Implementation of topsis method for decision support of department at SMKN 4 Surabaya

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ABSTRACT

Vocation high school has many skill programs. The skill program implemented at the Vocational High School adapts to the needs of the existing world of work. The skill program at the vocational level also adjusts to community and market demands. Vocational education is secondary education that prepares students especially to be ready to work in certain fields. Based on the information obtained, there are 4 majors that is Accounting, Office Administration, Multimedia, Online Business and Marketing and Travel Business. The skill program implemented at the Vocational High School adapts to the needs of the existing world of work. Metode Technique For Others Preference By Similarity To Ideal Solution (TOPSIS) as decision-making that lies in its ability to make more informed judgments because it is based on the predetermined criteria and preference weights (priority).

Keywords:
TOPSIS, DSS, SPK, SMK, Vocational

1. INTRODUCTION

Vocational High School (SMK) is a form of formal education unit that organizes vocational education at the secondary education level as a continuation of SMP, MTs, or other equivalent forms. SMK has many skill programs. The skill program applied in SMK adjusts to the needs of the existing world of work. The skill program at the vocational level also adjusts to community and market demands. Vocational education is secondary education that prepares students especially to be ready to work in certain fields. Based on the information obtained, the number of majors in SMKN 4 consists of five majors, namely Accounting, Office Administration, Multimedia, Online Business and Marketing, and Travel Business. The selection of each major is based on the student's choice when registering by including interest in majors 1 and 2, besides that, majors are determined by the value required for each type of major.

Making the right decisions will greatly affect our lives in the future. Decision Support System (DSS) was first described in the early 1970s by Michael S. Scott Morton with the term Management Decision System. The system is a computer-based system that is intended to assist decision makers by utilizing certain data and models to solve various unstructured and semi-structured problems. The problem of choosing the appropriate major for prospective new students is very important, because many prospective new students do not know the potential that exists within them, so they are often wrong in choosing a major. In making decisions about majors, many aspects need to be considered including in terms of values, potential and interests of prospective new students. Decision-making, which is carried out manually by departmental analysis for prospective new students, has several weaknesses, such as an ineffective and inefficient decision-making process that requires a relatively long time. Therefore, a decision support system (SPK) was made that can overcome the problems that arise in the selection of majors that are in accordance with the abilities of prospective new students. Technique For Others Preference Method By Similarity To Ideal Solution(TOPSIS) as a decision making that lies in its ability to make a more precise assessment because it is based on the value of the criteria and preference weights (priority/priority) that have been determined, besides the Technique For Others Preference By Similarity To Ideal Solution (TOPSIS) method can also selecting the best alternative from a number of alternatives because of the ranking process after determining the weight value for each attribute.
2. RESEARCH METHOD

TOPSIS considers both the distance to the positive ideal solution and the distance to the negative ideal solution by taking relative proximity to the positive ideal solution. Based on the comparison to the relative distances, an alternative priority arrangement can be reached. The more factors that must be considered in the decision-making process, the more difficult it is to make a decision on a problem. Moreover, if the decision-making effort of a particular problem, in addition to considering various factors/variables criteria, it also involves several decision makers. Such problems are known as Multiple Criteria Decision Making (MCDM) problems. In other words, MCDM can also be referred to as a decision-making process to choose the best alternative from a number of alternatives based on certain criteria. TOPSIS method is used as an effort to solve the problem of multiple criteria decision making. This is because the concept is simple and easy to understand, computationally efficient and has the ability to measure the relative performance of decision alternatives. This method is widely used to complete practical decision making.

Stages in the TOPSIS method

- Determining Criteria and Traits
  The criteria that will be used as a reference in decision making, namely Ci and the nature of each criterion.

- Determining the Match Rating
  The suitability rating of each alternative on each criterion.

- Creating a Normalized Matrix
  TOPSIS requires a performance rating of each alternative Ai on each normalized Cj criteria, namely:

\[ r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}} \]

- Multiplication Between Weight With Each Attribute
  This multiplication is used to form a Y matrix. It can be determined based on the normalized weight ranking (Yij) as follows:

\[ y_{ij} = w_i r_{ij} \]

with \( i=1,2,\ldots,m \) and \( j=1,2,\ldots,n \)

- Determining the Distance Between the Values of Each Alternative With a Positive and Negative Ideal Solution Matrix
  The distance between alternative Ai and the positive ideal solution is formulated as follows:

\[ D_i^+ = \sqrt{\sum_{j=1}^{n} (y_{ij}^+ - y_{ij})^2} \]

The distance between alternative Ai and the negative ideal solution is formulated as follows:
Determining Preference Values For Each Alternative

The preference value for each alternative (Vi) is given as:

\[ V_i = \frac{D_i^-}{D_i^- + D_i^+} \]

A larger Vi value indicates that the alternative Ai is preferred.

SYSTEM BASIC

A. Major Determination Criteria

There are 5 criteria used in the process of determining majors, namely:

| Criteria | Information                                                      |
|----------|------------------------------------------------------------------|
| C1       | Final score                                                      |
| C2       | Entrance Test Scores in the Field of Mathematics Studies         |
| C3       | Entrance Screen Test Scores in the Field of English Studies      |
| C4       | Entrance Screen Test Scores in the Field of Computer Studies      |
| C5       | Economic Capability of Parents of New Prospective Students        |

B. Alternative Course

Table 2. Alternative Course

| Alternative | Department Name                          |
|-------------|-----------------------------------------|
| A1          | Accountancy                             |
| A2          | Office administration                   |
| A3          | Multimedia                              |
| A4          | Online Business and Marketing           |
| A5          | Travel agent                            |

C. Economic Ability Assessment

Assessment for the economic ability of parents of prospective new students, taken from the total income of parents. There are 4 criteria as follows:

Table 3. Economic Ability Assessment

| Category               | Income              | Mark |
|------------------------|---------------------|------|
| Very Capable / Rich    | > 5,000,000,-       | 9.00 |
| Capable                | > 1,500,000,- up to 5,000,000,- | 8.00 |
| Unable                 | > 500,000,- up to 1,500,000,- | 7.00 |
| Very Incompetent / Poor| =< 500,000,-       | 6.00 |
D. Interest Weight Matrix

Is the influence between alternatives with each of the following criteria:

Table 4. Interest Weight Matrix

| Alternative | C1 | C2 | C3 | C4 | C5 |
|-------------|----|----|----|----|----|
| A1          | 4  | 3  | 2  | 5  | 1  |
| A2          | 4  | 5  | 2  | 3  | 1  |
| A3          | 4  | 2  | 5  | 3  | 1  |
| A4          | 4  | 3  | 5  | 2  | 1  |
| A5          | 3  | 4  | 5  | 2  | 1  |

3. Results And Discussion

To run this application, you are required to activate the Web Server first, in this case the author uses XAMPP, then access via a browser using the address http://localhost:8000/dashboard

1. Sign In Page Display

In this signin page view, the user inputs a username and password to enter the Home Page. If it is wrong, an error message for inputting the User Name and Password will appear on the screen, and the user must enter it again.

![Figure 1. Sign In Page](image1.png)

2. Home Page View

This page serves to display information and all the main menus contained in the application. The main menu page consists of the Home Page, Criteria Master Page, Registrant Master Page, Department Master Page, User Master Page, TOPSIS Analysis Report Page and Exit.
3. Criteria Master Page View

This page contains several entries. This field is used to input criteria data that will be used in the department. To input data, select the add criteria button, then fill in the criteria data. After the data has been filled in completely then click save to save it in the system.

4. Master Registrant Page View

This page contains a list of prospective new student registrants and the fields used to input new student registrant data.

5. Department Master Page View

This page contains a list of majors and fields used to input detail data for majors including the number of classes and student quotas per class.
6. User Master Page View
This page contains fields used to input user data. User data will be used as access to use the application.

7. TOPSIS Analysis Report Page Display
This page contains a report on the results of the analysis of majoring using the TOPSIS method, where the results displayed are sorted by the largest final value.
4. Conclusions

After going through the testing stage on the decision support system for determining majors, it was concluded that:

1. The decision support system for determining the majors that was built allows the PPDB Team to view all data in the form of reports/reports of prospective new students who have registered, who were accepted according to the quota and the appropriate majors for prospective students who have been accepted.

2. The achievement of the process of determining majors using the TOPSIS method at SMK Negeri 4 Surabaya, provides recommendations for more objective results and openness of assessment based on existing calculations.

3. The best major recommended by the system is the final value from the TOPSIS method calculation which has the largest final value (V).

4. This system has buttons to view or hide the details of a detailed calculation process.

5. The conclusion from the user acceptance test shows that the success rate in the development of this system is 99%.

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