



Decision Support System for Elective Course Selection Using the TOPSIS Method

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ABSTRACT

The Information Systems Study Program, Faculty of Da'wah and Communication, UIN Raden Fatah Palembang, is one of the study programs that offers elective courses in the high semester, namely between semesters six and seven with various advantages, making it difficult for students to make choices according to their interests and talents. In line with that, more and more elective courses are being offered as alternative choices. They are Geographic Information System (GIS), Advanced IS Analysis and Design, Data Mining and Warehouse, as well as Sillation Modeling in even semesters and Decision Support Systems, Multitier, Mobile Programming, and Artificial Intelligence as alternatives that the Study Program offers in odd semesters. In connection with this problem, Then a Decision Support System for the Selection of Elective Courses is designed so that students can determine the choice of elective courses appropriately according to their interests and talents. The method used for the Elective Course Selection Decision Support System is the Technique Order Preference by Similarity To Ideal Solution (TOPSIS) method. This method was chosen because it is able to choose the best alternative from a number of alternatives, in this case the alternative in question is the best choice of courses based on the specified criteria. The results of the process of implementing the TOPSIS method can sort alternatives from the largest value to the smallest value, so that elective courses are produced as solutions and suggestions for decision making for students.

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1. Introduction

Selection of elective courses is an important action for students in the sixth and seventh semesters of Information Systems at UIN Raden Fatah Palembang, the courses offered by the Information Systems study program lead to several fields, the right selection can help students determine courses that match their interests and talents they. The concentration of this course is used by students in choosing subjects of interest, as material for taking thesis themes and determining professions for the world of work when they graduate.

Many students choose this concentration course with very subjective considerations such as just because their classmates choose that area of expertise. Many students are still confused about the choice of the course itself because the previous semester there was no such elective course. There are also students who are still considering their interests and talents. consultations with academic supervisors were less than optimal, as for other factors due to the lack of socialization regarding the areas of expertise offered by the faculty, and the lack of initiative to get along and ask seniors who had passed it by time.

From the problems that have been explained, there are several conditions that must be resolved by making decisions with certainty, reducing the level of risk from the choice of courses offered by the faculty, and reducing decision making in conditions of uncertainty. Decision making is the activity of choosing a strategy or action in solving the problem. The act of choosing a strategy or action that is believed to provide the best solution. However, the lack of information about alternative options makes the right decision-making process difficult.

Decision Support System is an interactive information system that provides information, modeling, and manipulating data. With a Decision Support System using the TOPSIS method, it will assist students in determining elective courses according to their interests and talents or students who are still confused about the choice of elective courses offered by the Da'wah and Communications faculty of UIN Raden Fatah Palembang.

2. Method

2.1 Literature review

Methods of collecting data by reading books or magazines and other sources related to the problem under study

2.2 Field Study

Field study is a method of collecting data by direct observation of the object of research to obtain data in the following ways:

a. Observation (Observation)

Observation is a complex process, a process composed of various biological and psychological processes. Two of the most important are the processes of observation and memory. The author made observations on the faculty of Da'wah and Communication, Information Systems study program. Observing the procedures and requirements for selecting courses, as well as procedures for selecting elective courses at the Faculty of Da'wah and Communication.

b. Interview (Interview)

An interview is a meeting of two people to exchange information and ideas through question and answer, so that meaning can be constructed in a particular topic. The author conducted an interview with Mr. Ruliansyah as Secretary of the Department of Information Systems, the data obtained from the interview in the form of requirements and procedures for selecting elective courses according to the procedures applied at the Faculty of Da'wah and Communication.

c. Documentation

Documents are records of events that have passed. Documents can be in the form of writing, pictures, or monumental works of a person. Documents in the form of writing such as diaries, life histories, stories, biographies, regulations, policies.

3. Results and Discussion

3.1 Decision Support System Calculation Stage

In the seventh semester of the Information Systems Study Program, the Faculty of Da'wah and Communication, UIN Raden Fatah Palembang requires students to choose elective courses that will be used as areas of concentration for the next stage, such as choosing a thesis theme or even for future

work plans. There are 4 elective courses offered by the Information Systems study program which will be used as alternatives, namely:

TABLES 1.

ALTERNATIVE

No	Code	Alternative name
1	A1	Geographic Information System (GIS)
2	A2	Advanced IS Analysis and Design
3	A3	Data mining and ware house
4	A4	Simulation Modeling

There are 3 criteria that are used as a reference in making decisions, namely:

TABLE 2.

CRITERIA

No	Code	Criteria	Attribute
1	C1	Academic Value (GPA)	Benefits
2	C2	Interest	Benefits
3	C3	Talent	Benefits

The suitability rating of each alternative on each criterion is scored from 1 to 5, namely: 1 = very poor; 2 = Bad; 3 = Enough; 4 = Good; 5 = Very Good

Table of suitability rating of each alternative on each criterion.

TABLE 3.

CRITERIA

Alternative	Criteria		
	C ₁	C ₂	C ₃
A ₁	7.5	0	3
A ₂	7.5	3	1
A ₃	7.5	2	2
A ₄	7.5	1	2

Table 3 shows the suitability rating of each alternative on each criterion. The value of C₁ is obtained from the GPA weighted value, while the C₂ and C₃ values are obtained from the results of student input after filling out psychological tests and calculating the Decision Support System for Elective Courses using the TOPSIS method, which is devoted to calculating one case in one student. The level of importance of each criterion is also assessed with 1-4, namely: graded with 1-4, namely: 1 = Low; 2 = Enough; 3 = Height; 4 = Very High

Because each value given to each alternative in each criterion is a match value (the largest value is the best), then all the criteria given are assumed to be benefit criteria.

Decision making gives preference weight, as. $W = (5, 3, 4)$ The decision matrix is formed from the suitability table, namely:

$$\begin{matrix} 7.5 \\ X 7.5 \\ 7.5 \\ 7.5 \end{matrix} \begin{pmatrix} 0 & 3 \\ 3 & 1 \\ 2 & 2 \\ 1 & 2 \end{pmatrix}$$

Calculating Decision Normalization Matrices

$$|X1| = \sqrt{7,5^2 + 7,5^2 + 7,5^2 + 7,5^2} \\ = 15,0000$$

$$r11 = \frac{x11}{|x1|} = \frac{7,5}{15,000} = 0,05000$$

$$r21 = \frac{x2}{|x1|} = \frac{7,5}{15,000} = 0,05000$$

$$r_{31} = \frac{x_{31}}{|x_1|} = \frac{7,5}{15,000} = 0,05000$$

$$r_{41} = \frac{x_{41}}{|x_1|} = \frac{7,5}{15,000} = 0,05000$$

$$|X_1| = \sqrt{0^2 + 3^2 + 2^2 + 1^2} = 3,7416$$

$$r_{12} = \frac{x_{12}}{|x_2|} = \frac{0}{3,7416} = 0 \quad r_{22} = \frac{x_{22}}{|x_2|} = \frac{3}{3,7416} = 0,8017$$

$$r_{32} = \frac{x_{32}}{|x_2|} = \frac{2}{3,7416} = 0,5343 \quad r_{42} = \frac{x_{42}}{|x_2|} = \frac{1}{3,7416} = 0,2672$$

$$r_{13} = \frac{x_{13}}{|x_3|} = \frac{3}{4,2426} = 0,7071$$

$$r_{23} = \frac{x_{23}}{|x_3|} = \frac{1}{4,2426} = 0,2357 \quad r_{33} = \frac{x_{33}}{|x_3|} = \frac{2}{4,2426} = 0,4714$$

$$r_{43} = \frac{x_{43}}{|x_3|} = \frac{2}{4,2426} = 0,4714$$

$$r_{14} = \frac{x_{14}}{|x_4|} = \frac{5}{2,5000} = 2,0000$$

$$r_{24} = \frac{x_{24}}{|x_4|} = \frac{3}{2,5000} = 1,2000$$

$$r_{34} = \frac{x_{34}}{|x_4|} = \frac{4}{2,5000} = 1,6000$$

$$r_{44} = \frac{x_{44}}{|x_4|} = \frac{5}{2,5000} = 2,0000$$

$$r_{15} = \frac{x_{15}}{|x_5|} = \frac{3}{2,4051} = 1,2473$$

$$r_{25} = \frac{x_{25}}{|x_5|} = \frac{4}{2,4051} = 1,6631$$

$$r_{35} = \frac{x_{35}}{|x_5|} = \frac{3}{2,4051} = 1,2473$$

$$r_{45} = \frac{x_{45}}{|x_5|} = \frac{4}{2,4051} = 1,6631$$

$$r_{16} = \frac{x_{16}}{|x_6|} = \frac{4}{0,9428} = 4,2426$$

$$r_{26} = \frac{x_{26}}{|x_6|} = \frac{5}{0,9428} = 5,3045$$

$$r_{36} = \frac{x_{36}}{|x_6|} = \frac{4}{0,9428} = 4,2426$$

$$r_{46} = \frac{x_{46}}{|x_6|} = \frac{5}{0,9428} = 5,3045$$

$$r_{17} = \frac{x_{17}}{|x_7|} = \frac{5}{2,5000} = 2,0000$$

$$r_{27} = \frac{x_{27}}{|x_7|} = \frac{3}{2,5000} = 1,2000$$

$$r_{37} = \frac{x_{37}}{|x_7|} = \frac{4}{2,5000} = 1,6000$$

$$r_{47} = \frac{x_{47}}{|x_7|} = \frac{5}{2,5000} = 2,0000$$

$$r_{18} = \frac{x_{18}}{|x_8|} = \frac{3}{2,4051} = 1,2473$$

$$r_{28} = \frac{x_{28}}{|x_8|} = \frac{4}{2,4051} = 1,6631$$

$$r_{38} = \frac{x_{38}}{|x_8|} = \frac{3}{2,4051} = 1,2473$$

$$r_{48} = \frac{x_{48}}{|x_8|} = \frac{4}{2,4051} = 1,6631$$

Normalized matrix R

$$R = \begin{pmatrix} 0 & 0,7071 \\ 0,5000 & 0,8017 & 0,2357 \\ 0,0500 & 0,5345 & 0,4714 \\ 0,0500 & 0,2672 & 0,4714 \end{pmatrix}$$

The value of the y matrix, as follows:

$$V_{11} = w_1 r_{11} = (5) (0,5000) = 2,5000$$

$$V_{12} = w_2 r_{12} = (3) (0) = 0$$

$$V_{13} = w_3 r_{13} = (4) (0,7071) = 2,8284$$

$$V_{14} = w_4 r_{14} = (5) (0,5000) = 2,5000$$

$$V_{15} = w_5 r_{15} = (3) (0,8017) = 2,4051$$

$$V_{16} = w_6 r_{16} = (4) (0,2357) = 0,9428$$

$$V_{17} = w_7 r_{17} = (5) (0,5000) = 2,5000$$

$$V_{18} = w_8 r_{18} = (3) (0,5345) = 1,6035$$

$$V_{19} = w_9 r_{19} = (4) (0,4714) = 1,8856$$

$$V_{20} = w_{10} r_{20} = (5) (0,5000) = 2,5000$$

$$V_{21} = w_{11} r_{21} = (3) (0,2672) = 0,8016$$

$$V_{22} = w_{12} r_{22} = (4) (0,4714) = 1,8856$$

$$Y = \begin{pmatrix} 2,5000 & 0 & 2,8284 \\ 2,5000 & 2,4051 & 0,9428 \\ 2,5000 & 1,6035 & 1,8856 \\ 2,5000 & 0,8016 & 1,8856 \end{pmatrix}$$

The positive ideal solution (A+) is calculated as follows:

$$: y_{1+} = \max \{ 2,5000; 2,5000; 2,5000; 2,5000 \}$$

$$= 2,5000 \quad y_{2+} = \max \{ 0; 2,4051; 1,6035; 0,8016 \}$$

$$= 2,4051 \quad y_{3+} = \max \{ 2,8284; 0,9428; 1,8856; 1,8856 \}$$

$$= 2,8284$$

$$A^+ = \{ 2,5000; 2,4051; 2,8284 \}$$

$$: y_{1-} = \min \{ 2,5000; 2,5000; 2,5000; 2,5000 \}$$

$$= 2,5000 \quad y_{2-} = \min \{ 0; 2,4051; 1,6035; 0,8016 \}$$

$$\begin{aligned}
 &= 0 \\
 y_3^- &= \min \{ 2.8284; 0.9428; 1.8856; 1.8856 \} \\
 &= 0.9428 \\
 A^- &= \{ 2,5000; 0; 0.9428 \}
 \end{aligned}$$

The distance between the weighted value of each alternative to the positive ideal solution SI+, as follows:

$$\begin{aligned}
 D_{1+} &= \sqrt{(2,5000 - 2,5000)^2 + (0 - 2,4051)^2 + (2,8284 - 2,8284)^2} \\
 &= \sqrt{3,5554} \\
 &= 2430 \\
 D_{2+} &= \sqrt{(2,5000 - 2,5000)^2 + (2,4051 - 2,4051)^2 + (0,9428 - 2,8284)^2} \\
 &= \sqrt{3,5554} \\
 &= 1.8855 \\
 D_{3+} &= \sqrt{(2,5000 - 2,5000)^2 + (1,6035 - 2,4051)^2 + (1,8856 - 2,8284)^2} \\
 &= \sqrt{1,5313} \\
 &= 1.2374 \\
 D_{4+} &= \sqrt{(2,5000 - 2,5000)^2 + (0,8016 - 2,4051)^2 + (1,8856 - 2,8284)^2} \\
 &= \sqrt{3,4600} \\
 &= 1.8601
 \end{aligned}$$

The distance between the weighted value of each alternative to the negative SI- ideal solution, as follows:

$$\begin{aligned}
 D_{1-} &= \sqrt{(2,5000 - 2,5000)^2 + (0 - 0)^2 + (2,8284 - 0,9428)^2} \\
 &= \sqrt{3,5554} \\
 &= 1.8855 \\
 D_{2-} &= \sqrt{(2,5000 - 2,5000)^2 + (2,4051 - 0)^2 + (2,8282 - 0,9428)^2} \\
 &= \sqrt{5,7845} \\
 &= 2.4050 \\
 D_{3-} &= \sqrt{(2,5000 - 2,5000)^2 + (1,6035 - 0)^2 + (4,8856 - 0,9428)^2} \\
 &= \sqrt{1,5313} \\
 &= 1.8601 \\
 D_{4-} &= \sqrt{(2,5000 - 2,5000)^2 + (0,8016 - 0)^2 + (4,8856 - 0,9428)^2} \\
 &= \sqrt{1,5313} \\
 &= 1.2374
 \end{aligned}$$

The closeness of each alternative to the ideal solution is calculated, as follows:

$$\begin{aligned}
 V_1 &= \frac{D_{1-}}{D_{1-} + D_{1+}} \\
 &= \frac{1,8855}{1,8855 + 2,4050} \\
 &= 0.4394 \\
 V_2 &= \frac{D_{2-}}{D_{2-} + D_{2+}} \\
 &= \frac{2,4050}{2,4050 + 1,8855} \\
 &= 0.5606 \\
 V_3 &= \frac{D_{3-}}{D_{3-} + D_{3+}} \\
 &= \frac{1,8601}{1,8601 + 1,2374} \\
 &= 0.6005
 \end{aligned}$$

$$V4 = \frac{D4^-}{D4^- + D4^+}$$

$$= \frac{1,2374}{1,2374 + 1,8601}$$

$$= 0.3995$$

From the value of V, it can be seen that V3 has the largest value and V2 has the second largest value, so it can be concluded that the third and second alternatives will be chosen. In other words, Artificial Intelligence (AI) and Multitier will be selected as areas of concentration for students.

3.2 Discussion

As explained in the results section, based on 3 criteria, namely academic scores, interests and talents and a score of 7.5 obtained as an alternative for elective courses, to be able to access the DSS program for electing elective courses, the user must first login to the system, and perform data processing.

4. Conclusion

The decision support system makes it easy for users to determine elective courses according to their interests and talents. The decision support system is made web-based because the target users of this system are students, especially users are information systems students who are generally very familiar with web-based systems and technology, so it can make it easier for users to access anywhere, anytime with the internet network.

This decision support system can also facilitate academic supervisors in providing advice regarding the selection of elective courses in the information systems study program at UIN Raden Fatah Palembang. The use of the TOPSIS method can solve the problem of choosing elective courses with three criteria for each alternative, both in semester six and seven where the TOPSIS method not only considers the distance of the positive alternative to the choice but also considers the distance of the negative alternative of the choice. so the selection of elective courses will be more accurate based on the three criteria taken.

Reference

- Afrizal Iman (2015). Decision Support System for Selection of Expertise Concentration in Computer Science Using Analytical Hierarchy Process and PROMETHEE Methods. UPI: Jakarta.
- Anton AW (2014) Selection Decision Support System Area of expertise at PTI Yogyakarta State University using the Analytical Hierarchy Process (AHP) method. UNI : Yogyakarta.
- AS Rosa and Muhammad Salah, 2011, Software Engineering, Bandung.
- Rindy Bregita Antika (2013) Self-development system (Talents and Interests) in Literary Community Students at the Qoryah Thoyibah Alternative School Salatiga.
UNS : Semarang.
- Guntur Nuri Perdana and Tri Widodo (2013). Decision Support System for Providing Scholarships to New Students Using the TOPSIS Method. Sematic 2013. Yogyakarta.
- Husein Fakhri and Amin Wibowo (2006). Management information System. Upp STIM YKPN, Yogyakarta.
- Kusrini, 2007, Concepts and Applications of Decision Support Systems, Andi Offset, Yogyakarta.
- Kusumo Idam. (2011). Faculty Selection Decision Support System in Colleges Use the Analytical Hierarchy Process Method (AHP) Web-Based (Case Study of MA An-Nizhamiyyah). Syarif Hidayatullah State Islamic University: Jakarta.
- Leha Desi Kurniasih (2013). Laptop Selection Decision Support System with TOPSIS method. Pelita Informatics Budi Darma: Medan.
- Pressman, Ph.D Roger S., (2010). Software engineering. Andi Offset, Yogyakarta.
- Rahman, A. (2011). Decision Support System in Determining Car Loan Acceptance Based on Fuzzy Logic. pringsewu : STIMIK Pringsewu.
- Sachdeva, A., Kumar, D., Kumar, P. (2009), "Multi-Factor Mode Critically Analysis Using TOPSIS", International Journal of Industrial Engineering, Vol. 5, No. 8 pp 1-9.
- Sri Kusumadewi, et al, 2006, Fuzzy Multi-Attribute Decision Making (FUZZY MADM), Graha Ilmu, Yogyakarta
- Sugiyono, 2013, Educational Research Methods, Alfabeta, Bandung.

Sutabri tata, 2012, Information Systems Analysis, Andi offset, Jakarta.
University of North Sumatra (2016). Decision Support Systems course teaching materials. USU: North Sumatra.
Zulfiana Emil (2013). Decision Support System for Areas of Interest
Informatics Engineering UPN VETERAN East Java Using TOPSIS Method (Technique For Others Reference by
Similarity to Ideal Solution). UPN VETERANS: East Java.