIS method which requires a performance rating of each alternative  $A_i$  on each normalized  $C_i$  criteria.

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

- b) Normalized Matrix (R)  
 Calculate the normalized matrix ( R) with the following formula:

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \text{ where : } i = 1, 2, \dots, m; \text{ and } j = 1, 2, \dots, n \quad (2)$$

- c) Weighted Normalized Matrix (Y)  
 Calculate the weighted normalized matrix ( Y) with the following formula:

$$y_{ij} = w_i r_{ij}; \text{ with } i = 1, 2, \dots, m; \text{ and } j = 1, 2, \dots, n$$

- d) Matrix of positive and negative ideal solutions  
 Calculating the weighted normalized matrix ( Y) with the following formula:  
 Calculating positive (A+) and negative (A-) ideal solutions with the following formula:

$$A^+ = \max(y_1^+, y_2^+, \dots, y_n^+) \quad (3)$$

$$A^- = \max(y_1^-, y_2^-, \dots, y_n^-) \quad (4)$$

- e) Distance of the Ideal Solution Negative and positive  
 the distance of the ideal negative solution (D-) and the positive ideal solution (+) with the formula, namely:

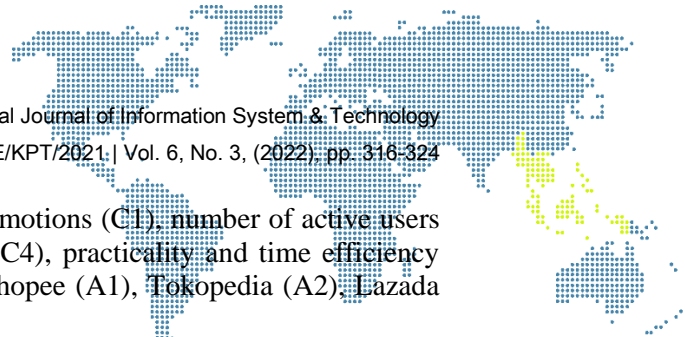
$$D_i^+ = \sqrt{\sum_{j=1}^n (y_i^+ - y_{ij})^2}; \quad i = 1, 2, \dots, m. \quad (5)$$

- f) Final Alternative Preference Value  
 The next step is to find out what the preference value is based on the results of the previous ideal solution. The preference value is searched by the formula, namely:

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}, \text{ where } i = 1, 2, 3, \dots, m \quad (6)$$

### 3. Results And Discussion

The research uses a decision development model using the AHP TOPSIS method. The first step is to determine the criteria in selecting online shopping applications for the purposes of marketing MSME products. This is important to determine which application will be used later.



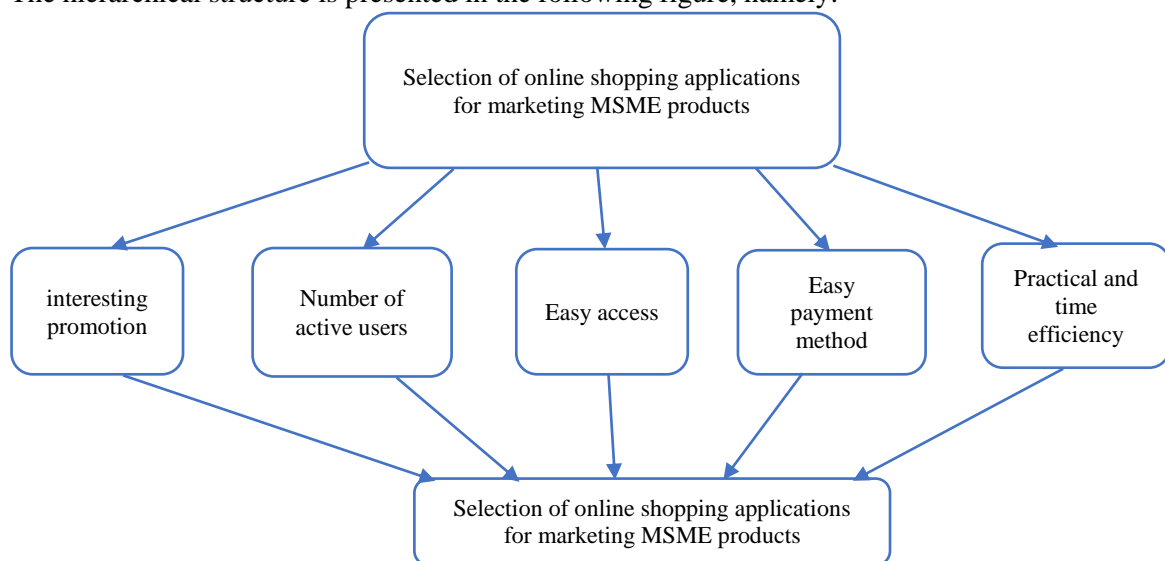
There are five criteria used, namely attractive promotions (C1), number of active users (C2), easy access (C3), ease of payment methods (C4), practicality and time efficiency (C5). Then the alternatives offered are as follows Shopee (A1), Tokopedia (A2), Lazada (A3), blibli (A4), Bukalapak (A5).

To further determine the value of the weight of the criteria with the following scale, namely:

**Table 1. Assessment Criteria**

Answer	Score
Very Good	5
Good	4
Enough	3
Bad	2
Very Bad	2

The next step is to determine the age hierarchy structure with the criteria to be tested. The hierarchical structure is presented in the following figure, namely:

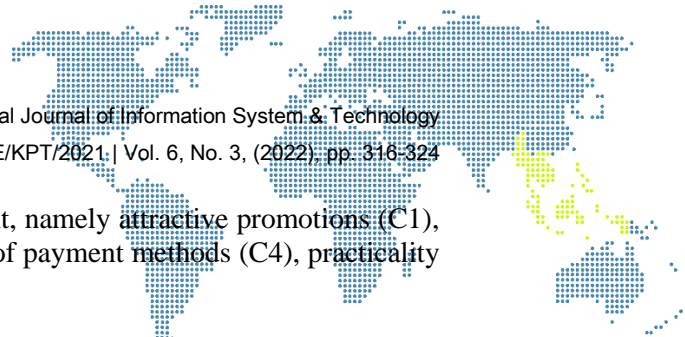


**Figure 1. Hierarchy structure**

After that, comparisons are made based on MSME policies by assessing each element with other elements. Then after the results are obtained, calculate the priority of each criterion, by dividing the contents of the pairwise comparison matrix by the corresponding number of columns, then adding up according to the row. After that, the result of the sum is divided by the number of criteria so that the priority weight is found. Then TOPSIS analysis is done by determining the rating scale is determined based on the weight values that can be seen in the table above. The next step is to determine the normalized decision matrix for each calculated alternative criterion. The results of the assessment are displayed in the following table:

**Table 2. Normalized Decision Matrix**

Criteria	C1	C2	C3	C4	C5
A1	5	4	4	3	4
A2	5	4	4	3	4
A3	4	5	4	5	3
A4	5	4	4	4	3
A5	5	4	4	3	3



Then give an assessment for each criterion weight, namely attractive promotions (C1), number of active users (C2), easy access (C3), ease of payment methods (C4), practicality and time efficiency (C5). Here are the results:

**Table 3. Criteria Weight**

A1	A2	A3	A4	A5
5	5	4	3	4

After knowing the weight of the criteria, then carry out a normalization assessment according to the criteria and alternatives offered by paying attention to the weight of the criteria. Here are the results:

**Table 4. Normalized Value**

Criteria	C1	C2	C3	C4	C5
A1	5	4	4	3	4
A2	5	4	4	3	4
A3	4	5	4	5	3
A4	5	4	4	4	3
A5	5	4	4	3	3
Result	116	89	80	68	59
Score	10.7	9.4	8.9	8.2	7.6

From the table above, the values and results of the normalization calculations are known. Then calculate each alternative according to the criteria A1, A2, A3, A4, and A5. Following are the results of the normalization matrix for alternative C1, namely:

**Table 5. Normalized Matrix C1**

Criteria	C1	Result	Score
A1	5	10.7	0.46
A2	5	10.7	0.46
A3	4	10.7	0.37
A4	5	10.7	0.46
A5	5	10.7	0.46

Following are the results of the normalization matrix for alternative C2, namely:

**Table 6. Normalized Matrix C2**

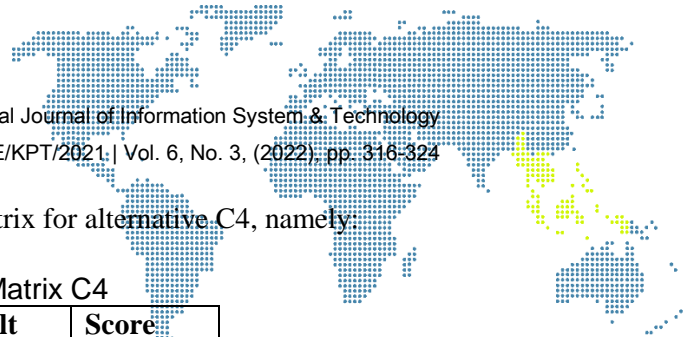
Criteria	C2	Result	Score
A1	4	9.4	0.42
A2	4	9.4	0.42
A3	5	9.4	0.53
A4	4	9.4	0.42
A5	4	9.4	0.42

Following are the results of the normalization matrix for alternative C3, namely:

**Table 7. Normalized Matrix C3**

Criteria	C3	Result	Score
A1	4	8.9	0.44
A2	4	8.9	0.44
A3	4	8.9	0.44
A4	4	8.9	0.44
A5	4	8.9	0.44





Following are the results of the normalization matrix for alternative C4, namely:

**Table 8.** Normalized Matrix C4

Criteria	C4	Result	Score
A1	3	8.2	0.36
A2	3	8.2	0.36
A3	5	8.2	0.60
A4	4	8.2	0.48
A5	3	8.2	0.36

Following are the results of the normalization matrix for alternative C5, namely:

**Table 9.** Normalized Matrix C5

Criteria	C5	Result	Score
A1	4	7.6	0.52
A2	4	7.6	0.52
A3	3	7.6	0.39
A4	3	7.6	0.39
A5	3	7.6	0.39

The following are the results of data normalization for alternatives C1, C2, C3, C4 and C5 according to the criteria A1, A2, A3, A4, A5, namely:

**Table 10.** Data Normalization

Criteria	C1	C2	C3	C4	C5
A1	0.46	0.42	0.44	0.36	0.52
A2	0.46	0.42	0.44	0.36	0.52
A3	0.37	0.53	0.44	0.60	0.39
A4	0.46	0.42	0.44	0.48	0.39
A5	0.46	0.42	0.44	0.36	0.39

The following is a weighted normalized matrix with alternatives C1, C2, C3, C4 and C5 according to the criteria A1, A2, A3, A4, A5, namely:

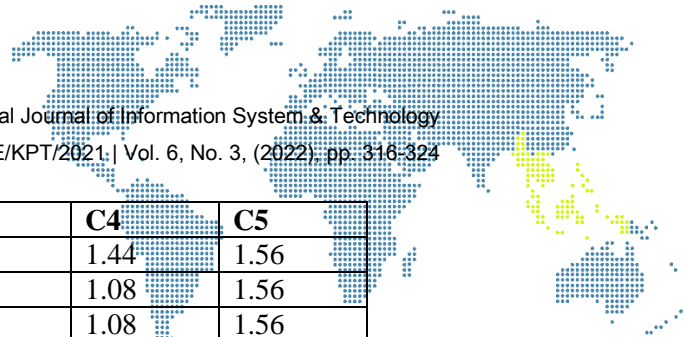
**Table 11.** Weighted Normalization Matrix

Criteria	C1	C2	C3	C4	C5
A1	2.30	2.25	1.76	1.08	2.08
A2	2.30	2.25	1.76	1.08	2.08
A3	1.85	2.65	1.76	1.80	1.56
A4	2.30	2.25	1.76	1.44	1.56
A5	2.30	2.25	1.76	1.08	1.56

In TOPSIS, the most important thing is to know the positive ideal solution matrix (A+) and the negative ideal solution matrix (A-). The following are the results of the calculation of the positive (A+) and negative (A-) ideal solutions, namely:

**Table 12.** Value of Positive and negative Ideal Solution

Criteria	C1	C2	C3	C4	C5
A1	2.30	2.25	1.76	1.08	2.08
A2	2.30	2.25	1.76	1.08	2.08
A3	1.85	2.65	1.76	1.80	1.56



Criteria	C1	C2	C3	C4	C5
A4	2.30	2.25	1.76	1.44	1.56
A5	2.30	2.25	1.76	1.08	1.56
Min	1.85	2.25	1.76	1.08	1.56
Maks	2.30	2.65	1.76	1.80	2.08

After knowing the positive and negative ideal solutions. Then calculate the weighted normalized matrix values for the criteria C1, C2, C3, C4 and C5. The results are as follows:

**Table 13.** Weighted Normalized Matrix Value

Criteria	D+	D-
C1	0.67	0.72
C2	0.67	0.72
C3	0.72	0.67
C4	0.56	0.57
C5	0.94	0.45

After getting the weighted normalization matrix value, then calculate the final preference value to get the expected ideal solution. The following are the results of the preference values according to the criteria C1, C2, C3, C4 and C5.

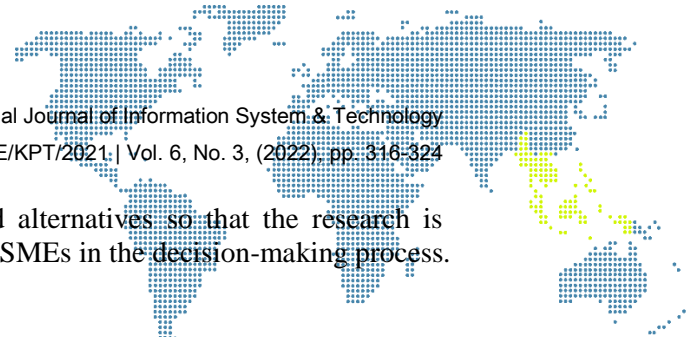
**Table 14.** Final Preference Score Results

Criteria	Formula	Result	Final Score
C1	$(0.72)/(0.72+0.67)$	0.72/1.39	0.51
C2	$(0.72)/(0.72+0.67)$	0.72/1.39	0.51
C3	$(0.67)/(0.67+0.72)$	0.67/1.39	0.48
C4	$(0.57)/(0.57+0.56)$	0.57/1.13	0.50
C5	$(0.45)/(0.45+0.94)$	0.45/1.39	0.32

Based on the final preference value, the decision matrix can be used by MSMEs to help determine the most appropriate online shopping application according to the most ideal solution. To choose the most appropriate MSME based on the AHP TOPSIS calculation, the most ideal consideration should be based on the number of active users and attractive promotions. Based on the alternatives offered from the various alternatives chosen, selling online at Shopee and Tokopedia is the most ideal alternative solution that can be used by MSMEs in marketing their products. This can be considered by MSMEs before deciding to sell using online applications.

#### 4. Conclusion

Research on decision support systems for selecting online shopping applications uses 5 criteria, namely attractive promotions (C1), number of active users (C2), easy access (C3), ease of payment methods (C4), practicality and time efficiency (C5). Then the alternatives offered are as follows Shopee (A1), Tokopedia (A2), Lazada (A3), blibli (A4), Bukalapak (A5). The study used the AHP TOPSIS method. AHP is used to determine complex problems and then group them hierarchically. The hope is that it can be used by MSMEs to determine priorities according to the benefits of each criterion and its alternatives. Then TOPSIS is used for the decision-making process so that it is right on target according to the ideal solution offered. In this case, MSMEs will choose several online shopping applications that will be used as marketing media. Based on the research conducted, the final preference value is 0.51 for attractive promotions and the number of active users of the application. Then the alternative applications that can be used are the Shopee and Tokopedia shopping applications based on the five alternatives offered. Of course,

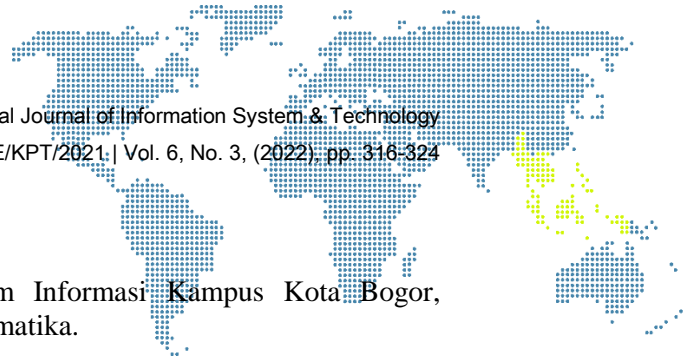


research can be done by adding other criteria and alternatives so that the research is broader. This research can be used as a reference by SMEs in the decision-making process.

## References

- [1] C. setyawan, Dodi Yudo; Rosmalia, Lia; Hikmah, “Pelatihan Pemanfaatan Media Sosial (Whatsapp Dan Marketplace) Untuk Meningkatkan Penjualan Pada Umkm Diva Fruits And Snack,” *Pengabd. Masy. J-Abdi*, vol. 2, no. 2, pp. 4201–4206, 2022.
- [2] D. Teruna and T. Ardiansyah, “Analisis Penjualan Produk Online UMKM melalui Marketplace dan E-Commerce dengan Pendekatan Binary Logistic Regression,” *J. Pendidik. Kewirausahaan*, vol. 10, no. 1, pp. 204–220, 2022, [Online]. Available: <https://journalstkipppgrisitubondo.ac.id/index.php/PKWU/article/view/281>
- [3] A. A. Chamid, “Prioritas Kondisi Rumah,” *J. Simetris*, vol. 7, no. 2, pp. 537–544, 2018.
- [4] D. R. Sari, A. P. Windarto, D. Hartama, and S. Solikhun, “Decision Support System for Thesis Graduation Recommendation Using AHP-TOPSIS Method,” *J. Teknol. dan Sist. Komput.*, vol. 6, no. 1, pp. 1–6, 2018, doi: 10.14710/jtsiskom.6.1.2018.1-6.
- [5] R. Agusli, M. I. Dzulhaq, and F. C. Irawan, “Sistem Pendukung Keputusan Penerimaan Karyawan Menggunakan Metode Ahp-Topsis,” *Acad. J. Comput. Sci. Res.*, vol. 2, no. 2, pp. 35–40, 2020, doi: 10.38101/ajcsr.v2i2.286.
- [6] S. N. Amida and T. Kristiana, “Sistem Pendukung Keputusan Penilaian Kinerja Pegawai Dengan Menggunakan Metode Topsis,” *JSAI (Journal Sci. Appl. Informatics)*, vol. 2, no. 3, pp. 193–201, 2019, doi: 10.36085/jsai.v2i3.415.
- [7] S. Sahadi, M. Ardiansyah, and T. Husain, “Sistem Pendukung Keputusan Pemilihan Siswa/i Kelas Unggulan Menggunakan Metode AHP dan TOPSIS,” *J. Teknol. Sist. Inf.*, vol. 1, no. 2, pp. 153–167, 2020, doi: 10.35957/jtsi.v1i2.513.
- [8] G. S. Mahendra, “Metode Ahp-Topsis Pada Sistem Pendukung Keputusan Penentuan Penempatan Atm,” *JST (Jurnal Sains dan Teknol.)*, vol. 9, no. 2, 2020, doi: 10.23887/jst-undiksha.v9i2.24592.
- [9] T. Mardiana, “Sistem Pendukung Keputusan Penerimaan Asisten Laboratorium Komputer Menggunakan Metode AHP Topsis,” vol. 3, no. 2, pp. 159–166, 2018.
- [10] E. T. Alawiah and D. A. Putri, “Implementasi Metode TOPSIS Pada Penerima Bantuan Sosial Akibat Covid19 di Desa Kota Batu Ciomas Bogor,” *J. Sains Komput. Inform.*, vol. 5, no. 1, pp. 72–82, 2021, [Online]. Available: <https://tunasbangsa.ac.id/ejurnal/index.php/jsakti/article/view/299>
- [11] A. A. C. A. C. Murti, “Kombinasi Metode AHP Dan Topsis Pada Sistem Pendukung Keputusan,” *Pros. SNATIF Fak. Tek. Univ. Muria Kudus*, vol. 4, pp. 115–119, 2017.





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