Journal of Information Systems and Informatics
Vol. 3, No. 1, March 2021 e-ISSN: 2656-4882 p-ISSN: 2656-5935
http://journal-isi.org/index.php/isi Published By DRPM-UBD

University Decission Support System for Promotion Strategy Using Topsis Method

Pradityo Utomo[1], Arief Budiman[2]

[1,2]Informatics Management Departement , Merdeka Madiun University, Madiun, Indonesia
Email: [1]pradityo@unmer-madiun.ac.id, [2]arief@unmer-madiun.ac.id

Abstract

Campus or college is a place of education for people to seek knowledge. One of the essential components of campus sustainability is the existence of students. For this reason, each campus must have the right strategy in carrying out promotions, especially during the Covid-19 Pandemic as it is today. Because in a pandemic like this, many people are inevitably aware of the economy and health. So, the campus must have a strategy where the community continues to respond to the campus's promotions. Among the several promotional strategies to be right on target in this pandemic are conducting webinars, television broadcasts, radio broadcasts, advertisements on social media, placing banners, distributing pamphlets, and distributing campus marches. In carrying out promotions, wherever possible, keep prioritizing health by reducing the risk of covid-19 transmission. The promotion strategy in this pandemic must also pay attention to several factors for its implementation including available costs, human resources involved, the location of the activity implementation, the number of activities, and the risks associated with covid-19. From several promotional strategies and factors that support the smooth running of activities, a decision support system can be made that can help determine the campus promotion strategy. Decision Support Systems made using the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method approach.Furthermore, the developing of decision support systems using the waterfall system development method. Based on the results and discussion of this study, it concluded that the TOPSIS method could be used to determine campus promotion strategies during the Covid-19 pandemic by building a decision support system. The results of determining the promotion strategy with a decision support system obtained the greatest value lies in V4, which means that the strategy for using social media is the most suitable for campus promotion during the Covid-19 pandemic.

Keywords: Determination of Campus Promotion Strategy, System, Decision Support, TOPSIS Method

1. INTRODUCTION

The campus is higher education followed after the Senior High School level either Senior High School or Vocational High School. Some important points for implementing campus or college education include the presence of lecturers

and students. In attracting prospective students, the campus uses several promotional strategies, including installing banners and distributing pamphlets. But some of these activities are considered ineffective, especially in the Covid-19 Pandemic because it assumed that not many people leave the house in this pandemic. Some promotional strategies that may be implemented include conducting webinars, conducting television broadcasts, conducting radio broadcasts, utilizing social media, and distributing campus marches that can realize in the form of health equipment.

In determining the campus promotion strategy for the Covid-19 pandemic, especially the Merdeka Madiun University (UNMER Madiun) there has been a debate. Because several factors make promotions not on target in this pandemic, so that in this study a system will be made by applying the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method to support the decision to determine the campus promotion strategy. For alternative data used are various strategies that may be implemented in campus promotion, including webinars, television broadcasts, radio broadcasts, social media, placing banners, and distributing pamphlets. As for the data, the criteria used include costs, human resources involved, the location of the activity implementation, the number of activities carried out, the risk of contracting covid-19. To develop a decision support system using the TOPSIS method are using the waterfall system development method. So it is hoped that this decision support system can help the campus, especially UNMER Madiun, in carrying out campus promotions appropriately.

A technique for Other Preference of Similarity to Ideal Solution (TOPSIS) is a multi-criteria decision-making system (Multi-Attribute Decision Making) or MADM which Yoon and Hwang first introduced in 1981[1]. The basic concept of the TOPSIS method is that the chosen alternative must have the closest distance from the positive ideal solution and have the farthest distance from the negative ideal solution from a geometric point of view by using the Euclidean distance (distance between two points) to determine the relative proximity of an alternative. The stages in decision making using TOPSIS are [2] :

1. Creating a decision matrix that has normalized.
2. Creating a weighted normalized decision matrix.
3. Determine the ideal solution matrix positive and perfect solution negative matrix.
4. Determine the distance between each alternative's value with the ideal solution matrix of positive and negative solutions.
5. Determine the preference value for each alternative value.

Muzakkir[3] also uses the Topsis method in his research, and this method used for decision-making on determining the issue of low-income families who have the right to receive assistance. in these studies, the decision support system can

provide good results maximally in terms of decision making by ranking community alternativesthe poor start from the poorest.Renaldo[4] also applies this method to his research entitled Topsis Method In Decision Support System. Determination Of Scholarship Acceptance At Pringsewu Stmik. in this research method Topsis in Decision Support Systems The determination of scholarships at STMIK Pringsewu can be applied to help and determine scholarship acceptance at STMIK Pringsewu.Topsis can also be used to determine the point of a location, as indicated by Santiary[5]. The researcher applies the topsis method to determine tourist location points in the city of Bali. The study was conducted using 17 tourist destinations and three criteria. The weight of the criteria is obtained by processing the user's input values based on their importance. Price criteria are criteria that are costs while facilities and star are benefits. The fuzzification process is carried out on the price criteria, where the price data received is in the form of numbers, while the actual price data is in the form of a taste (fuzzy) value.Likewise, as was done by Kristiana in her research [6].

Not only for decision support, but the Topsis method can also be used for the application of expert systems, as was done by Setiawan et al[7]., namely an expert system used to diagnose zalacca plant diseases.In other research in the health sector, this method is also used to diagnose dengue fever. where the knowledge data obtained is based on calculations on the variable comparison of symptoms of the disease called criteria with several conditions (alternatives) which several experts carry out in their fields by processing the data by the distributed questionnaire data[8].Hartono and Kasma also implemented the topsis method for disease diagnosis[9], besides that, Suyono and Carnovia have also succeeded in applying this method to diagnose diseases in cocoa plants [10].

2. METHODS

This research using Waterfall methodology. The method starts with data collection, making systems with the waterfall method, system evaluation. The explanation of each stage is as follows:

A. Data Collection

Secondary data will be collected in the data collection stage, especially the data used for system criteria data. The data criteria we collect in this research was :

a. Cost
b. Human Resources
c. Activity Location
d. Number of Activities
e. Risk of Covid-19

And for the alternative data for this research was :

a. Webinars
b. Television Broadcast

c. Radio Broadcast
d. Social Media Utilization
e. Banner Installation
f. Distribution of flyers

B. Making the Waterfall Method System

Making the system using a waterfall method has several stages, including:

a. Requirement Definition, which defines the system requirements such as data requirements, system functional requirements, and system non-functional requirements.
b. System and Software Design, the stages of designing a decision support system for determining campus promotion strategies using the TOPSIS method. And using UML as Use Case Diagrams and Activity Diagrams.
c. Implementation and Unit Testing, which is the stage where the decision support system determines the campus promotion strategy using the TOPSIS method implemented using the Delphi programming language and MySQL database.
d. Integration and System Testing, testing the decision support system for determining the campus promotion strategy using the TOPSIS method by Testing method like blackbox.
e. Operation and Maintenance, implementing and managing a decision support system for determining a campus promotion strategy using the TOPSIS method.

C. System Evaluation. This evaluation stage is carried out after completing the system development method's final steps to see the system's success.

3. RESULTS AND DISCUSSION

Fist we define the entity that involve in this system, and there is 4 prior entity shown in figure 1 below :

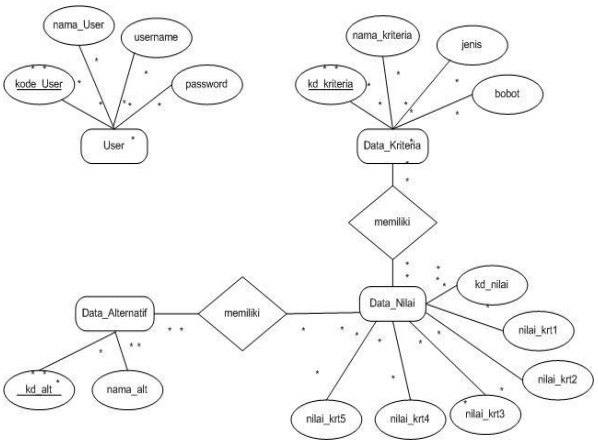

Figure 1. Entity Relationship Diagram

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

In Figure 1, ERD shows where the user entity has user_code, user_name, username, and password. The data_criteria entity has attributes including kd_criteria, name_criteria, type, and weight. At the same time, the data_alternative entity has attributes kd_alt and nama_alt. To unify alternatives and criteria, there is an entity that has attributes, including kd_value, krt_value, krt_value, krt_value, krt_value, and krt5_value.
Then, after all the design steps have been completed, the application implementation stage is continued. Finally, the application can be accessed after the user has logged in first, as shown in Figure 2.

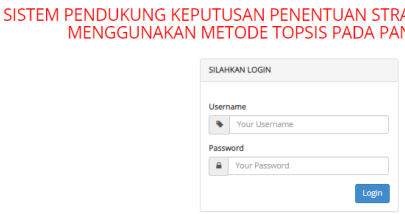

Figure 2. Login Page

After the user has successfully logged in, the next step is to enter the configuration of the criteria table settings. Where each of these criteria is given a weighting on a scale of 1 to 5 as follows:

Tabel 1. Criteria Table

Code	NameCriteria	Type	Weight Value	Description
K1	Cost	Cost	5	Very High
K2	Human Resources	Cost	4	High
K3	Activity Location	Benefit	3	Sufficient
K4	Number ofActivites	Benefit	4	High
K5	Risk of Covid-19	Cost	5	Very High

Description :
5 = very high
4 = height
3 = enough
2 = low
1 = very low

Configuration can be entered into the application as shown in Figure 3 below:

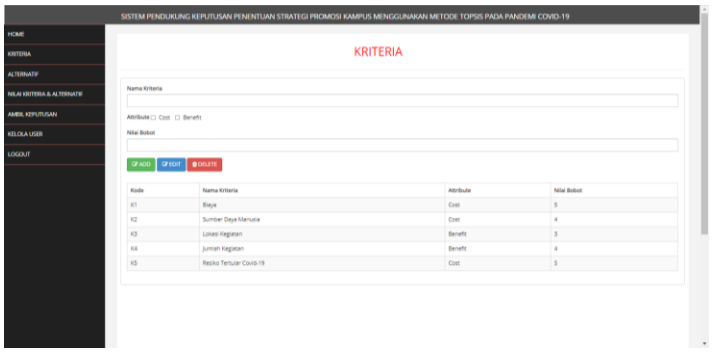

Figure 4. Criteria Page

The next step is to enter the criteria and alternative value data, as shown in Table 2 below:

Table 2. Criteria Value and Alternative

Nilai	K1	K2	K3	K4	K5
A1	10000000.00	4	1	10	2
A2	27000000.00	9	2	4	4
A3	18000000.00	3	2	7	2
A4	9000000.00	2	5	30	2
A5	69000000.00	5	26	26	4
A6	7500000.00	10	26	20	3

A1 is Webinar, A2 Television Broadcast, A3 Radio Broadcast, A4 Social Media Utilization, A5 Banner Installation, and A6 Pamphlet Distribution.Then the data is entered into the system as shown in Figure 5 below:

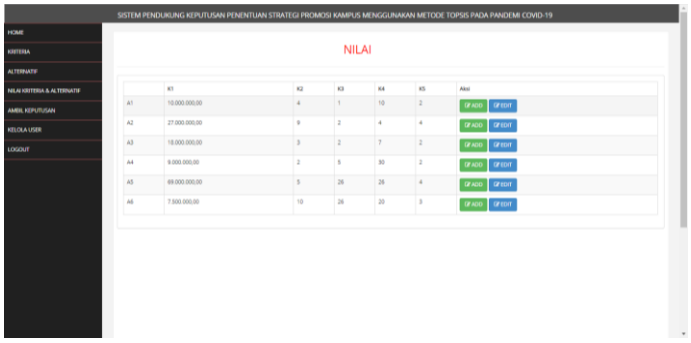

Figure 5. Criteria Value and Alternative

p-ISSN: 2656-5935 http://journal-isi.org/index.php/isi e-ISSN: 2656-4882

The system automatically performs calculations and performs rankings to provide decision recommendations. The first calculation stage is the normalization of R with the equation 1 below :

$$\mathbf{Rij} = \frac{x^{ij}}{\sqrt{\sum_{i=1}^{m} x^2\ ^{ij}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

With formula 2.1, the calculation carries out the value of each alternative to the criteria2, criteria3, criteria4, and criteria5 columns. So that the value of the normalized matrix R is obtained as follows.

$$R = \begin{bmatrix} 0.129 & 0.26 & 0.03 & 0.22 & 0.27 \\ 0.347 & 0.59 & 0.05 & 0.09 & 0.55 \\ 0.231 & 0.20 & 0.05 & 0.15 & 0.27 \\ 0.116 & 0.13 & 0.13 & 0.65 & 0.27 \\ 0.887 & 0.33 & 0.70 & 0.56 & 0.55 \\ 0.096 & 0.65 & 0.70 & 0.43 & 0.41 \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

After the normalization of R, the weighted normalization of Y is carried out using the equation3.

Yij = wj rij with i = 1,2,3,…, m; and j = 1,2,3,…., n. ……..……..………….. (3)

Y calculation uses preference weights which can be seen in Table 1. The following is a Y weighted normalization calculation.

$$Y_{11} = 0.129 * 5 = 0.64$$
$$Y_{21} = 0.347 * 5 = 1.74$$
$$Y_{31} = 0.231 * 5 = 1.16$$
$$Y_{41} = 0.116 * 5 = 0.58$$
$$Y_{51} = 0.887 * 5 = 4.44$$
$$Y_{61} = 0.096 * 5 = 0.48$$

With equation 3, the calculation is carried out on the value of each alternative to the criteria2, criteria3, criteria4, and criteria5 columns. So that the value of the Y normalized matrix is obtained as follows.

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$$Y = \begin{bmatrix} 0.64 & 1.04 & 0.08058 & 0.86447 & 1.37361 \\ 1.74 & 2.35 & 0.16116 & 0.34579 & 2.74721 \\ 1.16 & 0.78 & 0.16116 & 0.60513 & 1.37361 \\ 0.58 & 0.52 & 0.40291 & 2.59342 & 1.37361 \\ 4.44 & 1.30 & 2.09514 & 2.24763 & 2.74721 \\ 0.48 & 2.61 & 2.09514 & 1.72895 & 2.06041 \end{bmatrix} \quad \text{.....(4)}$$

From the results of the Y normalized matrix calculation, then calculate the positive ideal solution and negative ideal solution with the equation 5.

A = {(min vij | j € J), (max vij | j € J'), I = 1,2,3,….., m}
= {v1 , v2 , v3 , …. v-n …….. (5)

The result of calculating the positive ideal solution :

$A_{1+} = 0.48$

$A_{2+} = 0.52$

$A_{3+} = 2.0951$

$A_{4+} = 2.5934$

$A_{5+} = 1.37361$

The result of calculating negative ideal solution :

$A_{1-} = 4.44$

$A_{2-} = 2.61$

$A_{3-} = 0.08058$

$A_{4-} = 0.34579$

$A_{5-} = 2.7472$

Before insert into the calculation of V, calculate Di+ and Di- by calculating the distence first.

$$D_{1+} = \sqrt{(0.48-0.64)^2 + (0.52-1.04)^2 + ... + (1.37361-1.37361)^2} = 2.7103$$

$$D_{2+} = \sqrt{(0.48-1.74)^2 + (0.52-2.35)^2 + ... + (1.37361-2.74721)^2} = 3.9479$$

$$D_{3+} = \sqrt{(0.48-1.16)^2 + (0.52-0.78)^2 + ... + (1.37361-1.37361)^2} = 2.8666$$

$$D_{4+} = \sqrt{(0.48-0.58)^2 + (0.52-0.52)^2 + ... + (1.37361-1.37361)^2} = 1.6950$$

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$$D_{5+} = \sqrt{(0.48-4.44)^2 + (0.52-1.30)^2 + ... + (1.37361-274721)^2} = 4.2714$$

$$D_{6+} = \sqrt{(0.48-0.48)^2 + (0.52-2.61)^2 + ... + (1.37361-2.06041)^2} = 2.3615$$

$$D_{1-} = \sqrt{(0.44-0.64)^2 + (2.61-1.04)^2 + ... + (2.7472-1.37361)^2} = 4.3575$$

$$D_{2-} = \sqrt{(0.44-1.74)^2 + (2.61-2.35)^2 + ... + (2.7472-2.7472)^2} = 2.7134$$

$$D_{3-} = \sqrt{(0.44-1.16)^2 + (2.61-0.78)^2 + ... + (2.7472-1.37361)^2} = 4.0053$$

$$D_{4-} = \sqrt{(0.44-0.58)^2 + (2.61-0.52)^2 + ... + (2.7472-1.37361)^2} = 5.1257$$

$$D_{5-} = \sqrt{(0.44-4.44)^2 + (2.61-1.30)^2 + ... + (2.7472-2.7472)^2} = 3.0623$$

$$D_{6-} = \sqrt{(0.44-4.48)^2 + (2.61-2.61)^2 + ... + (2.7472-2.06041)^2} = 4.6978$$

Then calculated the value of V with the equation 6.

$$V = \frac{D_{i-}}{D_{i-} + D_{i+}} \text{ , i = 1,2,3,… m} \quad \text{..... (6)}$$

$$V_1 = \frac{4.3575}{4.3575+2.7103} = 0.6165$$

$$V_2 = \frac{2.7134}{2.7134+3.9479} = 0.4073$$

$$V_3 = \frac{4.0053}{4.0053+2.8666} = 0.5829$$

$$V_4 = \frac{5.1257}{5.1257+1.6950} = 0.7515$$

$$V_5 = \frac{3.0623}{3.0623+4.2714} = 0.4176$$

$$V_6 = \frac{4.6978}{4.6978+2.3615} = 0.6655$$

Based on the ranking obtained from the calculation of V, the results obtained in the first order are V4 which indicates Social Media Utilization, second is V6 which means Pamphlet Distribution, third is V1 which indicates Webinars, fourth V3 indicates Radio Broadcast, the fifth is V5 indicates Banner Installation, and sixth is V2 show Television Broadcast.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

4. CONCLUSION

Based on the results and discussion of this study, it concluded that the TOPSIS method could be used to determine campus promotion strategies during the Covid-19 pandemic by building a decision support system. The results of determining the promotion strategy with a decision support system obtained V1 of 0.6165, V2 of 0.4073, V3 of 0.5829, V4 of 0.7515, V5 of 0.4176, and V6 of 0.6655. According to these results, the greatest value lies in V4, which means that the strategy for using social media is the most suitable for campus promotion during the Covid-19 pandemic.

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