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Analysis of Hybrid Learning Model Interest Selection for students using the Multi-Attribute Utility Theory Method Case Study: Mulia University

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ABSTRACT

Hybrid learning is a learning method that combines or combines online learning with face-to-face learning (PTM). so that in its implementation, there are times when students and teaching staff meet face to face in class. However, in its implementation there are several obstacles, one of which is the number of students attending class and decreasing interest in learning, resulting in a poor final semester assessment. In connection with the problems faced, this research will try to measure interest in the hybrid learning model that has been implemented at Mulia University using the Multi-Attribute Utility Theory method, where this method is a decision-making method used to evaluate alternatives by considering several attributes. relevant and selecting the alternative that best meets the needs and preferences of the decision maker.

INTRODUCTION

Hybrid learning is a learning method that combines or combines online learning with face-to-face learning (PTM). so that in its implementation, there are times when students and teaching staff meet face to face in class. However, in its implementation there are several obstacles, one of which is the number of students attending class and decreasing interest in learning, resulting in a poor final semester assessment. It is felt that Hybrid Learning really needs to be implemented because the process makes it easy for students to be able to access material quickly, anytime and anywhere. However, the problem faced requires selecting and measuring interest in the learning model of the students themselves, who in the process use a hybrid learning model. So we conducted research, namely Analysis of the Interest Selection of Hybrid Learning Models for students using the Multi-Attribute Utility Theory Method. Case Study: Mulia University.

LITERATURE REVIEW

Decision Support Systems (DSS)

Decision Support Systems (DSS) were first put forward in the 1970s by Michael S Scott Morton with the term Management Decision System. This system is a compute-based system which is designed to make decisions by utilizing certain data and models to solve various unstructured problems (Dewanto, 2015).

Multi-Attribute Utility Theory (MAUT) Method

The Multi-Attribute Utility Theory (MAUT) method is an approach to making complex decisions by considering several different attributes or criteria. MAUT is used to model individual or group preferences for a set of alternatives that meet certain criteria.

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METHOD

Based on the problems taken from this research, there are several stages of research that will be carried out in this research, namely as follow:

Figure 1. stages of Research

Research Model and Design The model or theory used is Multi-Attribute Utility Theory (MAUT) where this model will help the author in solving problems in determining the most popular alternative. The process stages in determining the decision system in the MAUT method are as follows:

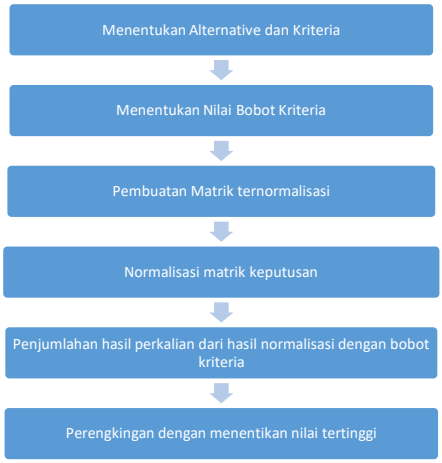

Figure 2. Stages of the MAUT Method Process

Following are the general steps involved in using MAUT:

1. Attribute Identification: Identify attributes or criteria that are relevant in the decision making context. For example, in the context of product selection, attributes that might be included are price, quality, brand, reliability, and features.
2. Assessment and Value Scale: Once the attributes are identified, values must be assigned to each attribute for each alternative to be evaluated.
3. The rating scale can be a numerical scale, such as a 1-10 scale, or a verbal scale such as "very poor," "poor," "fair," "good," and "very good." Attribute Weights: After attribute assessment, weights should be determined to reflect the relative importance of each attribute. These weights can be determined through analytical methods or through consensus of the decision makers involved. The equation can be seen as follows.

$$V(x) = \sum_{i=1}^{n} Wi\, Vi(x) \qquad \text{.....(1)}$$

Where:
v (x) = Evaluate the total of the x alternatives
Wi = Bobot relatif kriteria ke- i
Vi(x) = Evaluation results of the i th attribute (criteria) for the x th alternative
i = Indeks to show criteria
n = Number of Criteria

4. Utility Function: Utility functions are used to describe individual or group preferences for each attribute. The utility function can be linear, non-linear, or can even use a subjective satisfaction function.
The equation can seen as follows.

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$$U(x) = \frac{x - x^{-}}{xi^{+} - xi^{-}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:
U(x) = The utility value of each x-th alternative criterion
xi+ = Maximum value (best weight) of the xth alternative criteria
$xi-$ = Minimum value (worst weight) of the xth alternative criteria
x = Criteria value for each alternative

5. Utility Value Calculation: Once the utility function is determined, the utility value can be calculated for each alternative by multiplying the attribute ratings by the corresponding attribute weights and adding up the results. The equation can be seen as follows.

$$\sum_{i=1}^{n} Wi = 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:
Wi = Relative weight of the xth criterion
i= Index to show criteria
n = Number of criteria

6. Ranking and Decision Making: After the utility value is calculated, alternatives can be ranked based on the resulting utility value. This will help in decision making by choosing the alternative that has the highest utility value. MAUT can be used in a variety of decision-making contexts, such as product selection, project evaluation, employee selection, or investment decisions. This approach helps overcome the complexity of decision making by considering various relevant attributes and individual or group preferences for those attributes.

RESULT

The steps taken in formulating the MAUT method in the case study of measuring interest in the hybrid learning model among students are as follows:

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

Tabel 1. Explaining the Normalization of Credit Granting Weights

Criteria	Bobot
Study Completely (C1)	0,10 – 1,00
Facilities and Resources for Learning Outcomes (C2)	0,20 – 1,00
Achievement of Instructional Goals (C3)	0,20 – 1,00
Attractive Learning Experience (C4)	0,20 – 1,00
Learning outcomes (C5)	0,20 – 1,00
Interest and Motivation (C6)	0,10 – 1,00

2. Determine the alternative that will be used. In this case study, the alternatives used are all students in the 3rd semester of the 2023-2024 academic year. The rating scale ranges from “very poor,” “poor,” “fair,” “good,” and “excellent.

Tabel 2. Alternative courses

No	**Alternative**
1	Theory and Practicum of Hybrid Learning (A1)
2	Face-to-face Theory and Practicum (A2)

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3. The results of the analysis of students will then provide their assessment to get recommendations regarding the choice of learning model interests that suit their values. The values entered by students will be converted into numbers for later processing. After that, the Normalization Matrix and Preference Weights are calculated.

$$V(x) = \sum_{i=1}^{n} Wi\, Vi\,(x) \quad \text{.....(1)}$$

Tabel 3. Matrix Normalization and preference weights

Courses	C1	C2	C3	C4	C5	C6
Theory and Practicum of Hybrid Learning (A1)	0,76	0,76	0,78	0,73	0,73	0,70
Face-to-face Theory and Practicum (A2)	0,77	0,75	0,77	0,76	0,76	0,73
Preference Weights	0,10	0,20	0,20	0,20	0,20	0,10
xi^-	0,76	0,75	0,77	0,73	0,73	0,70
xi^+	0,77	0,76	0,78	0,76	0,76	0,73

4. Calculations based on the MAUT Method
Next, normalize the effective recommendation matrix using the equation formula The equation can be seen as follows.

$$U(x) = \frac{x - x^-}{xi^+ - xi^-} \quad \text{..... (2)}$$

Table 4. Experimental results

Courses	C1	C2	C3	C4	C5	C6
Theory and Practicum of Hybrid Learning (A1)	0,00	1,00	1,00	0,00	0,00	0,00
Face-to-face Theory and Practicum (A2)	1,00	0,00	0,00	1,00	1,00	1,00
Preference Weights	0,10	0,20	0,20	0,20	0,20	0,10

5. After obtaining the matrix normalization results, next multiply the matrix normalization results with the preference weights using the equation formula (3)

$$\sum_{i=1}^{n} Wi = 1 \quad \text{..... (3)}$$

A1 = (0,10 x 0,00) + (0,20 x 1,00) + (0,20 x 1,00) + (0,20 x 0,00) + (0,20 x 0,00) + (0,10 x 0,00)
= 0,40
A2 = (0,10 x 1,00) + (0,20 x 0,00) + (0,20 x 0,00) + (0,20 x 1,00) + (0,20 x 1,00) + (0,10 x 1,00)
= 0,60

6. The calculation results based on the formula Equation (1) are displayed in matrix form, as in table 3.6 below.

Tabel 5. Result of the ranking

Courses	C1	C2	C3	C4	C5	C6	Total	Ranking
Theory and Practicum of Hybrid Learning (A1)	0,00	0,20	0,20	0,00	0,00	0,00	0,40	2
Face-to-face Theory and Practicum (A2)	0,10	0,00	0,00	0,20	0,20	0,10	0,60	1
Preference Weights	0,10	0,20	0,20	0,20	0,20	0,10		

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DISCUSSION

This research involved 48 respondents in carrying out an assessment based on a questionnaire where the results of the analysis of the students would then provide their assessment to get recommendations regarding the choice of interest in learning models that were in accordance with their values. The values entered by students will be converted into numbers for later processing.

Respondents' Assessment of Face-to-face Theory and Practicum Courses

Tabel 6. Respondents to Hybrid Learning Theory and Practicum courses

(R)

R	C1	C2	C3	C4	C5	C6
R1	0,67	0,8	0,67	0,77	0,77	0,8
R2	0,75	0,72	0,75	0,82	0,72	0,78
R3	0,8	0,67	0,9	0,86	0,6	0,75
R4	0,72	0,77	0,72	0,8	0,33	0,9
R5	0,67	0,82	0,68	0,78	0,45	0,8
⋮						
R45	0,8	0,9	0,86	0,8	0,8	0,75
R46	0,77	0,8	0,6	0,8	0,77	0,9
R47	0,72	0,4	0,8	0,78	0,72	0,77
R48	0,6	0,55	0,8	0,75	0,6	0,72
Average	0,76	0,76	0,78	0,74	0,73	0,70

Table 7. Respondents to Face-to-Face Theory and Practicum courses

(R)

R	C1	C2	C3	C4	C5	C6
R1	0,75	0,86	0,77	0,8	0,9	0,6
R2	0,75	0,72	0,75	0,82	0,72	0,78
R3	0,8	0,67	0,9	0,86	0,8	0,75
R4	0,72	0,77	0,72	0,8	0,78	0,9
R5	0,67	0,82	0,68	0,78	0,75	0,8
⋮						
R45	0,8	0,9	0,86	0,8	0,8	0,75
R46	0,76	0,8	0,9	0,8	0,77	0,9
R47	0,72	0,88	0,78	0,78	0,72	0,77
R48	0,78	0,8	0,8	0,77	0,67	0,9
Average	0,77	0,75	0,77	0,76	0,76	0,73

From all the respondents' results, assessment results were obtained based on student interest in the two alternatives which were assessed based on student interest, so students who were interested in hybrid learning from the noble university student sample had a utility value of 0.40 while those interested in face-to-face had a utility value of 0.60.

CONCLUSION

Based on 48 samples, results were obtained which showed that students still felt that the face-to-face method would be more helpful, especially in deepening the material and practicum. However, this research only measured student interest according to existing criteria with a sample of only 48 people who received theory and practicum classes. The results of calculations using the MAUT method for the Hybrid Learning Model Interest Selection Analysis

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of students using the Multi-Attribute Utility Theory Method at the Faculty of Computer Science, Mulia University produced a more objective choice with an assessment of Face-to-Face Theory and Practicum courses (0.60) as the highest assessment and courses in Hybrid Learning Theory and Practicum (0.00). The results of this calculation can be used as support for the decision that face-to-face theory learning is more effective than hybrid learning. It is hoped that in the future hybrid learning methods at noble universities will be popular in order to facilitate the teaching and learning process along with technological developments.

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