DECISION SUPPORT SYSTEM FOR TEACHER PERFORMANCE APPRAISAL WITH SIMPLE ADDITIVE WEIGHTING METHOD

Jijon Raphita Sagala¹, Penda Sudarto Hasugian²

¹Teknologi Informasi, STMIK Pelita Nusantara, Medan, Indonesia,
²Teknologi Rekayasa Komputer Jaringan, STMIK Pelita Nusantara, Medan, Indonesia
E-mail: ¹sisagala@gmail.com, ²penda.hasugian@gmail.com

ABSTRACT- The teacher is the component that most influences the creation of quality educational processes and outcomes. Therefore improvement efforts are made to improve the quality of education. Schools will not make a significant contribution without the support of professional and qualified teachers. Teachers are really required to have high performance. In schools there are still many teacher performance problems. To improve the quality of teacher performance, SD Negeri 064022 conducts teacher performance assessments every 3 months, but the mechanism is not effective due to lack of transparency. Teacher performance appraisal research uses an applied system for efficiency and transparency. The system was developed using the Simple Additive Weighting method. The Simple Additive Weighting method, part of the Decision Support System (DSS), is used to help determine decisions based on alternative data and criteria data.

Keywords: Decision Support System, Teacher Performance, Simple Additive Weighting.

1. INTRODUCTION

Teachers are professional activities that support certain knowledge that is managed in the knowledge they have, so that teacher performance is essentially the result of the knowledge they are responsible for and that teachers also need to have other specialized knowledge to acquire in order to teach better (Sunarto & Gata, n.d.). Continuous teacher performance appraisals are conducted to improve the work ethic of teachers, as well as at State Elementary School 064022. The school also conducts regular teacher performance appraisals according to predetermined rules.

Teacher appraisals generally have various benefits for teachers and schools. For teachers, it will trigger a competitive spirit to be better in the future. One of them is characterized by an increase in the work ethic of the teachers themselves, while for schools it will have an impact on increasing productivity for the school itself. To improve the quality of teacher performance, State Elementary School 064022 conducts teacher performance appraisals every 3 months but the mechanism is less effective due to lack of transparency (Education et al., 2019).

The assessment of teacher performance is to underlie policies regarding teacher promotion and career along with the awards that should be obtained (Dermawan & Triyono, 2022). Therefore, an assessment of teacher performance at 064022 State Elementary School is needed. Meanwhile, teacher performance appraisal at 064022 State Elementary School in determining teacher performance appraisal still occurs difficulties because it is still done manually, without using qualitative data that compares each existing criterion, and causes the loss of old data in bookkeeping, so a system is needed that can carry out teacher performance appraisal more efficiently. The system is a decision support system. In decision support systems there are many methods that can be used including Simple Additive Weighting, Analytical Network Process,
MOORA, TOPSIS, and Analytical Hierarchy Process, in this study using the Simple Additive Weighting Method (Mulianti et al., 2019).

2. LITERATURE REVIEW

2.1 Decision Support System (DSS)

The concept of Decision Support System (DSS) was first described in the early 1970s by Michael S. Scott Morton with the term Management Decision Systems. After that, several companies, research institutes, and universities began to research and develop SPK. The purpose of implementing DSS is to make decisions and improve decision-making efficiency when solving semi-structured problems (Ajiansya & Sari, 2022).

A decision support system is a computer system that processes data into information to make decisions about specific semi-structured problems. DSS is designed to support the entire decision-making process, starting from defining the problem, selecting relevant data, and determining the approach used in the decision-making process to evaluating alternative choices (Pramana et al., 2022).

2.2 Phases of Decision Making

While the phases that must be carried out step by step in the decision-making process include the following (Rahayu & Sindar, 2022):

1. Intelligence
   In the Intelligence phase, problems are identified, their goals and objectives, causes, and magnitude are determined. This step is very important because before an action is taken, the problem at hand must be clearly formulated first. Problems are described in more detail and categorized whether they are programmed or non-programmed.

2. Design
   In the Design phase, alternative actions are developed, potential solutions are analyzed, models are created, feasibility tests are conducted, and results are validated.

3. Choice
   In this phase, a selection process is carried out among various alternative actions that may be carried out. The results of the selection are then implemented in the decision-making process.

2.3 Simple Additive Weighting Method

The Simple Additive Weighting method is a method also known as the weighted sum method. The basic concept of the Simple Additive Weighting method is to find the weighted sum of the performance ratings on each alternative on all attributes (Fahrizal, 2016). The Simple Additive Weighting method requires a normalization process of the decision matrix (X) to a scale that can be compared with all existing alternative ratings. This method is the best known and most widely used method in dealing with Multiple Attribute Decision Making (MADM) situations. MADM itself is a method used to find the optimal alternative from a number of alternatives with certain criteria (Fa & Majaruni, 2018).

The formula for normalizing is:

\[
rij = \begin{cases} 
    \frac{Xij}{\max Xij} & \text{If } j \text{ is a benefit attribute} \\
    \frac{Xij}{\min Xij} & \text{If } j \text{ is a cost attribute (cost)}
\end{cases}
\]
3. **METHOD**

3.1 **Research Framework**

The steps taken in this research can be seen in the block diagram below:

![Figure 1. Research Stages](image)

3.2 **Framework Description**

The research steps that will be carried out based on Figure 3.1 will be described as follows (Ridhawati et al., 2018):

1. **Literature Review**

The literature review is related to the concept of decision support systems, the Simple Addictive Weighting method, Teacher Performance Appraisal and other concepts related to this research problem. The literature review is carried out by reviewing sources sourced from...
journals and other research results as references to previous research, textbooks, online sources (internet) and other sources related to the research topics discussed.

2. Data Collection
   Data collection carried out in research includes several techniques to provide accuracy of research results.

3. Analysis of Place and Research Needs
   Analyzing the Needs for decision-making in Teacher Performance Appraisal of 064022 State Elementary School by involving Class Teachers and Principals.

   Analyzing the data requirements that will be used to solve decision-making problems in the Performance Assessment of Teachers of State Elementary School 064022 with the Simple Addictive Weighting Method.

5. Completion of Simple Addictive Weighting Method For Decision Making
   Completion of the SAW Method for Teacher Performance Appraisal problems that are in accordance with the capacity and needs of the system or application.

6. System design
   Make application design using unified modeling language and design the required interface.

7. Validation System
   The system is built using Visual Basic 2010 which is a high-level programming language. Visual Basic 2010 is an object-centered programming language (Object Oriented Programming) used in the creation of Windows applications based on the Graphical User Interface.

8. Publish Research Outputs and Reports
   Publish the results of the system built in making Teacher Performance Appraisal decisions as research output.

4. RESULTS
4.1 Analysis of the Simple Addictive Weighting Method
   Based on its name, the Simple Addictive Weighting method can be interpreted as a simple weighting method or weighted summation on problem solving in a decision support system. The concept of this method is to find a priority scale rating on each alternative in all attributes. The steps used in the research of Teacher Performance Appraisal with Simple Addictive Weighting method are as follows:

1. Determine Alternative Ai

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Alternative Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Binawati Br Sitepu, S.Pd</td>
</tr>
<tr>
<td>A2</td>
<td>Sukaryani Danamik, S.Pd</td>
</tr>
<tr>
<td>A3</td>
<td>Marisa Natarlina Ginting, S.Pd</td>
</tr>
<tr>
<td>A4</td>
<td>Juli Fitryani Batubara, S.Pd</td>
</tr>
<tr>
<td>A5</td>
<td>Rahmad Zulfahmi, S.Pd.i</td>
</tr>
<tr>
<td>A6</td>
<td>Rejeki Br Karo, S.Pd</td>
</tr>
<tr>
<td>A7</td>
<td>Rasta Tarigan</td>
</tr>
<tr>
<td>A8</td>
<td>Sopia Br Barus</td>
</tr>
<tr>
<td>A9</td>
<td>Rahmayanti Ginting, S.Pd</td>
</tr>
<tr>
<td>A10</td>
<td>Lucky Riandra Subakti, S.Pd</td>
</tr>
</tbody>
</table>
2. Determine the Cj criteria that will be used as a reference in determining decision making.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Mastering Learner Characteristics.</td>
<td>10</td>
</tr>
<tr>
<td>C2</td>
<td>Mastering Learning Theory and Principles of Eduative Learning.</td>
<td>10</td>
</tr>
<tr>
<td>C3</td>
<td>Curriculum Development</td>
<td>9</td>
</tr>
<tr>
<td>C4</td>
<td>Eduative Learning Activities.</td>
<td>9</td>
</tr>
<tr>
<td>C5</td>
<td>Developing Learners' Potential.</td>
<td>8</td>
</tr>
<tr>
<td>C6</td>
<td>Communication With Learners.</td>
<td>8</td>
</tr>
<tr>
<td>C7</td>
<td>Assessment and Evaluation.</td>
<td>7</td>
</tr>
<tr>
<td>C8</td>
<td>Act in accordance with religious, legal, social and socio-cultural norms.</td>
<td>7</td>
</tr>
<tr>
<td>C9</td>
<td>Showing a mature and exemplary personality.</td>
<td>6</td>
</tr>
<tr>
<td>C10</td>
<td>Work Ethic, High Responsibility and Proud to be a Teacher.</td>
<td>6</td>
</tr>
<tr>
<td>C11</td>
<td>Be Inclusive, Act Objectively, and Non-Discriminatory.</td>
<td>5</td>
</tr>
<tr>
<td>C12</td>
<td>Communication with fellow teachers, education personnel, parents, students and the community.</td>
<td>5</td>
</tr>
<tr>
<td>C13</td>
<td>Mastery of Materials, Structures, Concepts and Scientific Thinking Patterns that Support the Subjects Covered.</td>
<td>5</td>
</tr>
<tr>
<td>C14</td>
<td>Developing Professionalism Through Reflective Action.</td>
<td>5</td>
</tr>
</tbody>
</table>
3. Of the 14 main criteria, each main criterion has the same sub-criteria. The following is a weight table for sub criteria.

<table>
<thead>
<tr>
<th>Sub Criteria</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Fulfilled</td>
<td>90</td>
</tr>
<tr>
<td>Fulfilled</td>
<td>70</td>
</tr>
<tr>
<td>Less fulfilled</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 3 Sub Criteria Values

4. Based on the steps in determining the performance appraisal of teachers at 064022 State Elementary School with the Simple Addictive Weighting Method... Then it is done as follows.
1. Alternative Suitability Rating
The following table shows the suitability rating of each alternative on each criterion.

<table>
<thead>
<tr>
<th>No</th>
<th>Alternative</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>C9</th>
<th>C10</th>
<th>C11</th>
<th>C12</th>
<th>C13</th>
<th>C14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A1</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>A2</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>A3</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>A4</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>A5</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>90</td>
<td>70</td>
<td>50</td>
<td>50</td>
<td>90</td>
<td>70</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>A6</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>A7</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>A8</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>70</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>70</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>A9</td>
<td>90</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>A10</td>
<td>70</td>
<td>70</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

Based on table number 4, it is converted into a decision matrix X with data:

\[ X = \begin{bmatrix}
90 & 70 & 70 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 \\
70 & 70 & 70 & 70 & 70 & 70 & 70 & 70 & 50 & 50 & 90 & 90 & 90 & 90 & 90 \\
90 & 90 & 90 & 70 & 90 & 90 & 70 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 \\
70 & 90 & 90 & 70 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 \\
90 & 90 & 90 & 70 & 70 & 70 & 70 & 50 & 50 & 90 & 70 & 70 & 50 & 50 & 50 \\
70 & 90 & 90 & 70 & 70 & 70 & 50 & 90 & 90 & 50 & 90 & 90 & 90 & 90 & 90 \\
90 & 90 & 90 & 70 & 70 & 70 & 50 & 90 & 90 & 50 & 90 & 90 & 90 & 90 & 90 \\
90 & 70 & 70 & 70 & 70 & 70 & 50 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 \\
70 & 70 & 70 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 & 90 \\
\end{bmatrix} \]

2. Calculate the normalized value of each alternative:

\[ r_{ij} = \frac{X_{ij}}{\text{Max } X_{ij}} \]
Description:
Rij = Normalized Performance Rating Value
Xij = The Attribute Value of Each Criterion
Max Xij = The Greatest Value of Each Criterion
Benefit = The Greatest Value is the Best
Normalization for criteria can be seen as follows.

a. For the criteria of Mastering the Characteristics of Learners.

\[
\begin{align*}
     r_{11} & = \frac{90}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{90}{90} = 1 \\
     r_{21} & = \frac{70}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{31} & = \frac{90}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{90}{90} = 1 \\
     r_{41} & = \frac{70}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{51} & = \frac{90}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{90}{90} = 1 \\
     r_{61} & = \frac{70}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{71} & = \frac{90}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{90}{90} = 1 \\
     r_{81} & = \frac{70}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{91} & = \frac{90}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{90}{90} = 1 \\
     r_{101} & = \frac{70}{\text{max} \{90,70,90,70,90,70,90,70,70,70\}} = \frac{70}{90} = 0.78 \\
\end{align*}
\]

b. For the criterion of Mastering Learning Theories and Principles of Educative Learning.

\[
\begin{align*}
     r_{12} & = \frac{70}{\text{max} \{70,70,90,90,90,90,90,90,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{22} & = \frac{70}{\text{max} \{70,70,90,90,90,90,90,90,70,70\}} = \frac{70}{90} = 0.78 \\
     r_{32} & = \frac{90}{\text{max} \{70,70,90,90,90,90,90,90,70,70\}} = \frac{90}{90} = 1 \\
     r_{42} & = \frac{90}{\text{max} \{70,70,90,90,90,90,90,90,70,70\}} = \frac{90}{90} = 1 \\
     r_{52} & = \frac{90}{\text{max} \{70,70,90,90,90,90,90,90,70,70\}} = \frac{90}{90} = 1
\end{align*}
\]
3. The normalization results are made in the form of a normalization matrix below.

\[
X = \begin{bmatrix}
1 & 0.78, 0.78, 0.78 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
0.78 & 0.78, 0.78, 0.78 & 0.78, 0.78 & 0.78, 0.78 & 0.78, 0.78 & 0.78, 0.56 & 0.56 & 1 & 1 & 1 \\
1 & 1 & 1 & 0.78, 0.78 & 0.78 & 1 & 1 & 0.78 & 1 & 1 & 1 & 1 & 1 \\
0.78 & 1 & 1 & 0.78, 0.78 & 0.78 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
1 & 1 & 1 & 0.78, 0.78 & 0.78 & 1 & 1 & 0.78 & 0.56 & 0.56 & 1 & 0.78 & 0.56 & 0.56 \\
0.78 & 1 & 1 & 0.78, 0.78 & 0.78 & 0.56 & 1 & 1 & 1 & 0.56 & 1 & 1 & 1 & 1 \\
1 & 1 & 1 & 0.78, 0.78 & 0.78 & 0.56 & 1 & 1 & 1 & 0.56 & 1 & 1 & 1 & 1 \\
0.78 & 1 & 1 & 0.78, 0.78 & 0.78 & 0.56 & 0.78, 0.78 & 0.78, 0.56 & 0.56 & 0.78 & 0.56 & 0.56 & 0.78 & 0.56 & 0.56 \\
0.78, 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78, 0.78 & 1 & 1 & 1 & 1 & 1 & 1 \\
0.78, 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78, 0.78 & 1 & 1 & 1 & 1 & 1 & 1 \\
0.78 & 1 & 1 & 1 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 1 & 1 & 1 & 1 & 1 & 1 \\
0.78 & 1 & 1 & 1 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 0.78 & 1 & 1 & 1 & 1 & 1 & 1 \\
0.78 & 0.78, 0.78 & 1 & 1 & 0.78 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
\end{bmatrix}
\]

4. Ranking

Next, the multiplication of the W * R matrix will be made and the sum of the multiplication results to obtain the best alternative by ranking the largest value as follows using the following formula:

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

**Description:**

- \( V_i \) = The final value of the alternative
- \( w_j \) = Predetermined weight
- \( r_{ij} \) = Value matrix normalization

The preference value to determine the ranking results is as follows:
5. After obtaining the results of multiplication by the W * R matrix and the summation of the multiplication results, the following final decision value is obtained:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Ranking Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marisa Natarlina Ginting, S.Pd</td>
<td>94.67</td>
</tr>
<tr>
<td>Juli Fitryani Batubara, S.Pd</td>
<td>94.00</td>
</tr>
<tr>
<td>Binawati Br Sitepu, S.Pd</td>
<td>93.78</td>
</tr>
<tr>
<td>Lucky Riandra Surbakti, S.Pd</td>
<td>91.78</td>
</tr>
<tr>
<td>Rasta Tarigan</td>
<td>89.11</td>
</tr>
<tr>
<td>Rahmayanti Ginting, S.Pd</td>
<td>88.44</td>
</tr>
<tr>
<td>Rejeki Br Karo, S.Pd</td>
<td>86.89</td>
</tr>
<tr>
<td>Rahmad Zulfahmi, S.Pd.i</td>
<td>82.00</td>
</tr>
<tr>
<td>Sukaryani Danamik, S.Pd</td>
<td>78.67</td>
</tr>
<tr>
<td>Sopia Br Barus</td>
<td>74.44</td>
</tr>
</tbody>
</table>

5. **CONCLUSION**

The conclusion that can be drawn is that from the calculation process carried out with the Simple Addictive Weighting Method, the results obtained are that the Best Teacher Performance Assessment is Alternative A3, namely Marisa Natarlina Ginting, S.Pd with a score of 94.67. With the construction of this system, it can help Principals to see data on Teacher Performance Appraisals that are truly the best because they have been ranked and reduce their doubts.

**REFERENCES**


semeru varieties lumajang towards staphylococcus auerus and pseduomonas aeruginosa.


Sunarto, P. R., & Gata, G. (n.d.). *PENILAIAN KINERJA GURU PADA SMK YADIKA 5 DENGAN MENGGUNAKAN METODE ANALYTICAL HIERARCHY PROCESS (AHP)*. 265–271.