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Selection of Outstanding Lecturers Using the Simple Multi-Attribute Rating Technique (SMART) Method

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Abstract

Lecturers play a crucial role as professional educators in the implementation of higher education through the Tridarma Perguruan Tinggi (Triple Dharma of Higher Education), which encompasses education, research, and community service. The selection of exemplary lecturers serves as both a form of recognition and a motivational instrument to enhance institutional quality. However, the selection process is often hindered by subjective assessments and the lack of standardized measurement, which may lead to dissatisfaction and diminish the objectivity of the results. This study aims to address these issues by implementing a Decision Support System (DSS) using the Simple Multi-Attribute Rating Technique (SMART) method. The SMART method was selected for its effectiveness in facilitating multi-criteria decision-making through weight assignment to priority parameters, such as scientific publications, educational qualifications, and external achievements. The results of this system implementation are provide structured, transparent, and accurate decision recommendations, ensuring that the selection of exemplary lecturers is conducted objectively based on measurable data.

Keywords: *Decision Support System, SMART, Lecturer*

1. Introduction

Lecturers are one of the elements involved in the provision of higher education. Lecturers must be professional educators with expertise in the three pillars of higher education: education, research, and community service, both in public and private universities[1][2]. As a token of appreciation for their dedication, awarding outstanding lecturers is crucial for universities. The goal is to motivate lecturers to further improve the quality of their teaching, conduct research, and contribute to society.

The process of selecting outstanding lecturers often faces challenges due to subjective assessments. Traditional assessments typically rely on subjective opinions without precise measurable standards. This can lead to dissatisfaction and reduce the objectivity of selection results. Therefore, a method is needed that can process various types of complex assessments, such as scientific publications, educational achievements, and extracurricular achievements, into accurate and clear decisions.

To address these challenges, the implementation of a Decision Support System (DSS) is a relevant solution. A Decision Support System is an information system that displays data by analyzing and implementing predetermined practices to support the decision-making process within a company[3]. Decision support systems are designed to facilitate decision-makers in solving problems using a structured approach that utilizes specific data and models. A decision support system is a part of an information system that has problem-solving capabilities to assist in making informed decisions and serve as considerations in specific decisions or policies within an organization or company[4].

There are many methods that can be used in decision support systems, but the Simple Multi-Attribute Rating Technique (SMART) method has been recognized as an effective approach for multi-criteria-based decision-making. Previous research has shown that the SMART method can provide more precise and appropriate answers in the performance evaluation process due to its ability to accommodate various parameters and weight them according to priority level[5].

The SMART method has been used in previous studies, including a study entitled "Decision Support System for Selecting High-Achieving ICT Teachers Using the SMART Method" with the criteria of Pedagogical Competence, Material Mastery, Learning Innovation, Communication, and Contribution[6]. Another study entitled Supporting corporate investment decisions using the Simple Multi-Attribute Rating Technique (SMART) method with the criteria of Price, Investor Profit Value, Productivity Support, Main Business Needs, and Ease of Investment [7]. The SMART method is also used in the Application of the SMART Method (Simple Multi-Attribute Rating Technique) in the Decision Support System for Selecting Exemplary Employees with the criteria of Experience, Length of Service Communication, Responsibility and Ability[8]. In addition, the SMART method is also used in the Development of Smart Method for Evaluating the Performance of Regional Election Monitors in Improving the Transparency of the North Sumatra KPU research with the criteria of State Apparatus Mobilization, Intimidation, Money Politics, Politicization of Social Assistance, Violation of the Quiet Period, and TPS Findings [9]. Based on the literature review, it can be concluded that the SMART method has advantages in processing diverse multi-criteria. The success of its application in selecting teachers, exemplary employees, investment decisions to the political field shows the validity of this method as a consistent and effective decision support system solution in various sectors.

2. Research Method

Conducting research requires a method that explains the steps involved in each stage. The following are the stages of the research.

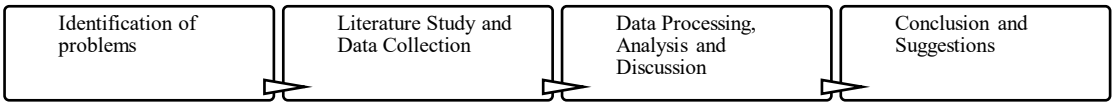

Fig 1: Research Framework

The research phase began with problem identification, specifically how to implement the SMART method in determining outstanding lecturers. This was followed by a literature review and data collection, including data on lecturers' academic positions, education, research and scientific publications, community service, achievements, and student feedback. These criteria data represent lecturer performance during the odd and even semesters.

The data obtained is then processed using the SMART method to produce recommendations for outstanding lecturers in each study program. The results of these recommendations will be announced at the end of each academic year as evaluation and motivation for each lecturer.

The following are the steps in the SMART method[10]:

1. Determine the criteria used to solve the decision-making problem.
2. Assign a weight to each criterion.
3. Calculate the normalization of each criterion by comparing the criterion weight value with the sum of the criterion weights, using the formula:

$$wj = \frac{wj}{\sum_{j=1}^{m} = wm} \quad (1)$$

Note:
a) Normalization Wj = Normalized weight of the j-th criterion
b) Wj = weight of the j-th criterion
c) M = number of criteria
d) Wm = Weight of the m-th criterion

4. Assign criteria values to each alternative.
5. Determine utility values by converting the criteria values for each alternative to standard data criteria values. These utility values depend on the nature of the criteria themselves, namely:
   a) For criteria that are "smaller is better", criteria like this are usually in the form of costs that must be incurred using the equation:

$$ui(ai) = \frac{c_{max} - c_{out}}{c_{max} - c_{min}} \quad (2)$$

   b) For criteria that are of a “bigger is better” nature, criteria like this are usually in the form of benefits using the equation:

$$ui(ai) = \frac{c_{out} - c_{min}}{c_{max} - c_{min}} \quad (3)$$

Description:
$ui\ (ai\ )$ = utility value of criterion i for alternative i
Cmax = maximum criterion value
Cmin = minimum criterion value
Cout = criterion value k

6. Calculate the final value for each criterion by multiplying the value obtained from the normalization of the standard data criteria value by the normalization of the criteria weight value. Then, add the values from these multiplications using the formula:

$$u(ai) = \sum_{j=1}^{m} w_j * u_{i(ai)} \quad (4)$$

3. Result and Discussion

The following are the results of the analysis of the selection of outstanding lecturers using the SMART method. The data presented includes the stages of criteria identification, weighting, normalization, and the emergence of the best alternative based on the assessment results.

1. Criteria Identification
   This study used six criteria in conducting the ranking: lecturers' academic positions, education, research and scientific publications, community service, achievements, and student feedback assessments.

Table 1: Criteria

No.	Criteria	Code
1	Academic position	C1
2	Education	C2

3	Research and Scientific Publications	C3
4	Community Service	C4
5	Achievements	C5
6	Student Feedback	C6

2. Determining criteria weights
The next step is to determine the weights for each criterion. The criteria weights were determined through interviews with the head of human resources.

Table 2: Criteria Weights

Criteria Code	Criteria Name	Value		Weight
C1	Academic Position	Assistant Professor	60	15%
		Lecturer	80	
		Associate Lecturer	100	
C2	Education	Bachelor's Degree	60	20%
		Master's Degree	80	
		Doctoral Degree	100	
C3	Research and Scientific Publications	Poor (<2)	60	30%
		Fairly Active (2)	80	
		Active (>2)	100	
C4	Community Service	Poor (<2)	60	10%
		Fairly Active (2)	80	
		Active (>2)	100	
C5	Achievements	No	60	15%
		Have	100	
C6	Student Feedback	Fair (<80)	60	10%
		Good (80)	80	
		Very Good (>80)	100	

3. Normalizing Criteria Weights
After determining the criteria weights, the next step is to normalize the criteria weights.

Table 3: Normalization of Criteria Weights

No.	Criteria	Weight	Normalized
1	Academic Position	15%	0.15
2	Education	20%	0.20
3	Research and Scientific Publications	30%	0.30
4	Community Service	10%	0.10
5	Achievements	15%	0.15
6	Student Feedback	10%	0.10

4. Assign criteria values to each alternative.
After performing the normalization calculation, the next step is to determine the alternatives. In this study, ten lecturer data were used as alternatives.

Table 4: Alternatives

No.	Code	Lecturer Name
1	A1	Lecturer 1
2	A2	Lecturer 2
3	A3	Lecturer 3
4	A4	Lecturer 4
5	A5	Lecturer 5
6	A6	Lecturer 6
7	A7	Lecturer 7
8	A8	Lecturer 8
9	A9	Lecturer 9
10	A10	Lecturer 10

The next step is to assign criteria values to each alternative.

Table 5: Alternative Criteria Values

Kode	C1	C2	C3	C4	C5	C6
A1	60	80	80	80	100	80
A2	60	80	80	80	100	80
A3	60	80	80	80	100	80
A4	80	80	80	80	100	80

Kode	C1	C2	C3	C4	C5	C6
A5	80	100	80	80	60	60
A6	80	100	100	80	60	80
A7	80	80	100	60	60	80
A8	80	80	80	80	60	80
A9	80	80	80	80	60	80
A10	80	80	80	80	60	80
Max	80	100	100	80	100	80
Min	60	80	80	60	60	60

5. Determine the utility value
   Determine the utility value by converting the criterion values for each criterion into standard data criterion values. All criteria are included in the benefit category.
   a. C1 Academic Position

$$A1 = \frac{60-60}{80-60} * 100\% = 0 \qquad A6 = \frac{80-60}{80-60} * 100\% = 1$$
$$A2 = \frac{60-60}{80-60} * 100\% = 0 \qquad A7 = \frac{80-60}{80-60} * 100\% = 1$$
$$A3 = \frac{60-60}{80-60} * 100\% = 0 \qquad A8 = \frac{80-60}{80-60} * 100\% = 1$$
$$A4 = \frac{80-60}{80-60} * 100\% = 1 \qquad A9 = \frac{80-60}{80-60} * 100\% = 1$$
$$A5 = \frac{80-60}{80-60} * 100\% = 1 \qquad A10 = \frac{80-60}{80-60} * 100\% = 1$$

   b. C2 Education

$$A1 = \frac{60-80}{100-80} * 100\% = 0 \qquad A6 = \frac{100-80}{100-80} * 100\% = 1$$
$$A2 = \frac{60-80}{100-80} * 100\% = 0 \qquad A7 = \frac{80-80}{100-80} * 100\% = 0$$
$$A3 = \frac{60-80}{100-80} * 100\% = 0 \qquad A8 = \frac{80-80}{100-80} * 100\% = 0$$
$$A4 = \frac{80-80}{100-80} * 100\% = 0 \qquad A9 = \frac{80-80}{100-80} * 100\% = 0$$
$$A5 = \frac{100-80}{100-80} * 100\% = 1 \qquad A10 = \frac{80-80}{100-80} * 100\% = 0$$

   c. C3 Research and Scientific Publications

$$A1 = \frac{60-80}{100-80} * 100\% = 0 \qquad A6 = \frac{100-80}{100-80} * 100\% = 1$$
$$A2 = \frac{60-80}{100-80} * 100\% = 0 \qquad A7 = \frac{100-80}{100-80} * 100\% = 1$$
$$A3 = \frac{60-80}{100-80} * 100\% = 0 \qquad A8 = \frac{80-80}{100-80} * 100\% = 0$$
$$A4 = \frac{80-80}{100-80} * 100\% = 0 \qquad A9 = \frac{80-80}{100-80} * 100\% = 0$$
$$A5 = \frac{80-80}{100-80} * 100\% = 0 \qquad A10 = \frac{80-80}{100-80} * 100\% = 0$$

   d. C4 Community Service

$$A1 = \frac{80-60}{80-60} * 100\% = 1 \qquad A6 = \frac{80-60}{80-60} * 100\% = 1$$
$$A2 = \frac{80-60}{80-60} * 100\% = 1 \qquad A7 = \frac{60-60}{80-60} * 100\% = 0$$
$$A3 = \frac{80-60}{80-60} * 100\% = 1 \qquad A8 = \frac{80-60}{80-60} * 100\% = 1$$
$$A4 = \frac{80-60}{80-60} * 100\% = 1 \qquad A9 = \frac{80-60}{80-60} * 100\% = 1$$
$$A5 = \frac{80-60}{80-60} * 100\% = 1 \qquad A10 = \frac{80-60}{80-60} * 100\% = 1$$

e. C5 Achievements

$$A1 = \frac{100-60}{100-60} * 100\% = 1 \qquad A6 = \frac{60-60}{100-60} * 100\% = 0$$
$$A2 = \frac{100-60}{100-60} * 100\% = 1 \qquad A7 = \frac{60-60}{100-60} * 100\% = 0$$
$$A3 = \frac{100-60}{100-60} * 100\% = 1 \qquad A8 = \frac{60-60}{100-60} * 100\% = 0$$
$$A4 = \frac{100-60}{100-60} * 100\% = 1 \qquad A9 = \frac{60-60}{100-60} * 100\% = 0$$
$$A5 = \frac{60-60}{100-60} * 100\% = 0 \qquad A10 = \frac{60-60}{100-60} * 100\% = 0$$

f. C6 Student Feedback

$$A1 = \frac{80-60}{80-60} * 100\% = 1 \qquad A6 = \frac{80-60}{80-60} * 100\% = 1$$
$$A2 = \frac{80-60}{80-60} * 100\% = 1 \qquad A7 = \frac{80-60}{80-60} * 100\% = 1$$
$$A3 = \frac{80-60}{80-60} * 100\% = 1 \qquad A8 = \frac{80-60}{80-60} * 100\% = 1$$
$$A4 = \frac{80-60}{80-60} * 100\% = 1 \qquad A9 = \frac{80-60}{80-60} * 100\% = 1$$
$$A5 = \frac{60-60}{80-60} * 100\% = 0 \qquad A10 = \frac{80-60}{80-60} * 100\% = 1$$

After determining utility based on its criteria, the next step is to calculate the utility value.

Table 6: Utility Value Calculation Matrix

Code	C1	C2	C3	C4	C5	C6
A1	0	0	0	1	1	1
A2	0	0	0	1	1	1
A3	0	0	0	1	1	1
A4	1	0	0	1	1	1
A5	1	1	0	1	0	0
A6	1	1	1	1	0	1
A7	1	0	1	0	0	1
A8	1	0	0	1	0	1
A9	1	0	0	1	0	1
A10	1	0	0	1	0	1

6. Determine the final grade
The next step is to determine the final grade.

Table 7: Final Grade

Code	C1	C2	C3	C4	C5	C6	Final Grade
A1	0	0	0	1	1	1	3
A2	0	0	0	1	1	1	3
A3	0	0	0	1	1	1	3
A4	1	0	0	1	1	1	4
A5	1	1	0	1	0	0	3
A6	1	1	1	1	0	1	5
A7	1	0	1	0	0	1	3
A8	1	0	0	1	0	1	3
A9	1	0	0	1	0	1	3
A10	1	0	0	1	0	1	3

Based on the calculation results using the SMART method, the data obtained for lecturer A6 with the highest final value, namely 5, so that lecturer A6 can be selected as an outstanding lecturer.

4. Conslusion

Based on the research results of the Selection of Outstanding Lecturers Using the SMART Method, it can be concluded that the SMART Method has successfully transformed the assessment method from being solely based on personal opinion to being more measurable and

certain. By weighting criteria such as Education, Research, Community Service (Tri Dharma), as well as other supporting criteria, the final results obtained better reflect the lecturer's actual performance. The SMART method has proven effective in providing recommendations for the priority order (ranking) of outstanding lecturers. Its linear and additive nature makes it easier for decision-makers to understand how each criterion value affects the final score. The use of this system also helps reduce the risk of conflicts of interest and errors that may occur due to human factors. This system provides lecturers with a clearer understanding of the indicators that have a significant impact, thereby encouraging improved performance in the future.

For future research, it is recommended to compare or combine the SMART method with other methods such as AHP to determine more consistent criteria weights, or TOPSIS to check the extent to which ranking results are affected by changes in these factors. In addition, it is recommended to continue to adjust the weights and assessment criteria periodically in accordance with the latest standards from the Ministry of Education, such as the integration of SINTA values, the number of citations from Scopus, or more specific IPR outputs, so that the assessment results remain in line with global demands.

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