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Determination of Exemplary Lecturer Decision Making with Modified Attributes and Criteria Prioritization Technique

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ABSTRACT

The problem of determining exemplary lecturers is included in the multi-criteria decision making problem because the assessment can be based on predetermined assessment criteria. Consequently, determining exemplary lecturers is an important aspect of improving the quality of education in an institution. In order for the final outcomes of exemplary lecturers to be objective and to examine various values for each criterion and criterion characteristic, decision-making processes are obviously required. Consequently, the goal of this study is to provide a model for evaluating the performance of exemplary lecturers by employing decision making with changed criterion characteristics and criteria prioritization strategies based on the Rank Order Centroid (ROC) method. At the end of the procedure, the best alternative will be chosen based on the choice assessment model for identifying excellent lecturers with a case study at institution XYZ. Analysis of the final results revealed that the decision assessment model was influenced by modifying the assessment attributes using a Likert scale. The final results revealed that one of three alternative candidates for exemplary lecturer was selected based on alternative values for each criterion.

Keywords: Decision Model Analysis; Determination od Exemplary Lecturer; Rank Order Centroid;Modified Attributes

1. INTRODUCTION

The Society 5.0 era is the concept of a technologically advanced and seamlessly integrated smart society. In the era of Society 5.0, humans and technology collaborate to build a more productive, efficient, and sustainable society. For instance, in the sphere of education, particularly at the postsecondary level, the academic community includes professors and students as technology users in learning(Fauzi et al., 2023). Professors have a crucial role in fostering the growth of the Society 5.0 period. Lecturers must be able to serve as models for their students and peers by consistently enhancing their technological skills, establishing ability-based curriculum, engaging in research and innovation, and encouraging student entrepreneurship. Students can be prepared to meet future issues and play an active role in constructing a sustainable smart society with the help of their instructors(Muhammad Wali et al., 2023).

Determining model lecturers is one of the important things in improving the quality of education in an institution. A lecturer is of course synonymous with the obligations of the Tri Dharma of Higher Education, which on the other hand requires lecturers to meet the criteria so that a lecturer must have many competencies. For example, in relation to technological developments, a lecturer must have the ability and skills to integrate technology in teaching(Johan & Ahmalia, 2019), lecturers must also be able to adjust to updated curriculum so that it is relevant to the needs of the job market, lecturers can assist students in developing an entrepreneurial spirit from an early age and what is no less important is that lecturers must be involved in research and innovation to support the development of the Society 5.0 era. Lecturers must update their knowledge in the latest technology. In reality, not all abilities and competencies can be achieved by a lecturer because there are many factors in fulfilling them, so to determine an exemplary lecturer you can use the assessment criteria that have been set internally by the institution.

In the context of evaluating lecturer performance, the criteria assessed are usually adjusted to the obligations of the Tri Dharma of Higher Education which include teaching, research, and community service(Nyoto, 2021; Usanto,

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2022). In teaching, lecturer performance can be assessed based on the quality of the material presented, teaching methods, interactions with students, and evaluations from students. In research, lecturer performance can be assessed based on the number of publications, the level of success in obtaining research funding, and contributions to the development of science. Whereas in community service, the performance of lecturers can be assessed based on the activities carried out, such as training and providing consultations, as well as the impact resulting from these activities(Setyowati, 2020).

The importance of measuring a lecturer's performance barometer is not to make subjectivity comparisons but this can be useful for institutions so they can evaluate the extent to which lecturers have achieved the set goals, and know the strengths and weaknesses of each lecturer. This can assist institutions in developing human resource development plans, providing training and development as needed, and improving the quality of teaching and research.In the process of determining exemplary lecturers, they are included in the multi-criteria decision making(Ningtyas et al., 2022; Nurlaela & Usanto, 2021), there needs to be a system or method that can assist in decision making. One method that can be used is decision support(Sudipa et al., 2023; Usanto et al., 2022).

Decision support is a system or method that can assist in decision making by providing accurate and objective information and analysis(Udayana et al., 2023). In the context of determining exemplary lecturers, decision support can assist in identifying lecturers who have exemplary performance, based on certain criteria. So in this study proposes a model for evaluating the performance of exemplary lecturers by applying decision making with modification of the attribute criteria and criteria priority techniques using the Rank Order Centroid (ROC) method. The reason for using the ROC method is due to the surrogate weighting technique or replacement weight technique(Sudipa & Aryati, 2019; Sureeyatanapas, 2016), where the decision maker only determines the priority order of each criterion so that the ROC technique can generate criteria weights automatically from the calculation results(Kunsch & Ishizaka, 2019)Of course, this technique can make it easier for the lecturer performance appraisal team to make decisions objectively.The decision assessment model can produce the final score for ranking the best alternative seen from the largest value of the ranking, at the end of the process the best alternative will be selected based on the decision assessment model for determining exemplary lecturers with case studies at XYZ institutions.

2. LITERATURE REVIEW

Some research that applies the method of decision support systems related to the determination of lecturer decisions, namely(Madona, 2020)which uses the criteria of teaching time, neatness of dress, communication, lecture process, mastery of material and evaluation of learning using the Mamdani fuzzy. Furthermore, there is research by(Labolo, 2020)which applies the ARAS (Additive Ratio Assessment) method as a multi-criteria decision-making method based on the concept of ranking using a utility degree by comparing the overall index value of each alternative to the overall optimal alternative index value. other research that examines the selection of the best lecturers namely(Suranti, 2021)who explained that the use of the SMART method is because this method is a multi-criteria decision-making technique where each alternative consists of a number of criteria that have values and weights that describe how important they are compared to other criteria. While research that applies attribute modification and criteria priority techniques with the ROC method is carried out in research(Ahn, 2017; Sudipa et al., 2022)which explains the use of criteria weighting techniques with ROC can help decision makers with uncertain conditions in determining the priority weights of incomplete criteria or attributes that affect the final ranking process(Kunsch & Ishizaka, 2019; Sucahyo & Nurlaela, 2021; Sudipa & Puspitayani, 2019). The ease in determining the weight of criteria with the ROC method was later developed in various studies and was intended to complement other methods(Hatefi, 2023; I Gede Iwan Sudipa, 2018; B. K. Wijaya et al., 2022; Zega et al., 2023). So that in this study the criteria priority technique was selected using the ROC method to facilitate decision makers in determining alternative exemplary lecturers based on alternative values for each weighted criterion which can provide differences from each criterion in producing the final ranking value.

3. METHODS

3.1. Rank Order Centroids

ROC is an extension of the SMARTS (Simple Multi Attribute Rating Technique Using Swings) method to

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SMARTER, by adding ROC calculations to determine elicitation weights for criteria(Danielson & Ekenberg, 2017), which was originally the SMARTS method still using swing weighting by decision makers with a scale of 0 to 100 or 0 to 1(Barron & Barrett, 1996)(Kunsch & Ishizaka, 2019; B. K. et al Wijaya, 2022).

$$C1 \geq C2 \geq C3 \geq \ldots \geq Cn \quad (1)$$

To calculate the weight value, it is determined by the rules, namely:
$W1 \geq W2 \geq W3 \geq \ldots \geq Wn \geq 0; \sum_{j=1}^{n} \overline{W}_j = 1$
Where W1 is the weight for all criteria C1, so the values W1 to Wj are shown in equation 1.

$$W1 = ( )/K1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{k} \quad (2)$$
$$W2 = ( )/K0 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{k}$$
$$Wj = ( )/K0 + \ldots + 0 + \frac{1}{k}$$

if K is the number of criteria, then the weight value of the jth criterion is formulated by multiplying 1/K by the total number of 1/i, where i = 1,2,3..,j, as follows:

$$\mathrm{Wj} = \frac{1}{\mathrm{K}} \sum_{i=j}^{\mathrm{K}} \left(\frac{1}{i}\right) \quad (3)$$

Information:
Wj = weighted value of the k-th attribute
K = number of attributes
i = attribute priority order value

3.2. Decision Making Model

There is an exemplary lecturer decision-making model used in this study,The model proposed in this study uses the ROC technique to determine the criteria weight and modify the criteria attributes using a Likert value scale. The decision model is intended to facilitate decision makers in determining the stages of decision making. The decision-making model can be seen in Figure 1 below.

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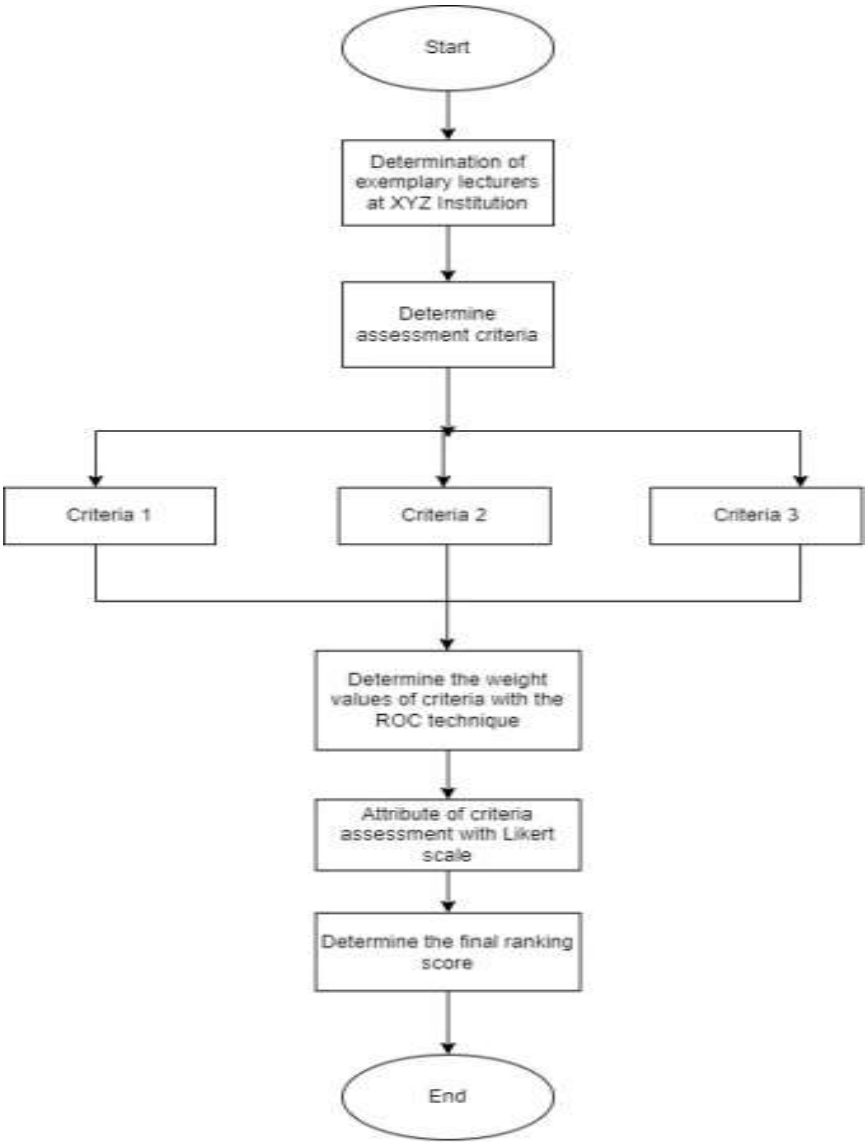

Fig. 1 Exemplary Lecturer Decision Making Model

Based on Figure 1, it can be explained that the decision-making model in this study in completing the selection of exemplary lecturers starts from determining the decision problem, namely determining the selection of exemplary lecturers at XYZ institutions. At the beginning of the assessment process, the assessment criteria are first determined, namely there are 3 main criteria or symbolized (C) obtained from the tridharma rules of higher education which are the obligations of lecturers in the field of education (C1), research (C2) and community service (C3).), on each criterion will be modified by giving attributes to each criterion to facilitate the process of evaluating each alternative on each criterion. In determining the weight value of the criteria, the ROC technique is used to make it easier for decision makers to find out the criteria priority,(Nurlaela, 2018), the goal is to facilitate the process of scoring criteria attribute values that reflect alternative performance on each criterion attribute. In determining the total value of the criteria, it is obtained from adding the attribute values of the criteria using the following equation (4).

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Criteria Total Value = ∑criteria attribute (4)

To determine the final ranking value, it is done by calculating the addition of the multiplication of the criterion weight value with the criterion value. It can be seen in equation (5) below.

Ranking Final Value = $\sum_{j=1}^{n} criteria\ weight * criteria\ value$ (5)

4. RESULTS AND DISCUSSION

4.1. Calculation of Final Ranking Value

In calculating the final value of the alternative ranking, it is obtained from the alternative values for each criterion. Alternative values that have been calculated using a Likert scale, can then proceed to the process of calculating the final value.

This section describes the analysis of the criteria, the assessment of the criteria attributes and the alternative values for each criterion.

1. Criteria Attribute Analysis

In the analysis of the attribute criteria it can be explained that based on the exemplary lecturer decision-making model, there are 3 assessment criteria namelyeducation (C1), research (C2) and community service (C3). Each criterion has an attribute rating to make it easier to determine alternative performance values for each criterion, as well as the value of each attribute (j) using a Likert scale. The following is an explanation of the attributes on each criterion.

Table 1
Attributes from Criterion C1

Attribute symbol (j)	Attribute Name	Attribute scale	Liker Scale Value
J1	Variation of Learning Materials	Varies greatly	5
		Enough	3
		Less varied	1
J2	Teaching Method	Very good and can make students quickly understand	5
		Too much theory and students tend to get confused about the material being taught	2
		lack of applying teaching methods.	1
J3	Hardskills and Softskills	Very good	5
		Good	3
		Not enough	1
J4	Evaluation Value of Students	Very good	5
		Good	4
		Enough	3
		Not enough	2
		Less	1

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Table 2
Attributes of Criterion C2

Attribute symbol (j)	Attribute Name	Attribute scale	Liker Scale Value
J5	Number of publications in each semester	> 5 publications	5
		1 to 5 publications	3
		There isn't any	1
J6	Success in obtaining research grants	Ministry of Research and Technology grants	5
		Internal Grants	3
		There isn't any	1
J7	Creation of Prototypes and Intellectual Property Rights	There is	4
		There isn't any	1
J8	Book Writing every semester	There is	4
		There isn't any	1

Table 3
Attributes from Criterion C3

Attribute symbol (j)	Attribute Name	Attribute scale	Liker Scale Value
J9	The number of community service activities in each semester	> 3 activities	5
		1 activity per semester	3
		There isn't any	1
J10	Activeness in journal management	There is	4
		There isn't any	1
J11	Active participation in organizations outside the institution	There is	4
		There isn't any	1

Based on table 1, table 2 and table 3, it can be explained that attribute modifications can be carried out in accordance with the assessment provisions at each institution. This can also be done in determining the scale of attributes that can be adjusted, analysis is needed in determining attribute modifications and adjusting scale values.

Table 4.
Calculation of Criteria Weight Value

Priority Order	Criteria	Calculation of Weight Value
1	Field of education	$W1 = x = 0.611\frac{1}{3}(\frac{1}{1}+\frac{1}{2}+\frac{1}{3})$
2	Field of Research	$W2 = x = 0.278\frac{1}{3}(\frac{1}{2}+\frac{1}{3})$
3	Field of Community Service	$W3 = x = 0.111\frac{1}{3}(\frac{1}{3})$

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2. Alternative Value Calculation Simulation Analysis

At the alternative value analysis stage, a simulation example can be determined from calculating alternative performance values for each attribute (j), there are 3 alternative examples (A) of exemplary lecturer candidates. Lecturer alternative values for each criterion attribute can be seen in Table 5 below.

Table 5.
Alternative Values on Criteria Attributes

Alternative	C1				C2						C3
	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11
A1	5	2	3	5	1	3	1	1	3	1	1
A2	3	2	3	3	5	5	4	4	3	1	1
A3	3	2	3	3	3	1	1	4	5	4	4

Based on table 5 above, it can be explained that there are alternative values for each criterion attribute that has been given using a scale of 1 to 5. There are 3 selected alternatives for exemplary lecturer candidates. Then calculate the total value of the criteria using equation (4). Alternative values for each criterion can be seen in Table 6 below.

Table 6.
Alternative Value on Each Criterion

Alternative	C1	C2	C3
A1	15	6	5
A2	11	18	5
A3	11	9	13

3. Calculation of Final Ranking Value

In calculating the final value of the alternative ranking, it is obtained from the alternative values for each criterion. Alternative values that have been calculated using a Likert scale, can then proceed to the process of calculating the final value.

Alternative final value A1 = (16*0.611)+(6*0.278)+(5*0.111) = 11.389
Alternative final score A2 = (11*0.611)+(18*278)+(5*0.111) = 12.278
Alternative final value A3 = (11*0.611)+(9*278)+(13*0.111) = 10.667

Based on the results of calculating alternative values, an alternative ranking table can be made. To determine the best value sorted from the highest alternative final value to the smallest value. The final value of the alternative ranking of exemplary lecturer candidates can be seen in Table 7 below.

Table 7.
Alternative Ranking Value

Alternative	Final score	ranking
A2	**12,278**	**1**
A1	11,389	2
A3	10,667	3

Based on table 7 it can be explained that the best alternative for exemplary lecturers is alternative A2 with a value of 12,278, because the initial goal of making a decision is to determine the ranking of the final grades and determine the best alternative, so only 1 lecturer is selected as the best alternative for exemplary lecturers.

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The results of the analysis of the alternative ranking results are the alternative values for each attribute in Table 5. It can be seen that alternative A1 tends to have an alternative value in the criteria for education (C1) which is relatively higher than alternatives A2 and A3. While the value of alternative A2 is greater in the field of research criteria (C2) than alternatives A1 and A3 and the value of alternative A3 is greater in the field of service criteria (C3) than alternatives A2 and A3. If seen from the final results, it shows that alternative A2 is the best alternative, so that the alternative value in the research field criteria (C2) affects the final ranking value. Of course, these results are also influenced by modifications to the attribute assessment carried out by decision makers

5. CONCLUSION

The conclusion of the research isin the context of determining exemplary lecturers, decision support can assist in identifying lecturers who have exemplary performance, based on certain criteria. So this research proposes a model for evaluating the performance of exemplary lecturers by implementing decision making with modification of the attribute criteria and the criteria priority technique using the Rank Order Centroid (ROC) method. The results showed that of the 3 alternative exemplary lecturer candidates, 1 was selected as the best alternative based on alternative values for each criterion, analysis of the final results showed that the decision-assessment model was influenced by modifications to the assessment attributes so that it could be a suggestion for further research, namely making attribute assessments according to the assessment parameters needed and can combine with methods for ranking.

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