

Analysis of the Decision System for Selecting Interest in Concentration Using the SMART Method

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The information technology study program at the Faculty of Computer Science, Mulia University has two areas of concentration, namely network technology and forensic and security architecture. Students tend to be confused in determining their interest in one of the concentrations so that they are less prepared in choosing concentration courses that suit their talents and interests. This research aims to make it easier for students to classify the types of interests according to their interests. Especially 5 & 6 semester students who are involved in the Information Technology (IT) study program. IT students, have tendencies such as confusion, or doubts in choosing a concentration interest in the study program. Therefore, by conducting this research and realizing its objectives, data collection and data analysis techniques were used and SMART Decision Analysis (Simple Multi Attribute Rating Techniue) was used to produce decisions for students who had the interests and talents of the selected concentrations.

Keywords: Consentration, Supporting decisions, SMART method, Alternative Ranking

1. INTRODUCTION

The study program is one of the implementing units that manages and organizes education in the academic field of a tertiary institution. Study programs are usually directed at more specific knowledge. Each study program must have a concentration in holding lectures, it is hoped that students can choose the concentration given by the study program according to their scientific field. Concentration is the study interest carried out by the study program as well as the study interest contained in the study program. The Information Technology Study Program, Faculty of Computer Science, Mulia University, Balikpapan provides two concentration options, namely Network Technology and Forensic Security and Architecture which will be chosen by semester 5 and 6 students. It is hoped that students will be able to direct their abilities to become the focus of research in the final semester. As lectures progress, students tend to still be confused with the choice of lecture concentration in the Information Technology study program, Faculty of Computer Science. In the lecture process, students are equipped with basic abilities according to their respective concentrations, but in conducting research many students also experience difficulties in determining the concentration they are interested in. Based on previous research entitled Recommendations for Course Selection in Completing Student Study Plans with the Application of the Apriory Algorithm (2022)(Syahrul and Solichin), this study discusses a system that can provide recommendations for students in taking courses when filling out study plans for the next semester. This course selection recommendation system uses the association rule mining method with the a priori algorithm and then data collection for taking student courses is evaluated using the a priori algorithm to then produce recommendations for taking courses in the following semester. Based on The second research that the researchers managed to find was research conducted by (DAMANIK)entitled "Determination of Students' Reading Interest in Borrowing Books Using the SMART Method (Simple Multi Attribute Rating Technique). In which humans to be able to communicate with themselves and others are required to have the ability to read. Interest in reading will grow if it is supported by adequate reading materials and is of interest to the reader, because it is from the

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reading material that a person will encounter various things that have never been known before. The third study regarding the smart method was conducted by (Magrisa et al.) entitled Implementation of the SMART method in decision support systems for selecting extra-curricular activities for high school students. This study discusses extracurricular activities where these activities are an internal part of the learning process that emphasizes the needs of students. Extracurricular activities can be a means of channeling talents and encouraging the development of potential in students so that they reach the maximum level. The large number of extracurricular activities that exist in the school makes it difficult for students to determine what extracurricular activities to participate in, so it is not uncommon for these students to choose the wrong extracurricular and do not match their potential. One solution to assist students in choosing extracurricular activities is to use a decision support system for selecting extracurricular activities using the Simple Multi Attribute Rating Technique (SMART) method. So through this research a decision system analysis will be carried out to measure student interest in choosing a concentration of courses in study programs that are more focused on concentration courses in information technology study programs at Mulia University. will carry out sample testing and settlement solutions using the Simple Multi Attribute Rating Techniue method. To determine the best choice according to students' interests in the concentration of choice which is centered on the Network Technology concentration and will be determined through ranking based on the results of differentiating assessments of 55 alternatives.

2. LITERATURE REVIEW

Decision Support System (DSS)

The Decision Support System (DSS) was first proposed in the 1970s by Michael S Scott Morton under the term Management Decision System. The system is a compute-based system that is shown to make decisions by utilizing certain data and models to solve various unstructured problems (Nur)(Rosita et al.)

SMART Method

SMART (Simple Multi Attribute Rating Technique) is a multi-attribute decision making method developed by Edward in 1971.(Safrizal) SMART uses a linear adaptive model to predict the value of each alternative. SMART is more widely used because of its simplicity in responding to the needs of decision makers and the way it analyzes responses.(Safrizal) The best analysis is transparent so that this method provides a high understanding of the problem and can be accepted by decision makers. The SMART weighting uses a scale of 0 to 1, making it easier to calculate and compare values for each alternative.(Magrisa et al.)

METHOD

Based on the problems taken from this study, there are several in figure 1 the stages of research that will be carried out in this study, as follows:

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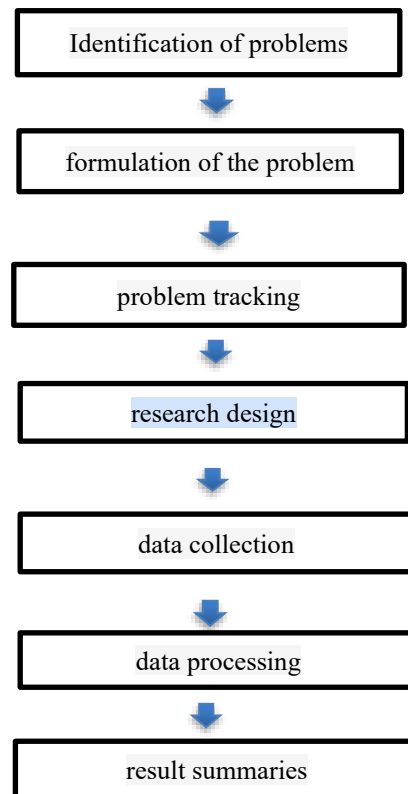


Figure 1 Stages of research

The instruments used in this study are: The questionnaire will be used in order to collect respondents' opinions regarding the object of research by determining the choice of answers first. In this case the correspondent was not given an alternative free answer. The indicators for these variables were described by the author into a number of statements in order to obtain qualitative data. This data will be converted into quantitative form with a statistical analysis approach. In general, the scoring technique used in this research questionnaire is the Likert scale technique. The use of a Likert scale according to Sugiyono (2013) is "a Likert scale is used to measure attitudes, opinions and perceptions of a person or group of people about social phenomena".(Yudi Marihot, Saptia Sari) According to Sugiyono (2013) suggests that "various measurement scales can be: nominal scale, ordinal scale, interval scale, and ratio scale, from the measurement scale, nominal, ordinal, interval, and ratio data will be obtained". 55 This study uses an ordinal scale, according to Sugiyono (2010:98) is "an ordinal scale is a measurement scale that not only states categories, but also states the rank of the construct being measured".The model or theory used is the SMART (Simple Multi Attribute Rating Techniue) method where this model will assist the author in solving problems in determining the most desirable alternative. (Sibyan)The stages of the process in determining the decision system in the SMART method are as follows:

1. Determine the criteria used in solving decision-making problems. To determine what criteria are used in this decision-making system, data from decision makers or authorities/competent parties is required for the problem to be resolved.
2. Determining Criteria Weight Give criteria weight to each criterion by using an interval of 1-100 for each criterion with the most important priority.

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3. Based on equation 1, Criteria Weight Normalization Calculates the normalized weight of each criterion by comparing the criterion weight value to the total criterion weight.

$$\frac{w_j}{\sum w_j} \dots\dots\dots (1)$$

Information :

- w_j : Normalize the weight of a criterion
- ∑ w_j : Total weight of all criteria

4. Provide Parameter Values for Each Criterion Provide criterion values for each alternative, criterion values for each of these alternatives can be in the form of quantitative data (numbers) or in the form of qualitative data, for example the value for the price criterion can be ascertained in quantitative form while the value for facility criteria may be qualitative form (very complete, complete, incomplete). If the criterion value is in the form of qualitative then we need to change it to quantitative data by making the criterion value parameter, for example very complete means 3, complete means 2 and incomplete means 1. (Sesnika et al.)

5. Determining Utility Values Determining utility values by converting the criterion values for each criterion to standard data criterion values. This utility value depends on the nature of the criterion itself. (Pangaribuan et al.)

• Cost Criteria (Cost Criteria)

Criteria that are "preferably a smaller value" criteria like this are usually in the form of costs to be incurred (eg price criteria, criteria for using fuel per kilometer to purchase a car, payback period in a business, delivery time criteria) can be calculated by using the equation:

$$U_i(a_i) = 100 \frac{c_{max} - c_{out\ i}}{c_{max} - c_{min}} \% \dots\dots\dots (2)$$

Information

- u_i(a_i) : utility value of the i-th criterion for the i-th alternative
- c_{max} : maximum criterion value
- c_{min} : minimum criterion value
- c_{out} : criterion value to-i
- Benefit Criteria

Based on equation 2, the criteria are "more desirable a greater value", criteria like this are usually in the form of benefits (eg capacity criteria quality criteria and others).(Sulviyana et al.)

6. Determine the Final Value

Determine the final value of each by multiplying the value obtained from the normalization of the standard data criterion value with the criterion weight normalization value:

$$u(a_i) = \sum_{j=1}^m w_j u_i(a_{ni}), \quad i = 1, 2, \dots, m \quad \dots\dots\dots (3)$$

Information:

- u(a_i) : total value for the i-th alternative
- w_j : normalized value of the weight of the jth criterion

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- $uj(ai)$: utility value of the j th criterion for the i th alternative

Based on equation 3, Ranking The results of the calculation of the final value are then sorted from the largest to the smallest value, the alternative with the highest final value shows the best alternative.(Kasus and Luqman)

3. RESULT

Based on a reference from one of the previous research references conducted by Tisa margarisa (2018)(Magrisa et al.)(Sesnika et al.)entitled Implementation of the SMART method in decision support systems for selecting extra-curricular activities for high school students. This study discusses extracurricular activities where these activities are an internal part of the learning process that emphasizes the needs of students. Extracurricular activities can be a means of channeling talents and encouraging the development of potential in students so that they reach the maximum level. The large number of extracurricular activities that exist in the school makes it difficult for students to determine what extracurricular activities to participate in, so it is not uncommon for these students to choose the wrong extracurricular and do not match their potential. One solution to assist students in choosing extracurricular activities is to use a decision support system for selecting extracurricular activities using the Simple Multi Attribute Rating Technique (SMART) method. Meanwhile, in this study the focus is on one concentration as a reference for student choice as an alternative to determine the feasibility of their interest. to that concentration. In this study the method used is the Simple Multi Attribute rating Technique (SMART) . (DAMANIK)

The steps taken in the formulation of the SMART method in the case study measuring student interest in choosing the concentration of this study program are as follows:

1. The researcher determines what criteria are suitable for use in the case study used. After distributing the questionnaires to students, it is found that the selected criteria are.

Table 1. Criteria Table

| No | Criteria Name | score | Description |
|----|-----------------------|--------|-------------|
| 1 | Course Value (K1) | 90-100 | Very Good |
| 2 | Skills & Talents (K2) | 75-89 | Good |
| 3 | Interest (K3) | 60-75 | currently |
| 4 | Work Background (k4) | 50-59 | Bad |

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2. The results of the analysis of students will then provide their assessment to obtain recommendations for concentration courses that are in accordance with their grades. according to table 2 the values entered by students will be converted into numbers for later processing.

Table 2. Alternative weighting

| No | Alternative | K1 Course Value | K2 Skills & Talents | K3 Interest | K4 Work Background |
|----|--------------------------------|-----------------|---------------------|-------------|--------------------|
| 1 | MALEAKHI | 0 | 0 | 0 | 60 |
| 2 | YUSNAINI NOER RAMADHANI | 0 | 0 | 0 | 60 |
| 3 | RANA ZABRINA | 70 | 60 | 60 | 60 |
| 4 | FLASH GUNAWAN | 70 | 60 | 60 | 60 |
| 5 | AZIZAR RAHMAN | 80 | 70 | 70 | 0 |
| ⋮ | | | | | |
| 53 | ERI WIDIANTORO | 0 | 0 | 0 | 60 |
| 54 | ALFAJRI NURUL KHAIR | 90 | 90 | 90 | 0 |
| 55 | MUHAMMAD DAFFA CHAIRI AKBAR | 0 | 0 | 0 | 0 |

Benefit Benefit Benefit Benefit

3. Next will be the weighting stage, at this stage according to table 3 the converted value will be entered in the weighting formula.

Table 3. Survey results

| No | Alternative | K1 Course Value | K2 Skills & Talents | K3 Interest | K4 Work Background | Weight value |
|----|--------------------------------|-----------------|---------------------|-------------|--------------------|--------------|
| 1 | MALEAKHI | 0 | 0 | 0 | 60 | 0 |
| 2 | YUSNAINI NOER RAMADHANI | 0 | 0 | 0 | 60 | 0 |
| 3 | RANA ZABRINA | 70 | 60 | 60 | 60 | 1 |
| 4 | FLASH GUNAWAN | 70 | 60 | 60 | 60 | 1 |
| 5 | AZIZAR RAHMAN | 80 | 70 | 70 | 0 | 1 |
| ⋮ | | | | | | |
| 53 | ERI WIDIANTORO | 0 | 0 | 0 | 60 | 0 |
| 54 | ALFAJRI NURUL KHAIR | 90 | 90 | 90 | 0 | 0 |
| 55 | MUHAMMAD DAFFA CHAIRI AKBAR | 0 | 0 | 0 | 0 | 0 |

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2. The next step is to find the Normalization value:

$$\frac{w_j}{\sum w_j} \dots\dots\dots(1)$$

1. MALEAKHI = 0/3300 = 0.000

Table 4. Normalisation of values

| No | Alternative | K1 Course Value | K2 Skills & Talents | K3 Interest | K4 Work Background |
|----|--------------------------------|-----------------|---------------------|-------------|--------------------|
| 1 | MALEAKHI | 0.000 | 0.000 | 0.000 | 0.023 |
| 2 | YUSNAINI NOER RAMADHANI | 0.000 | 0.000 | 0.000 | 0.023 |
| 3 | RANA ZABRINA | 0.021 | 0.019 | 0.020 | 0.023 |
| 4 | FLASH GUNAWAN | 0.021 | 0.019 | 0.020 | 0.023 |
| 5 | AZIZAR RAHMAN | 0.024 | 0.022 | 0.023 | 0.000 |
| ⋮ | | | | | |
| 53 | ERI WIDIANTORO | 0.000 | 0.000 | 0.000 | 0.023 |
| 54 | ALFAJRI NURUL KHAIR | 0.027 | 0.029 | 0.030 | 0.000 |
| 55 | MUHAMMAD DAFFA CHAIRI AKBAR | 0.000 | 0.000 | 0.000 | 0.000 |

According to table 4 is normalization result of values from alternative by criteria.

3. Next, according to table 5 find the utility value by adding up all the criteria values for one alternative:

$$u(a_i) = \sum_{j=1}^m w_j u_i(a_{ni}), \quad i = 1, 2, \dots, m \quad \dots\dots\dots(2)$$

1. MALEAKHI : 0.000+0.000+0.000+0.023 = 0.023

Table 5. Utility values

| No | Alternative | K1 Course Value | K2 Skills & Talents | K3 Interest | K4 Work Background | Total |
|----|-------------|-----------------|---------------------|-------------|--------------------|--------------|
| 1 | MALEAKHI | 0.000 | 0.000 | 0.000 | 0.023 | 0.023 |

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| | | | | | | | |
|----|--------------------------|-------|-------|-------|-------|-------|--------------|
| 2 | YUSNAINI RAMADHANI | NOER | 0.000 | 0.000 | 0.000 | 0.023 | 0.023 |
| 3 | RANA ZABRINA | | 0.021 | 0.019 | 0.020 | 0.023 | 0.083 |
| 4 | FLASH GUNAWAN | | 0.021 | 0.019 | 0.020 | 0.023 | 0.083 |
| 5 | AZIZAR RAHMAN | | 0.024 | 0.022 | 0.023 | 0.000 | 0.070 |
| : | | | | | | | |
| 53 | ERI WIDIANTORO | | 0.000 | 0.000 | 0.000 | 0.023 | 0.023 |
| 54 | ALFAJRI NURUL KHAIR | | 0.027 | 0.029 | 0.030 | 0.000 | 0.086 |
| 55 | MUHAMMAD CHAIRI AKBAR | DAFFA | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

4. DISCUSSIONS

After determining the utility value based on existing criteria, alternative results are found that are feasible to take the concentration of network technology as follows in the last step 4 is ranking results based on utilities value

Table 6. Network Technology Concentration Ranking

| Alternative | Value | Proritas |
|------------------------------|-------|-----------|
| MUHAMMAD ISA ANSHARI | 0.121 | 1 |
| DIMAS JULIANTORO | 0.113 | 2 |
| MUHAMMAD SIDQI SURYA NATA | 0.113 | 3 |
| MARCELINUS PURWANTO | 0.113 | 4 |
| YUS RIZAL FIRMANSYAH | 0.113 | 5 |
| MUHAMMAD ASFAR | 0.113 | 6 |
| PUTRI FATMADHANINGTYAS R | 0.097 | 7 |
| MUHAMMAD AKBAR NUR SHOLEH | 0.097 | 8 |
| TEDI RAMADANU | 0.097 | 9 |
| MALIK AL ZHOHIR | 0.097 | 10 |
| VIERZHA MUGHNII JANIELOFA | 0.097 | 11 |
| ASRIANI ALIM | 0.093 | 12 |
| MUHAMMAD RAFLI NUR ALAM | 0.093 | 13 |
| CHRISTOPHER MORA | 0.093 | 14 |

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| | | |
|--------------------------------|-------|-----------|
| JULIA MUSTIKA | 0.093 | 15 |
| MUHAMMAD DAVIS | 0.093 | 16 |
| LUTHFIYYAH KHAIRUNNISA | 0.093 | 17 |
| RENINDA DYAH RETNO AYU DEWANTI | 0.093 | 18 |
| NADA RESKY | 0.087 | 19 |
| RAFI AFNANDI AZHAR | 0.087 | 20 |
| MUHAMMAD IQBAL AYASS | 0.087 | 21 |
| SYAHRUL FADHEL | 0.087 | 22 |
| SHERINA NOOR ZAKIYAH | 0.087 | 23 |
| MOHAMMAD YUDHA AZHARI | 0.086 | 24 |
| YOGA PUTRA PRAWIRA | 0.086 | 25 |

According to table 6 From the assessment steps in selecting student interest in subject concentrations in the Information Technology study program using the Simple Multi Attribute Rating Technique method, utility results and priority rankings for concentration students have been obtained.

5. CONCLUSION

The results of this research using the SMART method have concluded that in determining the results of measuring student interest in selecting subject concentrations in the Information Technology study program using the Simple Multi Attribute Rating Technique method, the authors have taken a sample of one of the concentrations, namely Network Technology because it is one part of important in the Information technology curriculum and besides that it can be a reference for evaluating the criteria for each alternative and the results are ranked 1 to 25 having a high interest value for the concentration of network technology because the alternative choice with the largest utility value is one of the assessment factors for student interest in the concentration program of study to be chosen.

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