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Determining Promotion Priority Using TOPSIS on Trilogi University

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Abstract

Promotion is one way to achieve sales targets, private universities are also inseparable from the need for promotions to increase the number of student admissions so it is necessary to carry out various strategies to achieve the targets that have been set so that the promotions carried out by Trilogy University are right on target, a target analysis is needed. In this study, the TOPSIS method was used to rank schools that would be the target of promotion in the hope that promotional activities would be right on target and could increase the income of the number of new students. The results showed that the TOPSIS method was able to rank the target schools to be visited, from the ranking results showed that the number of applicants, the distance from school to university and the status of the school in collaboration with the education office had no significant effect on the ranking results.

Keywords: TOPSIS, University Trilogi Promotion, Decision Support System.

1. INTRODUCTION

One way to increase sales targets is to carry out promotions, promotional activities are an important part of the business world [1], so it is necessary to do a marketing strategy to get customers [2]. In the digital area, technology is very effective as a promotional medium for disseminating information [3], and everyone can easily connect to the internet to access information [4].

Universities are also inseparable from the need for promotion to increase the number of students. In promotion to prospective students, campuses generally use several promotional strategies [5], Based on the number of registrants from year to year, the most popular major is the Department of Management. It is proven that the highest number of students for the last 3 years are Management majors. Of the 12 study programs at Trilogy University, there is capacity for new student admissions every year. Determination of capacity for regular classes is determined based on the number of classes and the number of lecturers available in each study program. The maximum capacity for the regular class itself is 2250

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which is the total of all study programs in the regular class. This is a reference or target for Trilogy University in opening new student admissions.

To meet the capacity target each year, Trilogy University conducts several campus promotion programs which are carried out from November to August. These campus promotion programs are the responsibility of the Trilogy University Marketing and Admissions Directorate. Several campus promotion programs carried out by the Directorate of Admissions and Marketing at Trilogy University are establishing inter-school partners, Campus Expo, Education fair, Seminars, Workshops, and Counseling Guidance Teachers Consultation (MGBK) Expo.

The promotion was carried out by presenting an introduction to Trilogy University campus life to all high school students visited. In addition, attractive offers for schools that are partners of Trilogy University are also made, including the Get Student program offer for Guidance Counseling teachers, free forms, and scholarships. In implementing the promotion of high school, the Directorate of Admissions and Marketing divides the priorities of the schools to be visited into several priority groups. This priority group is divided into Ring 1, Ring 2, Ring 3, and so on. Schools that are included in the Ring 1 priority group will of course get an earlier schedule of visits and benefits as partners between schools.

One of the quality targets of the Directorate of Admissions and Marketing at Trilogy University is to obtain registrants exceeding the specified capacity of 2250 students. Therefore, the Directorate of Admissions and Marketing of Trilogy University makes various efforts so that Trilogy University registrants increase every year to meet the available capacity. This aims to maintain the position of the university and is also related to the implementation of accreditation. The large number of applicants is also expected so that the University gets a better selection of students. In the last 5 years, the number of new student registrants at Trilogy University has increased and decreased erratically. This can be seen from the high number of registrants in 2015 which was 674 and 2016 was 710, and decreased significantly from 2017 which was 417 to the lowest number of registrants in 2019 of 200. In 2020 Trilogy University experienced a drastic increase in the number of registrants of 494. compared to the previous year 2019. Although there was an increase in 2020, the capacity of the lecture benches provided was still not fully fulfilled.

Therefore, campus promotion activities are very important to attract high school students to continue their education at Trilogy University. With campus promotion activities that are carried out every year, information about Trilogy University can be conveyed evenly. The implementation of this promotion of course requires no small amount of cost and human resources. As a result, not all senior high schools located in Jakarta, Bogor, Tangerang, Bekasi (Jabodetabek) can be visited by the Liaison Officer Team in the period from November to August.

For this reason, it is necessary to conduct an analysis to determine the priority of the schools to be visited. In this study, the analysis was carried out using the TOPSIS method which has the ability to have alternative decisions in the form of simple mathematical calculations [6], the TOPSIS method is one of the methods used in multi-criteria decision support systems [7] and plays a role in determining alternative rankings [8].

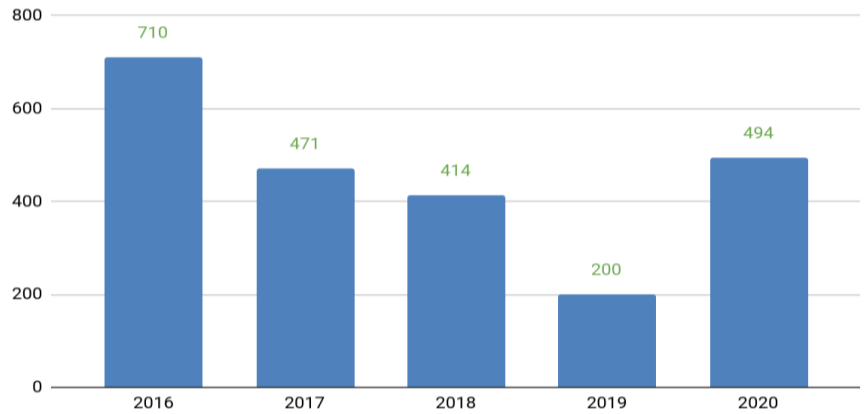

Figure 1. Number of registrants for Trilogy University 2016 to 2020.

2. METHODS

TOPSIS is a decision-making method that uses the principle that the chosen alternative must have the closest distance from the ideal solution and the longest (farthest) distance from the negative ideal solution from a geometric point of view by using the Euclidean distance [9],[10],[11]. The TOPSIS method was first proposed by Hwang and Yoon [12]. This method is the technique most often used to solve Multi Criteria Decision Making problems [13],[14],[15].

The TOPSIS method has a five-step calculation process [16]. The stages of calculating the normalized matrix, making a weighted normalized decision matrix, determining the positive ideal solution and the negative ideal solution, calculating the distance to the positive ideal solution and the negative ideal solution, and calculating the ideal preference value [17]. The five steps are described below.

1. Calculating the normalized matrix
   The value of each alternative against different criteria is normalized in order to be able to compare the size of several different units. The following are normalization methods that can be used:
   a. Distributive normalization

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$r_{ia} = \frac{x_{ia}}{\sqrt{\sum_{a=1}^{n} x_{ia}^2}}, for\ a = 1,2,3,\ldots n\ and\ i = 1,2,3,\ldots m$

Distributive normalization requires that each value be divided by the square root of the sum of each square element in the column.

b. Ideal normalization

$r_{ia} = \frac{x_{ai}}{u_a^+}, for\ a = 1,2,3,\ldots n\ and\ i = 1,2,3,\ldots m$

where $u_a^+ = max(x_{ai})$

$r_{ia} = \frac{x_{ai}}{u_a^-}, for\ a = 1,2,3,\ldots n\ and\ i = 1,2,3,\ldots m$

where $u_a^- = min(x_{ai})$

2. Calculating a weighted normalized matrix

A weighted normalized decision matrix is created by multiplying the normalized decision value by the weight of each criterion:

$v_{ai} = w_{ai} \cdot r_{ai}$

3. Determine the positive ideal solution and negative ideal solution

The positive ideal solution is determined by:

$A^+ = (v_1^+, v_2^+, \ldots, v_m^+)$

negative ideal solution,

$A^- = (v_1^-, v_2^-, \ldots, v_m^-)$

where $v_i^+ = max_{ai}(v_{ai})$ the maximum value of the criteria *i* dan $v_i^- = min_{ai}(v_{ai})$ minimum value of criteria *i*.

4. Calculate the distance between the positive ideal solution and the negative ideal solution

The distance to the positive ideal solution is,

$d_a^+ = \sqrt{\sum_i^n (v_i^+ - v_{ia})^2},\ a = 1,\ldots,m.$

and the distance to the negative ideal solution,

$d_a^- = \sqrt{\sum_i^n (v_{ia} - v_i^-)^2},\ a = 1,\ldots,m.$

5. Calculating the ideal preference value for each alternative.

$V_a = \frac{d_a^-}{d_a^- + d_a^+}$

The ideal preference value is always between 0 and 1, where 1 is the preferred action. If an action is closer to a positive ideal than a negative ideal, then V_a is close to 1, whereas if an action is closer to a negative ideal than to a positive ideal, then Va is closer to 0. The result of the preference value of each alternative that has the closest distance to the positive ideal is then be a priority decision.

3. RESULTS AND DISCUSSION

3.1 Determining Alternatives and Criteria

Determination of alternatives and criteria used are based on case studies at Trilogy University. The following is an alternative high school (SMA) to be visited and the criteria used to assess each alternative.

1. Criteria

There are 4 criteria with the weight values specified in table 1.

Table 1. Criteria

Criteria Code	Criteria	Weight
K1	Cooperation Status with University	0.4
K2	Location	0.3
K3	Number of registrants last year	0.2
K4	Status of cooperation with the education office (schools participating in MGBK)	0.1

Each criteria has a value as shown in table 1, table 2, table 3, table 4 and table 5.

Table 2. Status of Cooperation with Universities (K1)

Criteria	Score
Already collaborated	2
Haven't collaborated yet	1

Table 3. Location (distance to university) (K2)

Criteria	Score
Cluster 1 (< 10 km)	3
Cluster 2 (10 - 20 km)	2
Cluster 3 (> 20 km)	1

Table 4. Number of registrants in the previous year (K3)

Criteria	Score
> 30	4
21 - 30	3
11 - 20	2
< 11	1

Table 5. Status of cooperation with the education office (schools participating in MGBK) (K4)

Criteria	Score
Already working together (following MGBK)	2
Not working together (not participating in MGBK)	1

2. Alternative

There are 10 alternative samples used. Alternative data were taken from the Trilogy University PMB Mapping Data 2016 to 2020. The alternative values for the criteria were taken from Trilogy University PMB Mapping Data 2016 to 2020 for K1 and K4 and school.data.kemdikbud.go.id for K2 and K3.

Table 6. Alternative sample

Alternative Code	Alternative
A1	SMKN 8 Jakarta
A2	SMAN Budhi Warman 2
A3	SMA Suluh Jakarta
A4	SMK Muhammadiyah 7
A5	SMK Islam YPIK
A6	SMAN 99 Jakarta
A7	SMK Taruna Terpadu 1
A8	SMAN 8 Bogor
A9	SMAN 1 Bojong Gede
A10	SMK Manunggal Cibinong

3.2 Making a decision matrix

After determining the criteria and alternative high schools to be visited, an assessment of each alternative is carried out against the criteria. Criterion 1 data describing the status of SMA cooperation with Trilogy University and criteria 4 describing the number of registrants in the previous year (2020) were taken from the 2015 to 2020 PMB Registration Data Mapping documentation for Admissions and Marketing. Data on criteria for 2 high school locations, criteria 3 for the number of students, and criteria for school accreditation 5 were obtained from school profiles based on school.data.kemdikbud.go.id. After that the alternative analysis data against the criteria is described in Table 7.

.

Table 7. Alternative table against criteria.

	K1	K2	K3	K4
A1	Already collaborated	Cluster 1 (< 10 km)	33	Already working together (following MGBK)

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	K1	K2	K3	K4
A2	Haven't collaborated yet	Cluster 2 (10 - 20 km)	2	Already working together (following MGBK)
A3	Haven't collaborated yet	Cluster 1 (< 10 km)	5	Not working together (following MGBK)
A4	Already collaborated	Cluster 1 (< 10 km)	2	Not working together (following MGBK)
A5	Already collaborated	Cluster 2 (10 - 20 km)	0	Not working together (following MGBK)
A6	Haven't collaborated yet	Cluster 2 (10 - 20 km)	1	Already working together (following MGBK)
A7	Haven't collaborated yet	Cluster 3 (> 20 km)	1	Already working together (following MGBK)
A8	Already collaborated	Cluster 3 (> 20 km)	0	Not working together (following MGBK)
A9	Already collaborated	Cluster 3 (> 20 km)	1	Not working together (following MGBK)
A10	Haven't collaborated yet	Cluster 3 (> 20 km)	0	Not working together (following MGBK)

Table 8. Alternative values against the criteria.

	K1	K2	K3	K4
A1	2	3	4	2
A2	1	2	1	2
A3	1	3	1	1
A4	2	3	1	1
A5	2	2	1	1
A6	1	2	1	2
A7	1	1	1	2
A8	2	1	1	1
A9	2	1	1	1
A10	1	1	1	1

3.3 Normalized decision matrix

After the decision matrix is made, Table 9 is a normalized decision matrix whose function is to reduce the data range.

Table 9. Normalized decision matrix

0.4	0.4575	0.8	0.4264
0.2	0.305	0.2	0.4264
0.2	0.4575	0.2	0.2132
0.4	0.4575	0.2	0.2132
0.4	0.305	0.2	0.2132
0.2	0.305	0.2	0.4264
0.2	0.1525	0.2	0.4264
0.4	0.1525	0.2	0.2132
0.4	0.1525	0.2	0.2132
0.2	0.1525	0.2	0.2132

3.4 Weighted normalized decision matrix

A weighted normalized decision matrix is created by multiplying the normalized decision value by the weight of each criteria:

$$v_{ia} = w_i \cdot r_{ia}$$

Table 10. Weighted normalized decision matrix

0.16	0.1373	0.16	0.0426
0.08	0.0915	0.04	0.0426
0.08	0.1373	0.04	0.0213
0.16	0.1373	0.04	0.0213
0.16	0.0915	0.04	0.0213
0.08	0.0915	0.04	0.0426
0.08	0.0458	0.04	0.0426
0.16	0.0458	0.04	0.0213
0.16	0.0458	0.04	0.0213
0.08	0.0458	0.04	0.0213

3.5 Matrix of negative ideal solution and positive ideal solution

Positive ideal solutions and negative ideal solutions can be calculated based on the weighted normalization values, table 11 is the result of calculating positive and negative ideal solutions.

Table 11. Negative and positive ideal solutions

A+	0.16	0.1373	0.16	0.0426
A-	0.08	0.0458	0.04	0.0213

3.6 Determine the ideal solution distance

The Ideal Solution Distance is the Euclidean distance between the alternative values and the ideal solution values for each criterion. The positive ideal solution distance (D+) is the Euclidean distance between the alternative values and the positive ideal solution values for each criterion, while the negative ideal solution distance (D-) is the Euclidean distance between the alternative values and the negative ideal solution values for each criteria.

Table 12. The distance of alternative values to the positive and negative ideal solutions.

d_1^+	0	d_1^-	0.1721
d_2^+	0.1513	d_2^-	0.0504
d_3^+	0.1458	d_3^-	0.0915
d_4^+	0.1219	d_4^-	0.1215
d_5^+	0.1302	d_5^-	0.0921
d_6^+	0.1513	d_6^-	0.0504
d_7^+	0.1708	d_7^-	0.08
d_8^+	0.1524	d_8^-	0.08
d_9^+	0.1524	d_9^-	0.08
d_{10}^+	0.1721	d_{10}^-	0

3.7 Determine the preference value of each alternative

The preference value for each alternative is the final result of the TOPSIS method calculation, the higher the value, the alternative is the main alternative

Table 13. Alternative preferences based on ranking.

	Alternative	**Preference Value**	**Ranking**
V1	SMKN 8 Jakarta	1	1
V4	SMK Muhammadiyah 7	0.4992	2
V5	SMK Islam YPIK	0.4143	3
V3	SMA Suluh Jakarta	0.3856	4
V8	SMAN 8 Bogor	0.3442	5

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	Alternative	Preference Value	Ranking
V9	SMAN 1 Bojong Gede	0.3442	6
V7	SMK Taruna Terpadu 1	0.319	7
V2	SMAN Budhi Warman 2	0.2499	5
V6	SMAN 99 Jakarta	0.2499	9
V10	SMK Manunggal Cibinong	0	10

6. CONCLUSION

Based on the ranking results, it was found that the number of registrants last year, the distance from school to Trilogy University, the status of cooperation with the education office (MGBK participating schools) were not determinants of the ranking order generated by the TOPSIS method, the ranking results showed that alternative 5 did not have the number of applicants. in the previous year being able to rank 3 from the existing priority order, the results of the alternative priority schools to be visited need to be analyzed further based on the number of new student admissions obtained in the following year, so that the level of accuracy of the ranking generated by the TOPSIS method will be seen.

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