Decision Support System For Election Of Members Unit Patients Pamong Praja

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I. Introduction

The Civil Service Police Unit (Satpol PP) is part of the regional apparatus in enforcing the law and maintaining public order and public order. Satpo PP is good and meets the qualification standards obtained through effective recruitment efforts. Selection of candidate members of Satpol PP is done to get good quality human resources and most in accordance with the requirements required by the Agency[1].

In the selection stage should not be done with the family system, commission or in other words bribery. To handle that, a valid Decision Making System is required. Decision Support System or DSS (Decision Support System) is a computer-based information system whose primary purpose is to help decision making utilize data and models to solve unstructured and semi-structured problems. DSS is designed to support all stages of decision-making, starting from the stages of identifying problems, selecting relevant data, determining the approach used in the decision-making process to evaluating the selection of alternatives [2].

A valid decision should be made by the Human Resources Development (PSDM) section. So far in the acceptance of candidates for Satpol PP members, the PSDM divides and selects one by one applicant data entry. After sorting and selecting the data of incoming applicants, the PSDM section invites applicants to perform selection tests.

The PSDM section should conduct the selection objectively and accurately and can take place in a short period of time. Overcoming it then designed an application that will simplify and speed up the selection process Satpol PP members. Fuzzy Multiple Attribute Decision Making FMADM is a method used to find alternative optimize from a number of alternatives to optimize certain criteria, while the Simple Additive Weighting method (SAW). SAW method is often also known term weighted summation method. The basic concept is to find a method SAW weighted summation of the performance ratings of all the attributes of each alternative.

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method. The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative of all attributes [2]. These aspects of the Decision Support System's assessment are designed in such a way that the user in this case is the manager of the human resources department can define aspects of the self-assessment dynamically so that the decision support system can be used more widely [2].

Selection of FMADM and SAW method is due to give weight value for each criterion, then proceed with ranking process which will select best alternative from some alternative. With this method of ranking, it is expected to facilitate the decision maker in selecting and selecting the participants, while the final decision will be determined by the user based on further consideration. This is because so many criteria (multicriteria) must be considered in the selection process of new members of Satpol PP.

II. Theory

a. Basic Concepts of Multiple Attribute Decision Making (MADM)

Basically, the MADM process is done through 3 stages, namely the preparation of components of the situation, analysis, and synthesis of information. At the component compilation stage, the component of the situation, an estimate table will be formed which contains the identification of alternatives and objectives specifications, criteria and attributes. One way to specify the purpose of the situation | Oi, i = 1, ..., t | Is to list the possible consequences of an identified alternative | Ai, i = 1, ..., n |. In addition there are also set of attributes that will be used | ai, k = 1, ..., m |.

Most of the MADM approaches are conducted through two steps: first, aggregating responses to all goals on each alternative. Second, ranking the alternative decisions based on the results of decision aggregation.

Thus, it can be said that, the problem of multiple attribute decision making (MADM) is evaluating m alternative Ai (i = 1,2, ..., m) to a set of attributes or criteria Cj (j = 1,2, ...., N), where each attribute is independent of each other. The decision matrix of each alternative depends on each other. Alternative matrix of each alternative there are each attribute, X, given as:

\[
X = \begin{bmatrix}
X_{11} & X_{12} & \cdots & X_{1n} \\
X_{21} & X_{22} & \cdots & X_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
X_{m1} & X_{m2} & \cdots & X_{mn}
\end{bmatrix}
\]

Where Xij is the i-th alternative performance rating of the jth attribute, the weight value indicating the relative importance of each attribute, is given as, W:

\[W = \{w_1, w_2, ..., w_m\}\]

The performance rating (X), and weighted value (W) are the primary values that represent the absolute preferences of decision makers (Sri Kusumadewi, 2006).

b. Simple Additive Weighting (SAW)

One method of solving MADM problem is by using Simple Additive Weighting (SAW) method. The SAW method is often also known as the weighted summing method. The basic concept of the SAW method is to find a weighted sum of performance ratings on each alternative of all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale comparable to all alternative ratings (Destriyana Darmastuti, 2013). Given the following equation:

\[
r_{ij} = \begin{cases}
\frac{x_{ij}}{\text{Max } x_{ij}} & \text{Jika } x_{ij} \text{ atribut keuntungan (benefit)} \\
\frac{1}{\text{Min } x_{ij}} & \text{Jika } x_{ij} \text{ atribut biaya (cost)}
\end{cases}
\]

Information :

Rij = normalized performance rating value
Xij = attribute value owned by each criterion
Max xij = the largest value of each criterion
Min xij = the smallest value of each criterion
Benefit = if the greatest value is best.
Cost = if the smallest value is best

Where \( r_{ij} \) is the normalized performance rating of the alternative \( A_i \) on the attribute \( C_j \); \( I = 1,2, \ldots, m \) and \( j = 1,2, \ldots, n \). The preference value for each alternative \( (V_i) \) is given as follows:

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

Information:

- \( V_i \) = rank for each alternative
- \( W_j \) = weighted value of each criterion
- \( R_{ij} \) = normalized performance rating value

A larger value of \( V_i \) indicates that \( A_i \)'s alternatives are preferred. (Destriyana Darmastuti, 2013). The steps of SAW method are:

1. Determine the criteria that will be used as a reference in decision making, namely \( C \).
2. Determine the match rating of each alternative on each criteria.
3. Create a decision matrix based on criterion \( (C) \), then normalize the matrix based on the equation that is adjusted to the type of attribute (attribute gain or cost attribute) to obtain a normalized matrix \( R \).
4. The final result obtained from the ranking process is the sum of the matrix multiplication normalized \( R \) with the weight vector to obtain the largest value selected as the best alternative \( (A) \) as a solution.

The advantages of the Simple Additive Weighting (SAW) model compared to other decision-making models lie in its ability to conduct judgments more precisely because they are based on predetermined criteria and preference values. In addition, SAW can also select the best alternative from a number of alternatives because of the ranking process after determining the weight value for each attribute.

III. Analysis and System Design

a. System Requirement Analysis

In the process of making a decision support system for the selection of new members of Satpol PP, it takes a system need to consider on each criteria to be used. To determine the new members of Satpol PP there are 6 criteria to be used. Where criterion \( C_1 \) to \( C_6 \) is profit criterion (Benefit). The criteria are:

1. \( C_1 \) = Educational Value
2. \( C_2 \) = Value of Comulative Achievement Index (GPA)
3. \( C_3 \) = Age Weight
4. \( C_4 \) = Personal Characteristic Testing Value
5. \( C_5 \) = General Intelligence Test Scores
6. \( C_6 \) = National Insight Value Score

From the 6 criteria above it can be explained that the criterion with symbol \( C_1 \) is the value of education, the criteria of educational value is taken with the reason to make it easier in determining the position of placement available in the vacancy Satpol PP.

Criteria with symbol \( C_2 \) is the value of the index of achievement komulatif (GPA) is also taken dikarnakan with high index of cumulative achievement then the value in the weight of the assessment is also higher.

The criterion with the symbol \( C_3 \) is age, this age is intended to know the age limit, the age limit has been determined by the HR department as low as 18 years and as high as 35 years from the date specified by the HR section.

The criterion with the symbol \( C_4 \) symbol is the value of the personal characteristic test, the criteria for the personal characteristic test are taken to determine the personality assessment for each examinee. While the \( C_5 \) is a common intelligence test scores, this general intelligence test is used to obtain general insight assessments of each peserta and \( C_6 \) is the value of nationality insight test, this nationality insight test is also taken to obtain an assessment of national insight on each participant.
b. Criteria and Weighing

In the process of making a decision support system to determine the new members Satpol PP required weighting on any predetermined criteria. There are 6 (Six) criteria to be used in determining new members of Satpol PP. The criteria and fuzzy numbers used in determining the selection of new members of Satpol PP are:

A. Education Value Criteria is converted to fuzzy numbers below:

![Figure 4.1 Fuzzy Value of Education](image1)

<table>
<thead>
<tr>
<th>No.</th>
<th>Value Educational</th>
<th>Fuzzy Numbers</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>&lt;D3</td>
<td>Low (R)</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>D3</td>
<td>Medium (S)</td>
<td>0.33</td>
</tr>
<tr>
<td>3.</td>
<td>S1</td>
<td>High (T)</td>
<td>0.67</td>
</tr>
<tr>
<td>4.</td>
<td>S2</td>
<td>High Stake (ST)</td>
<td>1</td>
</tr>
</tbody>
</table>

![Table 4.1 Education Value](image2)

B. Criteria The grade point average (GPA) is converted to the following fuzzy numbers:

![Figure 4.2 Fuzzy Value of Cumulative Achievement Index (GPA)](image3)

<table>
<thead>
<tr>
<th>No.</th>
<th>Value GPA</th>
<th>Fuzzy Numbers</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>&lt;2.75</td>
<td>Low (R)</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>2.75 - 3.00</td>
<td>Medium (S)</td>
<td>0.25</td>
</tr>
<tr>
<td>3.</td>
<td>3.01 - 3.25</td>
<td>Middle (T1)</td>
<td>0.5</td>
</tr>
<tr>
<td>4.</td>
<td>3.26 - 3.50</td>
<td>Height (T2)</td>
<td>0.75</td>
</tr>
<tr>
<td>5.</td>
<td>3.51 - 4</td>
<td>High Stake (ST)</td>
<td>1</td>
</tr>
</tbody>
</table>

![Table 4.2 Cumulative Achievement Index Value (GPA)](image4)

C. Age Weight Criteria are converted to fuzzy numbers below:

![Figure 4.3 Fuzzy Age Weight](image5)

![Table 4.3 Age Weight](image6)

D. Personal Characteristic Value Test Criteria (TKP) are converted with fuzzy numbers below:

![Figure 4.4 Fuzzy Value of Personal Characteristic Test (TKP)](image7)

![Table 4.4 Tests of Personal Characteristics](image8)

E. The General Intelligence Test (TIU) Test Criteria are converted to the following fuzzy numbers:

![Figure 4.5 Fuzzy Value of General Intelligence Tests (TIU)](image9)
Table 4.5 General Intelligence Test Scores

<table>
<thead>
<tr>
<th>No.</th>
<th>Value TIU</th>
<th>Fuzzy Numbers</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>&lt; 70</td>
<td>Low (R)</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>&gt; 69</td>
<td>High Stake (ST)</td>
<td>1</td>
</tr>
</tbody>
</table>

F. Criteria of National Insight Score Test (TWK) is converted to fuzzy numbers below:

![Fuzzy Value of Nationality Insight Test (TWK)](image)

Table 4.6 Value of Insight Score Nationality

<table>
<thead>
<tr>
<th>No.</th>
<th>Value TWK</th>
<th>Fuzzy Numbers</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>&lt; 64</td>
<td>Low (R)</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>&gt; 63</td>
<td>High Stake (ST)</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.7 Minimum Weight Assumption of Variable Selection Variables

Real data 7 above participants, will be converted into fuzzy that have been determined in the previous discussion:

Table 4.10 Alternative Table and Participant Criteria with Fuzzy Value

Based on table 4.10 above, a decision X can be formed by using formula (1) the following data:

![Fuzzy Interests Each Criteria](image)

After the normalization process is done or the normalized matrix has been obtained, the next step is to determine the importance of each criterion determined by the decision maker, symbolized by (W). From the criteria that have been determined, then made a level of importance criteria based on the value of weight that has been determined into the fuzzy number with the formula that is the n-n-1 variable. Twice match each alternative on each criteria as follows:

Table 4.11 Level of Interest of Each Criteria

Based on the calculation of normalization of X matrix, then can be determined normalized matrix R as follows:

![Normalized Matrix R](image)
The weighting of the fuzzy number is:

\[ W = [0.67 \ 0.67 \ 1 \ 1 \ 1 \ 1] \]

All V1-V7 rank values of multiplication result with normalization are combined in table 4.12, so the result of ranking in the table below:

### Table 4.12 Total Value Overall

<table>
<thead>
<tr>
<th>No</th>
<th>Alternative</th>
<th>Criteria</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C1  C2  C3  C4  C5  C6</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Samsuri</td>
<td>0.67  0.5  1  1  1  1</td>
<td>4.7839</td>
</tr>
<tr>
<td>2</td>
<td>Taufiq Fekri</td>
<td>0.67  0.5  1  0  1  0</td>
<td>2.7839</td>
</tr>
<tr>
<td>3</td>
<td>Bima Aprianto</td>
<td>0.33  0.75  0  1  0  0</td>
<td>2.7236</td>
</tr>
<tr>
<td>4</td>
<td>M. Daud</td>
<td>0.33  0.25  1  1  1  1</td>
<td>4.3880</td>
</tr>
<tr>
<td>5</td>
<td>Indira</td>
<td>0.33  1  1  1  1  1</td>
<td>4.8911</td>
</tr>
<tr>
<td>6</td>
<td>Koko Malrudi</td>
<td>0.67  0.75  0.67  1  1  0</td>
<td>3.6214</td>
</tr>
<tr>
<td>7</td>
<td>Jenderomawi</td>
<td>1  0.25  0.67  0  1  1</td>
<td>3.5075</td>
</tr>
</tbody>
</table>

### Table 4.13 Results of Ranking of New Members of Satpol PP

<table>
<thead>
<tr>
<th>No</th>
<th>Alternative</th>
<th>Criteria</th>
<th>Results</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C1  C2  C3  C4  C5  C6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Indira</td>
<td>0.33  1  1  1  1  1</td>
<td>4.8031</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Samsuri</td>
<td>0.67  0.5  1  1  1  1</td>
<td>4.7839</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>M. Daud</td>
<td>0.33  0.25  1  1  1  1</td>
<td>4.3880</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Koko Malrudi</td>
<td>0.67  0.75  0.67  1  1  0</td>
<td>3.6214</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Jenderomawi</td>
<td>1  0.25  0.67  0  1  1</td>
<td>3.5075</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Taufiq Fekri</td>
<td>0.67  0.5  1  0  1  0</td>
<td>2.7236</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Bima Aprianto</td>
<td>0.33  0.75  0  1  0  0</td>
<td>2.7258</td>
<td>7</td>
</tr>
</tbody>
</table>

For example, in Table 4:13 there is a decision result that the 3 participants who passed the race said that 3 participants meet the minimum value standard that has been determined by Kuantan Singingi Regency Government. The minimum standard score can be seen in criteria C4, C5, and C6. If the 3 criteria meet the minimum value standard then the participant is declared Passed and accepted as new member of Satpol PP with record of decision fixed by firmly by leader.

### IV. Conclusions

After analyzing and designing the decision support system of new Satpol PP member selection using Fuzzy Multiple Attribute Decision Making (FMADM) using Simple Additive Weighting (SAW) method, it can be concluded as follows:

1. With the decision support system in the selection of new Satpol PP members using Fuzzy Multiple Attribute Decision Making (FMADM) using Simple Additive Weighting Method (SAW) can help or as a reference for the user in determining the selection of new members of Satpol PP.
2. The built system can facilitate the selection, this is evidenced by the comparison between manual system with computerized system using Fuzzy Multiple Attribute Decision Making (FMADM) model using Simple Additive Weighting (SAW) method.
3. Fuzzy Multiple Attribute Decision Making (FMADM) selection using Simple Additive Weighting (SAW) method because this model can choose the best alternative from several alternatives by using each criterion.

### References


