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Selection of the best lecturers using the Simple Additive Weighting method

Achmad Noeman[1], Wowon Priatna[2], Abrar Hiswara[3]

Department of Informatics, Faculty of Computer Science,

Universitas Bhayangkara Jakarta Raya Jalan Raya Perjuangan Bekasi Utara, West Java, Indonesia[1,2,3]

Abstract: In the process of determining the best lecturer by students, there are several criteria, including in terms of explaining the material, teaching methods, which make it easier for students to follow their courses. To assist in the selection process for someone to become the best lecturer for students, a decision support system is needed using Fuzzy Multiple Addictive Decision Making (FMADM). This study uses the SAW (Simple Addictive Weighted) method based on predetermined criteria. The SAW method can determine the selection of the best lecturer based on predetermined criteria for students, as well as looking for the weight value of each attribute to get the best lecturer.

Keywords: Fuzzy Multiple Addictive Decision Making, SAW Method, Decision Support System, criteria for the best lecturers

I. INTRODUCTION

lecturers who are liked by students are a must in creating a comfortable and smooth learning process in the classroom that makes students enthusiastic about participating in the lecture process so that the learning process is more effective. Lecturers are professional educators and scientists with the main task of transforming and developing knowledge[1].

Bhayangkara Jakarta Raya University is a higher education institution that seeks to improve the quality of the learning process so that it can produce graduates who have competencies in their fields. Based on the Law of Republic of Indonesia No. 14 of 2005 concerning Teachers and Lecturers, that lecturers are entitled to promotions and awards according to with his academic performance[2].

With the appreciation of lecturers it can increase motivation which will have an impact on the development of academic management in universities. Lecturers who have achievements will be proud of their universities. So it is necessary to choose the best lecturer.

In selecting the best lecturers at Bhayangkara Jakarta Raya University, there are several factors that become performance assessments, namely the teaching and learning process, questionnaires, student guidance, research and community service[3]. In selecting the best lecturer, computer tools are needed to obtain a decision support system[4] carried out by the decision maker[5].

This study uses the Simple Additive Weighting (SAW) method. The SAW method is used to determine weights and criteria.

II. RESEARCH METHODOLOGY

A. Analysis Data

The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method requires a decision matrix normalization process (X) to a scale that can be compared with all available alternative ratings. The SAW method requires a decision matrix normalization process (X) to a scale that can be compared with all available alternative ratings.

Fuzzy Multiple Addictive Decision Making (FMADM) is a method used to find optimal alternatives from a number of alternatives with certain criteria[6]. The essence of FMADM is to determine the weight value for each attribute, then proceed with a ranking process that will select the criteria.

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The steps in the SAW method are:

1. Make a decision matrix R measuring m x n, where the alternative is selected and n = criteria.
2. Give each alternative an X value (i) on each criteria (j) which has been determined, for example : i = 1, 2,…m dan j = 1,2,…n on the decision matrix R. as shown in Fig. 1

$$R = \begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \dots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \dots & x_{3n} \\ \dots & \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & x_{m3} & \dots & x_{mn} \end{bmatrix}$$

Fig. 1 Decision Matrix R

3. The preference weight value (T) is a predetermined criteria
4. normalizing the decision matrix R by calculating the normalized performance rating (rps) value of the alternatives on the Cs attribute. As the picture shows. 2.

$$r_{ps} = \begin{cases} \dfrac{X_{ps}}{Max_i X_{ps}} & \text{If (s) is the profit attribute} \\ \dfrac{Min\, X_{ps}}{X_{ps}} & \text{If (s) is the cost attribute} \end{cases}$$

Fig. 2 calculate the normalized performance rating value

5. Forming a normalized matrix (Z). As shown fig. 3.

$$Z = \begin{pmatrix} r_{11} & r_{12} & r_{13} & \dots & r_{1s} \\ r_{21} & r_{22} & r_{23} & \dots & r_{2s} \\ r_{31} & r_{32} & r_{33} & \dots & r_{3s} \\ \dots & \dots & \dots & \dots & \dots \\ r_{p1} & r_{p2} & r_{p3} & \dots & r_{ps} \end{pmatrix}$$

Fig. 3 normalized matrix (Z).

6. Determining the preference value for each alternative (V) by adding the product of the normalized matrix (Z) and the preference value (W). As shown Fig. 4

$$V_p = \sum_{S=1}^{n} w_s r_{ps}$$

Fig. 4 Determining the preference value

B. Application of Simple Addictive Weighted (SAW)

The stages of application Simple Addictive Weighted are :

1. Weighting To determine the best lecturer, the first stage is to determine the assessment criteria and the weight of each criterion.
2. Determine the value of the matrix to give a decision R of size m x n obtained from the weighted results.
3. Determining the input score decision matrix then calculating the normalization (R) by using a formula that matches the type of attribute criteria.
4. Calculation of preferences (Vs) can be done when the normalization process has been completed and the results are known. After that all the normalization results are entered into the Preference formula (Vs).

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III. RESULTS AND DISCUSSION

A. Determine the weight of the criteria in determining the best lecturer, we need the weight of the criteria used. as shown in table 1.

Code	Criteria	Weight	Explanation
C1	lecturers have extensive knowledge	0,4	Benefit
C2	Have research and dedication to task	0,25	Benefit
C3	using renewable teaching methods	0,15	Benefit
C4	Have competence	0,1	Benefit
C5	Share knowledge	0,1	Benefit
Total		1	

Table 1. criteria in determining the best lecturer

B. Determine the value of the matrix obtained from the calculation of each criterion. This calculation is the basis for determining the normalized value (R) and the preference value (Vs). the input matrix value can be seen in table 2.

Kriteria	Nama Dosen				
	A1	A2	A3	A4	A5
has knowledge of IT technology developments	91	70	90	80	85
always to do Research and Community dedication	88	80	85	70	75
do development in teaching	86	75	70	80	80
have competencies	84	80	90	90	80
share knowledge with colleagues	84	95	75	95	90

Table 2. Input value matrix

The score input in the table above for each of the criteria C1, C2, C3, C4, C5 is already in the form of the initial matrix value. The initial matrix values as shown as in table 3.

Alternatif	Kriteria				
	C1	C2	C3	C4	C5
A1	91	88	86	84	84
A2	70	80	75	80	95
A3	90	85	70	90	75
A4	80	70	80	90	95
A5	85	75	80	80	90

Table 3 The score of criteria initial matrix

C. Determine the R Matrix (Normalized) to calculation of normalization (R) is carried out using a formula that is in accordance with the attribute type of the assessment criteria, because in this case all the attribute criteria are benefit, formula (2) is used. The results of the normalized R matrix. As shown as table 4.

Alternatif	Criteria				
	C1	C2	C3	C4	C5
A1	1	1	1	0,93	0,88
A2	0.76	0,9	0,87	0,88	1
A3	0,98	0,96	0,81	1	0,78
A4	0,87	0,79	0,93	1	1
A5	0,93	0,85	0.93	0,88	0,94

Table 4. results of the normalized R matrix

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D. Preference Calculation (Vs) is the result of normalization entered into the Preference formula (Vi), namely formula (3) as provided that the weight (W) = [0.4 0.25 0.15 0.1 0.1]. To get preference (Vs), each normalized alternative column is multiplied by a predetermined weight. The calculation results are shown in table 5.

Alternatif	Nilai Preferensi
V5 = A5	0,906
V4 = A4	0,885
V3 = A3	0,9315
V2 = A2	0,8475
V1 = A1	0,621

Table 5. Preference Calculation

Then the ranking is done so that the results are in table 6.

Alternatif	Nilai Preferensi	Rangking
V5 = A5	0,906	1
V4 = A4	0,885	2
V3 = A3	0,9315	3
V2 = A2	0,8475	4
V1 = A1	0,621	5

Table 6. The result ranking

From the results of the calculation of preferences that have been ranked, the result is that V5 or A5 has the highest value, and these results can be used as decision support in determining the best lecturer at Bhayangkara University, Jakarta Raya.

E. Design of System

To design the system with UML (Unified Modelling Language) diagrams which function to model users who interact with the system. Use case diagrams and class diagrams for decision support systems to determine the best lecturers are shown in Figure 5.

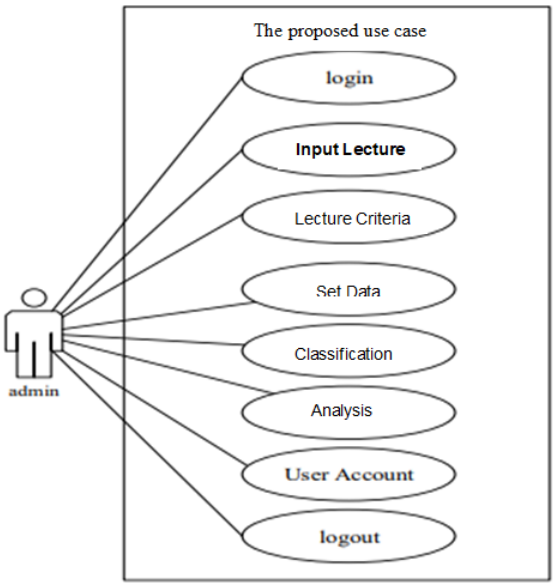

Fig. 5 Use case Diagram

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F. Application Design Results

- Main Menu Application is functions as the start page of a system after logging in and as a link between one menu and another. As shown figure 6.

Figure 6. Main menu application

- Lecturer Data Page is functions to see lecturer data and add, change, and delete lecturer data. As shown figure 7.

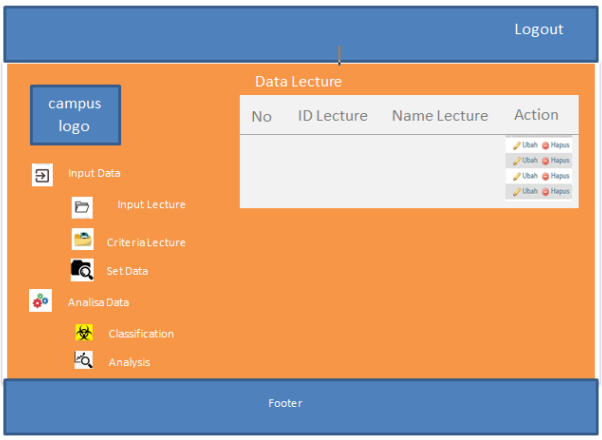

Figure 7. Data Lecture

- The data criteria page functions to view the criteria for lecturer. As shown as figure 8.

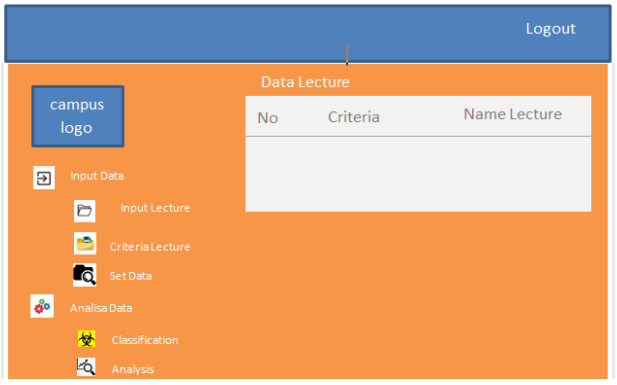

Figure 8. Criteria lecture

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IV CONCLUSION

Based on the research and discussion, it is possible concluded several things as follows.

- In this research, a support system application has been developed decision support system to determine best lecturers.
- With this decision support system application can help on Bhayangkara Jakarta Raya University work partners to get faster the highest score to determine the best lecturer
- In this Decision Support System application using the Fuzzy SAW (Simple Addictive weighting) to calculate the weight value of the criteria and carry out the process ranking. Where these criteria are given a weighted value and weight value is normalized and then the weight value is calculated and produce the highest ranking.

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