Developing Decision Support System: Assessing the Lecturers’ Performance with Additive Weighting Method

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Abstract: Tri Dharma of higher institution is one of the objectives that should be carried out by the college, in order to that objective is achieved, so assessing the performance of lecturers is carried out in every certain period. This study aimed to develop decision support system in assessing performance which include education, research assessment, community service and the support of Tri Dharma using simple additive weighting (SAW) method so it can assist in deciding the performance of lecturer at college, thus the process of assessing the performance of lecturers can be more efficient. The result of study is in the form of alternative ranking which is from the calculation of lecturers’ weigh value based on the criteria that has been determined.

Keywords: SAW, performance, assessment, decision support system

1. Introduction

Lecturers are one of the essential component in a education system of higher institution. The role, the obligation and the responsibility of lecturers are important in achieving the objectives of national education, which are to educate the nation, increase human quality, which includes faith/piety, noble moral and the mastery of knowledge, technology and the art and creating Indonesians become more forward, fair, prosperous, and civilized. The competence of educators, especially lecturers can be defined as a set of knowledge, skill and behavior that should be owned, perceived, mastered, and manifested by lecturers in carrying out their professional duties. The major duty of lecturers is that the implementation of Tri Dharma of higher institution which include research, community service and the presence with workload at least 12 SKS. The measurement of lecturers performance is important thing in order to evaluate and plan the objectives. Therefore, assessing the lecturers performance has to be carried out. At Computer Science Faculty, the assessment of lecturers performance remain using manual assessment in calculating the presence, reasearch and community service. Thus, the role of a decision support system is needed for the conformity assessment of work performance at Computer Science Faculty using Simple Additive Weighting (SAW) method for determining evaluation result of the performance of lecturers professionally.

Furthermore, a system is a network from the procedures that are connected, congregated together to make an activity or to accomplish a certain target. Every subsystem consists of smaller subsystems or components. Decision support system (DSS) is a part of information system computer-based including system based knowledge or management knowledge which is used to support the decision making in a organization or company. It can be mentioned that as a computer system that process the data become information to make a decision from the specific semi-structured problem.

According to Moore and Chang, DSS can be described as a system that can support the analysis of ad hoc data, and decision model, decision-oriented, the orientation of future planning and used in uncommon time. Moreover, according to Keen and Scoot Morton, Decision Support System is a combination of individual intelligence sources with the component power to fix the quality of decision. Decision Support System is also a information system based computer for the management of decision making that are fixing semi-structured problem. Based on the definition above, it can be explained that DSS is not a decision making tool, but it is a system that can assist to make decision. by completing it with information from the data that have been processed relevantly and needed to make
decision about certain problem become faster and more accurate. Thus this system is not aimed to replace the decision making in the process of decision making. Factor that affects the performance of individual includes skill, motivation, discipline, the existence of their working, rewards or incentives, their relationship with organization and many more factors. Organization or company, their performance depends on their worker. There are many ways to think about kinds of performance that needed by worker for a company in order to make them success, one of that ways is by considering three element, which include productivity, quality and service.

Based on Simple Additive Weighting (SAW) is familiar with the term of weighted sum. The basic concept of SAW method is to find the weighted sum from performance rating in every alternative at all of attributes. SAW method needs process of normalization decision matrix (X) in a scale that can be compared to all ratings. \( X_{ij} \) if \( j \) is a benefit attribute. Assessment in the study entitled “The Implementation of SAW Method for decision support system to assess the performance of lecturers in Muhammadiyah University Purwokerto” aimed to assist in assessing the performance of lecturers that carried out by quality insurance agency in order to give assessment to lecturers based on the indicator, formula and valid assessment.

The study of Implementing Simple Additive Weighting Method to Assess the Performance of Lecturers, the monitoring of lecturers performance is also useful to monitor lecturer that has good performance thus it is needed to get education development and rewards and for the lecturer that does not have good performance yet can get training to sharpen his/her softskill and hardskill. Study in the study that using SAW method aimed to find out the accuracy of SAW fuzzy method in determining the lecturers performance with their Tridharma by calculating the weigh and criteria that has been determined. A study entitled “Decision Support System in Choosing Well-Performed Lecturer at STMIK Tasikmalaya Using Simple Additive Weighting (SAW) Method”, the assessment used at STMIK Tasikmalaya is that using determination of Lecturers Assessment Index and carried out manually. For those who have highest score, so she/he can be a well-performed lecturer and get awards from agency. A study entitled “Decision Support System to Determine Scholarship Awardee Using Simple Additive Weighting (SAW) Method (A Case Study at MTS Al-Maidah Kotaanan)”, can be used as information displayed in the form of sequence alternative score, start from the lowest to the biggest from each criteria and the processed criteria include the average score of report, the income of family, semester, and the total of parents’ charge.

2. Methodology

SAW Method needs the process of normalization decision matrix (X) in certain scale that can be compared to all ratings. \( x_{ij} \) if \( j \) is benefit attribute.

\[
ri_j = \begin{cases}
\frac{x_{ij}}{\max_i x_{ij}} & \text{if } j \text{ is benefit attribute.}
\end{cases}
\]

**Description:**
- \( r_{ij} \): normalized performance rating
- \( \max_i x_{ij} \): maximum score from each row and column
- \( \min_i x_{ij} \): minimum score from each row and column
- \( X_{ij} \): row and column from matrix
- \( r_{ij} \) is normalized performance rating from Ai alternative at attribute Cj; \( i=1,2,\ldots,m \) and \( j=1,2,\ldots,n \).
Preference score for every alternative (Vi) is given as:

\[ V_i = \sum_{j=1}^{n} w_j r_{ij} \]

Description:
Vi : last score from alternative
Wi : determined weigh
Rij : normalization of matrix
Higher Vi score indicates that Ai alternative is more elected.

The stage in using SAW method are:
1. determine the criteria that will be used as reference in decision making, which is Ci
2. determine the match rating in each alternative of criteria.

To make decision matrix based on criteria (Ci), then Make matrix normalization based on similarity that adjusted with kinds of attribute (benefit and cost attribute) thus it can obtain normalized matrix R. The final result is obtain from each ranking process, which is the total from the multiplication of normalized matrix R with weigh vector thus it obtains the highest score which is selected as the best alternative (Ai) as a solution.

3. Findings and Discussion

The Analysis of Simple Additive Weighting Method

This system is designed to determine the assessment lecturer performance using Simple Additive Weighting Method adjusted with criteria that have been determined such as questionnaire, research assessment, community service and the presence at campus and being entered in formula. The basic concept of Simple Additive Weighting Method needd the process of normalization decision matrix (X) in a scale that can be compared to all ratings. Xij if j is a benefit attribute. The formula used is as follows:

\[ r_{ij} = \begin{cases} \frac{x_{ij}}{\text{Max} x_{ij}} & \text{if } j \text{ is a benefit attribute} \\ \frac{x_{ij}}{\text{Min} x_{ij}} & \text{if } j \text{ is a cost attribute} \end{cases} \]

Preference Score for each alternative (Vi) is given as follows:

\[ V_i = \sum_{j=1}^{n} w_j r_{ij} \]

Description:
Vi : last score from alternative
Wi : determined weigh
Rij : Normalization of matrix
The highest score indicates that alternative Ai is elected.
4. Analysis Stage

In the stage of assessing lecturers performance, criteria code for lecturer is that A1, the presence is C1, research is C2, community service is C3, and questionnaire is C4, based on the formula, this stage is analyzed first.

|   | C1 | C2 | C3 | C4 |
|---|----|----|----|----|
| A1 | 4  | 4  | 1,4| 70,5|
| A2 | 4,2| 3  | 1,4| 80 |
| A3 | 4  | 3,7| 0,6| 29,01|
| A4 | 4,5| 3  | 0,8| 83,1|
| A5 | 4,5| 4  | 0,8| 84,5|

Normalization stage

|   | C1 | C2 | C3 | C4  |
|---|----|----|----|-----|
| A1 | 0,4| 0,3| 0,2| 0,35|
| A2 | 4  | 4  | 1,4| 70,5|
| A3 | 4  | 3,7| 0,6| 29,01|
| A4 | 4,5| 3  | 0,8| 83,1|
| A5 | 4,5| 4  | 0,8| 84,5|

Rank stage

\[
\begin{align*}
A1 &= (4*0,4)+(4*0,3)+(1,4*0,2)+(70,5*0,35) \\
A2 &= (4,2*0,4)+(3*0,3)+(1,4*0,2)+(80*0,35) \\
A3 &= (4*0,4)+(3,7*0,3)+(0,6*0,2)+(29,01*0,35) \\
A4 &= (4,5*0,4)+(3*0,3)+(0,8*0,2)+(83,1*0,35) \\
A5 &= (4,5*0,4)+(4*0,3)+(0,8*0,2)+(84,5*0,35)
\end{align*}
\]

So the result are

|   | C1 | C2 | C3 | C4  | TOTAL | RANK |
|---|----|----|----|-----|-------|------|
| A1 | 1,6| 1,2| 0,28| 24,675| 27,55 | 5    |
| A2 | 1,68| 0,9| 0,28| 28   | 30,86 | 4    |
| A3 | 1,6| 1,11| 1,2| 27,653| 31,563| 3    |
| A4 | 1,6| 0,9| 1,6| 29,085| 33,385| 2    |
| A5 | 1,8| 1,2| 1,6| 29,575| 34,175| 1    |
This login page will be filled based on the username and password for those who want to login.

![Login Page](image1)

**Figure 1. Login Page**

Presence input page where admin will input the presence score.

![Presence Input Page](image2)

**Figure 2. Presence Input Page**
The page of research data input is page where admin will input the research data.

![Image of research data input page](image1)

**Figure 3. Input Page**

The page of community service data input is page where admin will input community service data input.

![Image of community service data input page](image2)

**Figure 4. Community Service data Input Page**
The page of questionnaire is page where admin will input questions that will be inputed into questionnaire form that will be assessed by college student.

![Figure 5. Questionnaire Page](image)

This page of Assessment of Lecturers Performance Result is page that displays result in form of rank from lecturers performance evaluation.

![Figure 6. Result of Performance assessment Page](image)

5. Conclusion

Based on the result of study, it can be concluded that: The application of decision support system the assessment of lecturers performance can be used as depository and management of lecturers data at Computer Science Faculty Lancang Kuning University, Beneficial for assessment staff of lecturers performance in making report of monitoring lecturers performance and needed to find out lecturers that have wether or not well performance. The exist application can be developed with further discussion like decision support system in choosing well-performed lecturer.
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