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The Implementation of the Simple Multi Attribute Rating Technique Method for Evaluating the Guidance Process for the Final Project of the Applied Software Engineering Technology Students

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ABSTRACT

Simple Multi Attribute Rating Technique (SMART) is a method that is able to solve problems with multi criteria. In the evaluation of the final project guidance process students of applied software engineering technology are intended to identify supporting factors as well as obstacles for students in completing the final project. Used several criteria such as liveliness of guidance, guidance response, how to communicate, mastery of materials, problem solving and report writing. The problem in determining the cause of the hampered completion of the final project is the lack of tools that can help in processing the criteria data. The solution is to utilize the SMART method with multi criteria problem solving as a tool in decision making. With the utilization of this method is expected to provide solutions in evaluating the guidance process so that the results can be accepted by all students objectively. With the decision support system model, it is expected to be able to know the problem factor in completing the final project so as to help in the implementation of the final project in the next period.

1. Introduction

A decision support system is a producer of information aimed at a particular problem that must be solved by the department and it assists the head of the study program in making decisions. In an organizational system, it is inseparable from the decision-making system. These problems can be corrected by building a decision support system to evaluate the student final project guidance process using the SMART (Simple Multi Attribute Rating Technique) method.

If it is compared to other decision-making methods, the SMART method is a method that has advantages. Especially when decision making uses many criteria. Decision making with many criteria requires a special way of handling. The more the number of students, the more complex the diversity of students, so it is very difficult to determine the results of the evaluation of the guidance process that has been undertaken by students. Evaluation of student guidance is carried out based on criteria consisting of: Guidance Active, Guidance Response, Communication Methods, Material Mastery, Problem Solving, and Report Writing. at this time there has been no evaluation of the guidance process that has been carried out by students with supervisors. To overcome the problems mentioned above, this system was created. In this study, it is possible to analyze the existence of

obstacles or issues in guidance so that a study is formed to evaluate the process of final project guidance for students of the applied software engineering technology program. The aim of this study was to solve a problem in evaluating the student's final project guidance process by using the SMART method and also to identify factors that were supporting or hindering students in completing the final project.

2. Material and Method

2.1 Decision Support System

Human life cannot be separated from nature because humans are part of nature. The element that increasingly dominates other elements in nature is the process of human life. This is due to the ability to develop that humans have. With all the senses that human has, all processes that occur around him and in him are felt and observed first before acting. Almost every time humans make or make decisions in the face of all processes that occur around them and within themselves. This is based on the assumption that all actions taken consciously are a reflection of the results of the decision-making process in his mind, so that basically humans are very accustomed to making decisions. [1]

2.2 Method of Simple Multi Attribute Rating Technique (SMART) Method

The SMART method is a multi-attribute decision making technique that is used to support decision-making from several alternative choices. Each alternative consists of a set of attributes or criteria that have values. Each attribute has a weight that describes how important it is compared to other attributes.

With its simplicity in responding to the needs of decision makers and the way it analyzes responses, SMART was more widely used. The transparency in the analysis involved in this method and it provided a high level of problem understanding and is acceptable to decision makers. The linear utility function model used by SMART is as follows. [2]

$$SMART = \sum_{j=1}^{k} \text{nwj} \,.\, \text{uij} \quad (1)$$

Where:

1. Wj is the weighted value of the j criteria
2. Uij is the utility value of alternative i on the j criteria
3. K is the number of criteria.

Calculating weight normalization :

$$nwj = \frac{wj}{\sum_{n=1}^{k} wj} \quad (2)$$

Where:

1. Nwj is the weight normalization of the j criteria
2. Wj is the weight value of the j criteria
3. K is the number of criteria
4. N is the weight of the n criteria

3. Result and Discussion

3.1 Criteria Data

This criteria data was used to evaluate the guidance process carried out by students and their supervisors for one semester. The criteria determined are as follows:

Table 1. Criteria Data

Criteria	Description	Weight (wj)
C1	Guidance Activeness	25%
C2	Guidance Response	15%
C3	Communication Way	15%
C4	Material Acquisition	30%
C5	Problem Solving	10%
C6	Report Writing	10%

Dealing with the table of criteria above, it can be explained as follows:

1. Guidance Activity
   Student activity during guidance discussions with lecturers. Example: Actively asking and diligent guidance.
2. Guidance Response
   The time it takes students to respond to the supervisor's response.
3. How to Communicate
   The form of interaction between students and supervisors in guidance discussions. Example: Politeness or ethics in contacting the supervisor.
4. Material Mastery
   The ability to master and explore the material in accordance with the title of the final project of each student.
5. Problem Solving
   Ability to provide solutions to responses given by supervisors or problems in working on the final project.
6. Report Writing
   The form of writing a student final project report. Examples: punctuation, sentence structure, material explanation, and writing errors.

3.2 System Algorithm

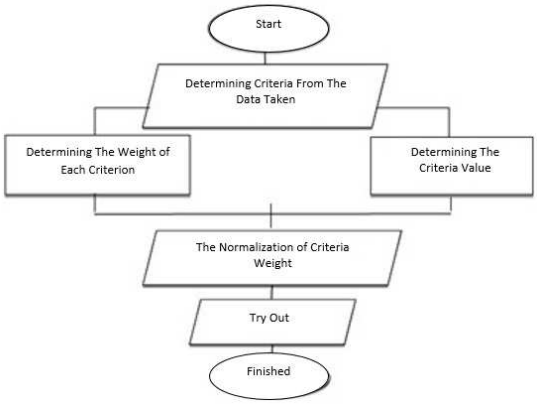

Figure 1. SMART Method System Algorithm [3]

From Figure 1, it can be explained that starting the calculation with the SMART method, namely entering the criteria from the data taken, then determining the weight for each criterion, after the weight is determined then determining the value for each criterion. After the weights and values have been determined, then normalizing each weight on the criteria at the final stage will be tested in the student final project guidance process. The selection of the SMART method in the evaluation process of the final project guidance between students and their supervisors is to determine the level of productivity of student guidance based on the weight values obtained based on each assessment criteria.

1. Criteria Value

Each criterion has a range of values that can be adjusted according to needs. The criteria values can be described in the following table:

Table 2. Criteria Value

No	Criteria	Score	Weight (wj)
1	Guidance Activeness		
	Excellent	100	
	Good	80	25%
	Fair	60	
	Poor	40	
2	Guidance Response		
	Very fast	100	
	Fast	80	15%
	Fair	60	
	Poor	40	
3	Communication Way		
	Excellent	100	
	Good	80	15%
	Fair	60	
	Poor	40	
4	Material Acquisition		
	Excellent	100	
	Good	80	30%
	Fair	60	
	Poor	40	
5	Problem Solving		
	Excellent	100	
	Good	80	10%
	Fair	60	
	Poor	40	
6	Report Writing		
	Excellent	100	
	Good	80	10%

No	Criteria	Score	Weight (wj)
	Fair	60	
	Poor	40	

2. Weight Normalization

The next step is to normalize the weights that have been determined for each criterion. The following is the weight normalization table:

Table 3. Weight Normalization

No	Criteria	Weight (wj)	Normalization
1	Guidance Activeness	25%	0,25
2	Guidance Response	15%	0,15
3	Communication Way	15%	0,15
4	Material Acquisition	30%	0,3
5	Problem Solving	10%	0,1
6	Report Writing	10%	0,1

3. The Recommended Values:

Table 4. The Recommended Values

No	Score	Recommendation
1	Score ≥ 80	Feasible
2	60 ≤ Score < 80	Considered
3	Score < 60	Not Feasible

4. Trial

In the final stage, it will be tested to determine the final result with several alternative decisions that may occur. The final result is useful as an evaluation of the guidance process between students and supervisors. The following are the results of the trials carried out as shown in the table below:

Table 5. Trial

No	Student	Score Utility	Normalization	Final Result
1	A	Criteria 1 : 100	0,25	
		Criteria 2 : 80	0,15	
		Criteria 3 : 80	0,15	93
		Criteria 4 : 80	0,3	
		Criteria 5 : 100	0,1	
		Criteria 6 : 100	0,1	
2	B	Criteria 1 : 80	0,25	
		Criteria 2 : 100	0,15	
		Criteria 3 : 80	0,15	
		Criteria 4 : 80	0,3	87
		Criteria 5 : 70	0,1	

No	Student	Score Utility	Normalization	Final Result
		Criteria 6 : 90	0,1	
3	C	Criteria 1 : 80	0,25	
		Criteria 2 : 80	0,15	
		Criteria 3 : 60	0,15	74
		Criteria 4 : 60	0,3	
		Criteria 5 : 80	0,1	
		Criteria 6 : 70	0,1	
4	D	Criteria 1 : 60	0,25	
		Criteria 2 : 50	0,15	
		Criteria 3 : 80	0,15	67,5
		Criteria 4 : 60	0,3	
		Criteria 5 : 80	0,1	
		Criteria 6 : 70	0,1	
5	E	Criteria 1 : 50	0,25	
		Criteria 2 : 40	0,15	
		Criteria 3 : 60	0,15	59,5
		Criteria 4 : 70	0,3	
		Criteria 5 : 60	0,1	
		Criteria 6 : 50	0,1	

5. Result of Trial

Through the evaluation that has been obtained in the test table, it can be determined the value recommendations given to students.

Table 6. Result of Trial

Student	C1	C2	C3	C4	C5	C6	Final Result	Recommendation
A	100	80	80	80	100	100	93	Feasible
B	80	100	80	80	70	90	87	Feasible
C	80	80	60	60	80	70	74	Considered
D	60	50	80	60	80	70	67,5	Considered
E	50	40	60	70	60	50	59,5	Not Feasible

6. Analysis of Results

Table 7. Analysis of Result

Criteria	Number of Students			
	Excellent Score > 80	Good 60 < Score ≤ 80	Fair 40 < Score ≤ 60	Poor Score ≤ 40
Guidance Activeness	1	2	2	-
Guidance Report	1	2	2	-

The Way of Communication	-	3	2	-
Material Acquisition	-	3	2	-
Problem Solving	1	3	1	-
Report Writing	2	2	1	-

The use of this method as a tool that can help the department to identify factors that support or hinder students in completing the final project. The identification process can be seen based on the results of the analysis of all criteria.

First, the activity of guidance. There are 4 levels in the assessment of student guidance activities, namely very good, good, sufficient and less. From the evaluation that has been done, it can be seen the number of students who are active or not active in conducting guidance. The more active and diligent students will be able to support the completion of the Final Project and vice versa, the inactivity of students in guidance will hinder the completion of the Final Project on time.

Second, the guidance response. There are 4 levels in the assessment of student guidance responses, namely very fast, fast, adequate and long. Regarding to the evaluation that has been carried out, it can be seen the number of students who are fast and long in processing responses from supervisors. The faster students respond to guidance will be able to support the completion of the Final Project on time and vice versa, the longer students respond to guidance will hinder and cause long to complete the Final Project.

Third, how to communicate. There are 4 levels in the assessment of the way students communicate, namely very good, good, sufficient and less. From the evaluation that has been done, it can be seen the number of students who communicate well with the supervisor. The better the students in communicating will be able to support the smooth completion of the Final Project and vice versa, with bad or impolite communication will hinder the guidance process with the supervisor.

Fourth, mastery of the material. There are 4 levels in the assessment of mastery of the material, namely very good, good, adequate and less. From the evaluation that has been carried out, it can be seen that the number of students who master the material from the proposed title can be seen. The better mastery of the material can support the smooth completion of the Final Project and vice versa, material that is not understood will make it difficult to complete the Final Project.

Fifth, problem solving. There are 4 levels in the assessment of problem solving, namely very good, good, sufficient and less. From the evaluation that has been done, it can be seen the number of students who are good at solving problems in completing the Final Project. The more responsive students are in finding solutions from the supervisor's revision will support the smooth completion of the Final Project.

Sixth, report writing. There are 4 levels in the assessment of report writing, namely very good, good, sufficient and less. From the evaluation that has been carried out, it can be seen the number of students who are good at writing reports based on the templates or provisions that have been set. The better the way in which the report is written, the better it can support the completion of the Final Project report.

Regarding to the exposure to the evaluation results, the department can make decisions to overcome obstacles that cause students difficulty or take a long time in completing the Final Project. Efforts can be undertaken such as increasing student motivation and providing socialization of writing a Final Project report.

4. Conclusion

Dealing with the results of the research, it can be concluded that the Implementation of the Simple Multi Attribute Rating Technique Method to Evaluate the Guidance Process for the Final Project of Students of the Applied Software Engineering Technology Program can assist majors and study

programs identify factors that are supporting and hindering students in completing the final project so that also assist in making decisions for the implementation of the final project in the next period.

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