Decision Support System In Sous Chef De Partie Selection Using Simple Method Additive Weighting (SAW)

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Abstract – The SAW method is also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of the performance ratings on each alternative of all attributes. The SAW method requires the decision matrix normalization process \((X)\) to a scale that can compare with all available alternative ratings.

Keywords – Decision Support System, Sous Chef De Partie, Simple Additive Weighting, SAW

1 INTRODUCTION

A restaurant is a place or building that is commercially organized, which organizes. Good service to all guests in the form of food and drink. Restaurants are located in a hotel, office or factory, and many also stand alone outside the building. In the restaurant there are several important parts for a restaurant. One of them is the kitchen, or commonly referred to by the general public kitchen. In the kitchen section, you must have a chef cook or called a chef. Chef also has several other sections, namely exc. Chef, exc. Sous chef, sous chef de partie, and demmie chef. From some parts of the chef in the goela batoe restaurant the position of the sous chef de partie was still empty and it made the management structure in the kitchen become unbalanced so that it had an impact on turnover in the goela batoe restaurant.

To choose a sous chef de partie is not arbitrary and cannot directly receive from job vacancies. Because the rules in the kitchen must increase the position of employees in the kitchen itself. So it's exc.chef must choose from one of the coomis. Coomis is the cook who is in charge of helping Chef de partie in carrying out his tasks starting from the process of cutting, cooking, to composing it for that way the solution to the problem can use decision support methods[1]. Many methods of decision support systems include ELECTRE, PROMETHEE II, TOPSIS, WSM, SAW[2]-[5]. One of them is a decision support system with the Simple Additive Weighting (SAW) method.

2 THEORY

2.1 Decision Support System

Decision support system (Decision Support System) is an interactive information system that provides information, modeling and manipulation of data. The system is used to help decision-making in semi-structured situations and unstructured situations where no one knows for certain how a decision should be made[2], [6], [7].

2.2 Simple Additive Weighting (SAW) Method

The SAW (Simple Additive Weighting) method is often also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of performance ratings on each alternative on all attributes. The SAW method requires the decision matrix normalization process \((X)\) to a scale that can be compared with all available alternative ratings[8].

The formula for normalization[8] is as follows:

\[
\begin{align*}
rij = \begin{cases} 
\frac{Xij}{\text{Max } Xij} & \text{If } j \text{ is attribute advantage (benefit)} \\
\frac{\text{Min } Xij}{Xij} & \text{If } j \text{ is the attribute of cost (Cost)}
\end{cases} 
\end{align*}
\]

Information:
\[
\begin{align*}
Rij & : \text{The value of the performance rating is normalized} \\
Xij & : \text{The attribute value that is owned by each criterion}
\end{align*}
\]
Max $X_{ij}$ : The biggest value of each criterion  
Min $X_{ij}$ : The smallest value of each criterion  
Benefit : If the biggest value is the best  
Cost : If the smallest value is the best  

Where $rij$ is a normalized performance rating from Ai alternative attribute $C_j$; $i=1,2,...,m$ and $j=1,2,...,n$. Preference values for each alternative (Vi) are given as:

$$Vi = \sum_{j=1}^{n} W_j. rij$$

(3)

Information :

$Vi$ : Ranking for each alternative  
$w_j$ : Weights of each criterion  
$rij$ : Normalized performance rating values  

A larger $Vi$ value indicates that Ai alternative is preferred.

3 RESULT AND DISCUSSION

3.1 Determine Criteria and Weight

In the SAW method process requires criteria that will be used as material for calculation and consideration. The criteria that are the material for calculation and consideration can be seen in table 1

<table>
<thead>
<tr>
<th>Table 1 Criteria</th>
<th>Criteria</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Creative</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Understand Management</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Speed</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>Cost</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>Consistent</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>Leadership</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 Creative Criteria</th>
<th>Creative (C1)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very not creative</td>
<td>Very low</td>
<td>0-20</td>
<td></td>
</tr>
<tr>
<td>Not creative</td>
<td>Low</td>
<td>21-40</td>
<td></td>
</tr>
<tr>
<td>Creative enough</td>
<td>Enough</td>
<td>41-60</td>
<td></td>
</tr>
<tr>
<td>Creative</td>
<td>High</td>
<td>61-80</td>
<td></td>
</tr>
<tr>
<td>Very creative</td>
<td>Very high</td>
<td>81-100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3 Understanding Management Criteria</th>
<th>Understand Management (C2)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Not Understanding Management</td>
<td>Very low</td>
<td>0-20</td>
<td></td>
</tr>
<tr>
<td>Not Understanding Management</td>
<td>Low</td>
<td>21-40</td>
<td></td>
</tr>
<tr>
<td>Simply Understanding Management</td>
<td>Enough</td>
<td>41-60</td>
<td></td>
</tr>
<tr>
<td>Understand Management</td>
<td>High</td>
<td>61-80</td>
<td></td>
</tr>
<tr>
<td>Very Understanding Management</td>
<td>Very high</td>
<td>81-100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4 Speed Criteria</th>
<th>Speed (C3)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Not fast</td>
<td>Very low</td>
<td>0-20</td>
<td></td>
</tr>
<tr>
<td>Not fast</td>
<td>Low</td>
<td>21-40</td>
<td></td>
</tr>
<tr>
<td>Fast enough</td>
<td>Enough</td>
<td>41-60</td>
<td></td>
</tr>
<tr>
<td>fast</td>
<td>High</td>
<td>61-80</td>
<td></td>
</tr>
<tr>
<td>Very fast</td>
<td>Very high</td>
<td>81-100</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 Cost Criteria

<table>
<thead>
<tr>
<th>Cost (C4)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Really do not understand the costs</td>
<td>Very low</td>
<td>0-20</td>
</tr>
<tr>
<td>Don't understand the cost</td>
<td>Low</td>
<td>21-40</td>
</tr>
<tr>
<td>Simply understand the cost</td>
<td>Enough</td>
<td>41-60</td>
</tr>
<tr>
<td>understand costs</td>
<td>High</td>
<td>61-80</td>
</tr>
<tr>
<td>Very understanding of costs</td>
<td>Very high</td>
<td>81-100</td>
</tr>
</tbody>
</table>

Table 6 Consistent Criteria

<table>
<thead>
<tr>
<th>Consistent (C5)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Not Consistent</td>
<td>Very low</td>
<td>0-20</td>
</tr>
<tr>
<td>Inconsistent</td>
<td>Low</td>
<td>21-40</td>
</tr>
<tr>
<td>Consistent enough</td>
<td>Enough</td>
<td>41-60</td>
</tr>
<tr>
<td>Consistent</td>
<td>High</td>
<td>61-80</td>
</tr>
<tr>
<td>Very consistent</td>
<td>Very high</td>
<td>81-100</td>
</tr>
</tbody>
</table>

Table 7 Leadership Criteria

<table>
<thead>
<tr>
<th>Leadership (C6)</th>
<th>Fuzzy</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very No Leadership</td>
<td>Very low</td>
<td>0-20</td>
</tr>
<tr>
<td>No leadership</td>
<td>Low</td>
<td>21-40</td>
</tr>
<tr>
<td>Enough Leadership</td>
<td>Enough</td>
<td>41-60</td>
</tr>
<tr>
<td>Leadership</td>
<td>High</td>
<td>61-80</td>
</tr>
<tr>
<td>Very Leadership</td>
<td>Very high</td>
<td>81-100</td>
</tr>
</tbody>
</table>

Analysis Using the SAW Method

Table 8 Match Rating of Each Alternative in Each Criteria

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Criteria</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anjaz</td>
<td></td>
<td>75</td>
<td>65</td>
<td>80</td>
<td>77</td>
<td>75</td>
<td>76</td>
</tr>
<tr>
<td>Yohan</td>
<td></td>
<td>85</td>
<td>75</td>
<td>80</td>
<td>89</td>
<td>78</td>
<td>85</td>
</tr>
<tr>
<td>Farhan</td>
<td></td>
<td>70</td>
<td>79</td>
<td>78</td>
<td>84</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>Jhoni</td>
<td></td>
<td>80</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>75</td>
<td>79</td>
</tr>
</tbody>
</table>

1. The first step

The matrix formed from the match table in this case is based on table 4.8 above

\[
X = \begin{bmatrix}
75 & 65 & 80 & 77 & 75 & 76 \\
85 & 75 & 80 & 89 & 78 & 85 \\
70 & 79 & 78 & 84 & 80 & 84 \\
80 & 60 & 75 & 90 & 75 & 79 \\
\end{bmatrix}
\]

Decision making provides standards, based on research results.

\[
W = (0.15 \quad 0.20 \quad 0.10 \quad 0.10 \quad 0.10 \quad 0.35)
\]

2. Second step

Normalize the X matrix based on the following equation:

a. Normalization for Anjaz

\[
\begin{align*}
\bar{r}_{11} &= \frac{75}{\text{Max} \{75,85,70,80\}} = \frac{75}{85} = 0.88 \\
\bar{r}_{12} &= \frac{65}{\text{Max} \{65,75,79,60\}} = \frac{65}{79} = 0.82
\end{align*}
\]
b. Normalization for Yohan

\[
\begin{align*}
    r_{13} & = \frac{80}{\text{Max } \{80;80;78;75\}} = \frac{80}{80} = 1 \\
    r_{14} & = \frac{77}{\text{Max } \{77;89;84;90\}} = \frac{77}{90} = 0.85 \\
    r_{15} & = \frac{75}{\text{Max } \{75;78;80;75\}} = \frac{75}{80} = 0.93 \\
    r_{16} & = \frac{76}{\text{Max } \{76;85;84;79\}} = \frac{76}{85} = 0.89
\end{align*}
\]

c. Normalization for Farhan

\[
\begin{align*}
    r_{21} & = \frac{85}{\text{Max } \{75;85;70;80\}} = \frac{85}{85} = 1 \\
    r_{22} & = \frac{75}{\text{Max } \{65;75;79;60\}} = \frac{75}{79} = 0.94 \\
    r_{23} & = \frac{80}{\text{Max } \{80;80;78;75\}} = \frac{80}{80} = 1 \\
    r_{24} & = \frac{89}{\text{Max } \{77;89;84;90\}} = \frac{89}{90} = 0.98 \\
    r_{25} & = \frac{78}{\text{Max } \{75;78;80;75\}} = \frac{78}{80} = 0.97 \\
    r_{26} & = \frac{85}{\text{Max } \{76;85;84;79\}} = \frac{85}{85} = 1
\end{align*}
\]

d. Normalization for Jhoni

\[
\begin{align*}
    r_{31} & = \frac{70}{\text{Max } \{75;85;70;80\}} = \frac{70}{85} = 0.82 \\
    r_{32} & = \frac{79}{\text{Max } \{65;75;79;60\}} = \frac{79}{79} = 1 \\
    r_{33} & = \frac{78}{\text{Max } \{80;80;78;75\}} = \frac{78}{80} = 0.97 \\
    r_{34} & = \frac{84}{\text{Max } \{77;89;84;90\}} = \frac{84}{90} = 0.93 \\
    r_{35} & = \frac{80}{\text{Max } \{75;78;80;75\}} = \frac{80}{80} = 1 \\
    r_{36} & = \frac{84}{\text{Max } \{76;85;84;79\}} = \frac{84}{85} = 0.98
\end{align*}
\]

3. Third step
Based on the results of normalization of matrix X, the matrix R is formed as follows:

\[
R = \begin{bmatrix}
0.88 & 0.82 & 1 & 0.85 & 0.93 & 0.89 \\
1 & 0.94 & 1 & 0.98 & 0.97 & 1 \\
0.82 & 1 & 0.97 & 0.93 & 1 & 0.98 \\
0.94 & 0.75 & 0.93 & 1 & 0.93 & 0.92
\end{bmatrix}
\]

4. Fourth step
Next will be made the multiplication preference matrix W * R and the sum of the multiplication results to determine the best alternative by ranking the largest value as follows:

\[
V_1 = 0.88(0.15) + 0.82(0.20) + 1(0.10) + 0.85(0.10) + 0.93(0.10) + 0.89(0.35) \\
= 0.13 + 0.16 + 0.10 + 0.085 + 0.093 + 0.31 \\
= 0.87
\]

\[
V_2 = 1(0.15) + 0.94(0.20) + 1(0.10) + 0.98(0.10) + 0.97(0.10) + 0.89(0.35) \\
= 0.15 + 0.18 + 0.10 + 0.098 + 0.097 + 0.35 \\
= 0.97
\]

\[
V_3 = 0.82(0.15) + 1(0.20) + 0.97(0.10) + 0.93(0.10) + 1(0.10) + 0.98(0.35) \\
= 0.12 + 0.20 + 0.097 + 0.093 + 0.10 + 0.34 \\
= 0.95
\]

\[
V_4 = 0.94(0.15) + 0.75(0.20) + 0.93(0.10) + 1(0.10) + 0.93(0.10) + 0.89(0.35) \\
= 0.14 + 0.15 + 0.93 + 0.10 + 0.093 + 0.32 \\
= 0.89
\]

Table 9. Case Settlement

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Criteria</th>
<th>Alternative Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anjaz</td>
<td>C1 C2 C3 C4 C5 C6</td>
<td>0.87</td>
</tr>
<tr>
<td>Yohan</td>
<td>75 84 78 80 75 76</td>
<td>0.97</td>
</tr>
<tr>
<td>Farhan</td>
<td>85 84 89 80 85 85</td>
<td>0.95</td>
</tr>
<tr>
<td>Jhoni</td>
<td>70 79 84 80 79 79</td>
<td>0.89</td>
</tr>
</tbody>
</table>

From the results of the calculation of preferences above obtained alternative values 1, 2, 3, and 4, respectively 0.87; 0.97; 0.95; 0.89 so that the best alternative is available and able to occupy a position sous chef de partie is Yohan.

4 CONCLUSION

From the results of the discussion of the problems described in the previous chapter it can be concluded as follows:
1. Criteria that can refer to the ability of a sous chef de partie are creative, understand management, speed, cost, consistency, leadership. The value weights for each criterion are creative (0.15), understanding management (0.20), speed (0.10), cost (0.10), consistent (0.10), leadership (0.35).

2. In the application of the SAW method, calculation of each of the criteria owned by each coomis is carried out through several stages such as creating an x matrix, normalizing, creating a normalized matrix, and making preference calculations to obtain the most maximum and accurate results.

3. Designing a decision support system in the selection of sous chef de partie is designed using visual basic 2008 programming language and MySQL database as a place to store data that will be processed and consists of several views namely, login, main menu, input criteria weighting each alternative, process, decisions, about me, and going out.

REFERENCES