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Management Information System Employee Bonus Reward with TOPSIS Method as Decision Support

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ABSTRACT

A piece of information on reality will be more efficient and effective with the application of computerization because everything is required quickly and accurate. Decision support system or known as Decision Support System is another form of term management Information System. Decision support system to determine the bonus is one form of decision support system used to help provide decisions to the leadership according to specific criteria, The most common problem is a large number of employees can complicate the giving of the right bonus.This research aims at designing and making the system to determine employees who are eligible to receive a gift by using the Technique Order Preference By Similarity To Ideal Solution (TOPSIS) method, the expected results of the leadership can get recommendations of employees who are eligible for bonuses based on specific criteria.

Keywords : Decision Support System, TOPSIS Method, MIS, Bonus Reward

I. INTRODUCTION

Decision-making [1] [2] [3] is always associated with the uncertainty of the outcome of the decision taken. Reduce the uncertainty factor, the decision requires valid information about the conditions that have been and may occur and then process the data into several alternatives problem-solving as a balance to take a decision [1] [4] [5]. Therefore, developed a decision support system that can process the information into an alternative problem solving [1] [5].

Decision Support System (DSS) is an information system that provides information, modeling, and data manipulation [6] [7]. Another opinion of DSS is similar to traditional management information system because both of them depend on a database as data source. Some DSS objectives include helping managers make decisions on semi-structured issues, increasing the effectiveness of decisions taken by managers rather than improving efficiency, computing speed, increasing productivity and improving quality [1] [6].

The method of TOPSIS (Technique for Order Performance by Similarity to Ideal Solution) is a multi-criteria decision-making methods by applying a weighting value to each criterion. This method uses the principle that the chosen alternative should have the shortest distance from the positive ideal solution and the farthest distance from the perfect negative solution, the choice will be sorted by the value of that alternative has the shortest distance to the positive ideal solution is the best alternative [8] [9] [10]

II. THEORY

Decision Support System

Decision support system is an interactive information support system that provides information and modeling [1] [6] [11]. The system is used to assist decision making in semi-structured situations and unstructured situations, where no one knows precisely how decisions should be made.

Decision support systems are usually built to support a solution to a problem or to evacuate an opportunity [1]

[5] [12]. Such decision support systems are called application decision support systems. Application of decision support system used in decision making in a problem. The application of decision support system using CBIS (computer-based information system) is flexible, interactive and can be adapted and developed in support of a solution to the problem of unstructured specification management [13].

Decision-making involving multiple criteria is called multiple criteria decision making [1]. Multiple criteria decision making is part of a relatively complex decision-making problem that requires one or more decision-makers, with some diverse criteria to be considered, and each rule has a specific weighting value, with the aim of obtaining an optimal solution to source problems [1] [11].

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

TOPSIS is one of the multiple criteria decision-making methods that first introduced by Yoon and Hwang [10] [14] [8]. TOPSIS using the principle that the alternatives selected must have the shortest distance from the positive ideal solution and the farthest from the negative ideal solution from a geometrical point by using the Euclidean distance to determine the relative proximity of an alternative to the optimal solution [10] [15] [14]. The positive ideal resolution is defined as the sum of all the best value that can be achieved for each attribute, while the negative ideal solution consists of all the worst value obtained for each quality. TOPSIS into account both the distance of the positive ideal solution and the distance to the negative ideal solution by taking the relative proximity to the positive ideal solution. Based on the comparison of the relative distance, the alternative priority order could achieve. This method is widely used to complete the decision making. TOPSIS method due to the concept is simple, easy to understand, efficient computation, and can measure the relative performance of the alternatives decision [10] [15] [16] [14] [8].

The steps in calculating the TOPSIS method [9]:

1. TOPSIS starts with building a decision matrix. The decision matrix m X refers to the alternatives that will be evaluated based on the criteria. The decision matrix X could be seen in Figure 2 below

$$X = \begin{array}{c} \\ a_1 \\ a_2 \\ a_3 \\ \cdot \\ \cdot \\ \cdot \end{array} \begin{array}{c} \begin{array}{cccccc} x_1 & x_2 & x_3 & \cdot & \cdot & \cdot & x_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdot & \cdot & \cdot & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdot & \cdot & \cdot & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdot & \cdot & \cdot & x_{3n} \\ \cdot & \cdot & \cdot & \cdot & & & \cdot \\ \cdot & \cdot & \cdot & \cdot & & & \cdot \\ \cdot & \cdot & \cdot & \cdot & & & \cdot \end{bmatrix} \end{array}$$

2. Make a decision matrix is normalized.
   The equation used to transform each element xij, are as follows:

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}}$$

3. Make a decision matrix is normalized weighted. With the weight w j = (w1, w2, w3,..., Wn), where w j is the weight of the criteria for all j and $\sum_j = 1\ w_j = 1$, The normalization of weight matrix V, is

$$v_{ij} = w_j * r_{ij}$$

4. Determining the ideal solution matrix of positive and negative ideal solution, The ideal solution is denoted positive A^+ whereas the negative ideal solution denoted A^- ,Here is the equation of A^+ and A^-:
   a. $A^+ = \{(\max v_{ij} \mid j \in J), (\min v_{ij} \mid j \in J'), i = 1,2,3, \dots, m\} = \{V_1^+, V_2^+, V_3^+, \dots, V_n^+\}$
   b. $A^- = \{(\min v_{ij} \mid j \in J), (\max v_{ij} \mid j \in J'), i = 1,2,3, \dots, m\} = \{V_1^-, V_2^-, V_3^-, \dots, V_n^-\}$
5. Calculating separation
   a. S+ is an alternative distance from the positive ideal solution is defined as:

$$s_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}$$, Where i = 1, 2, 3,. , , ,

   b. S– is an alternative distance from the negative

$$s_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}$$ as:

, Where i = 1, 2, 3,., , ,

m

6. Calculating the relative proximity to the positive ideal solution,
   The relative proximity of any alternative to the positive ideal solution can be computed using the following equation:

$$C_i^+ = \frac{s_i^-}{(s_i^- + s_i^+)}$$

7. The alternative rank.

Alternative C^+ sorted from most significant value to the smallest amount. Alternative with the most significant benefit of C^+ the best solution

III. RESULT AND DISCUSSION

Alternative calculation process is performed using Technique Order Preference By Similarity To Ideal Solution (TOPSIS) method, and this method can be used to solve the problem of Fuzzy Multiple Attribute Decision Making (FMADM), to determine the best alternative needed some criteria and weight as follows:

a. Determining each of each criterion can be seen in table 1

Table 1. Criteria

Criteria	
C1	Absent
C2	Behavior
C3	Achievement
C4	Teamwork

b. Next, take the decision of giving Weight Preferences for each criterion as W seen in table 2:

Table 2. Weight Value

Criteria	Range (%)	Weight
C1	30	0,3
C2	25	0,25
C3	20	0,2
C4	15	0,15

c. The value data of each employee can be seen in table 3:

Table 3. Value for Each Alternative

No	Alternative	Criteria			
		C1	C2	C3	C4
1	Arka	5	80	70	80
2	Santo	4	65	55	43
3	Andre	2	70	65	85
4	Rikanto	1	50	70	77
5	Rendi	0	75	80	40
6	Riko	1	90	81	40
7	Rifandi	0	75	56	15
8	Sunarjo	0	90	68	85
9	Aritonang	4	45	70	40
10	Junaidi	1	56	77	85
11	Idris	2	79	80	25
12	Darno	0	50	55	80
13	Niko	0	55	90	83
14	Santro	1	68	40	45
15	Rasyid	1	77	25	50
16	Sukirman	2	85	60	60
17	Anang hendro	4	81	80	70
18	Syakeh	2	40	75	85
19	Sarmen	3	60	45	59
20	Hermansyah SRG	1	65	50	85

d. The rating of each employee based on alternative data above can be matched on each criterion, which is seen in table 4:

Table 4. Rating Match

No	Alternative	Criteria			
		C1	C2	C3	C4
1	Arka	4	3	3	5
2	Santo	4	3	2	2
3	Andre	4	2	4	5
4	Rikanto	3	4	4	4
5	Rendi	4	4	3	2
6	Riko	4	3	1	2
7	Rifandi	4	3	2	1
8	Sunarjo	5	2	5	4
9	Aritonang	5	2	2	4
10	Junaidi	4	3	4	1
11	Idris	4	2	4	5
12	Darno	3	2	4	1
13	Niko	2	5	3	5
14	Santro	2	3	2	1
15	Rasyid	4	5	4	1
16	Sukirman	5	4	4	1
17	Anang hendro	4	2	4	4
18	Syakeh	4	4	3	5

19	Sarmen	3	3	2	1
20	Hermansyah SRG	3	4	4	4

e. Form each alternative ranking

$$X_1 = \sqrt{\begin{matrix}4^2+4^2+4^2+3^2+4^2+4^2+4^2+5^2+5^2+4^2+4^2+3^2+2^2+2^2 \\ +4^2+5^2+4^2+4^2+3^2+3^2\end{matrix}}$$
$$== \sqrt{295}$$
$$== 17{,}176$$

$$X_2 = \sqrt{\begin{matrix}3^2+3^2+2^2+4^2+4^2+3^2+3^2+2^2+2^2+3^2+2^2+2^2+5^2+3^2 \\ +5^2+4^2+2^2+4^2+3^2+4^2\end{matrix}}$$
$$= \sqrt{217}$$
$$= 14{,}731$$

$$X_3 = \sqrt{\begin{matrix}3^2+2^2+4^2+4^2+3^2+1^2+2^2+5^2+2^2+4^2+4^2+4^2+3^2+2^2+4^2 \\ +4^2+4^2+3^2+2^2+4^2\end{matrix}}$$
$$= \sqrt{226}$$
$$= 15{,}033$$

$$X_4 = \sqrt{\begin{matrix}5^2+2^2+5^2+4^2+2^2+2^2+1^2+4^2+4^2+1^2+5^2+1^2+5^2+1^2 \\ +1^2+1^2+4^2+5^2+1^2+4^2\end{matrix}}$$
$$= \sqrt{224}$$
$$= 14{,}967$$

Using equations 1 through 7 and calculated by the formula, the following results are obtained:

Table 5. List of Rankings

No	Alternative	Weight Value
1	Arka	0,439652
2	Santo	0,30949
3	Andre	0,411668
4	Rikanto	0,69051
5	Rendi	0,475685
6	Riko	0,276486
7	Rifandi	0,2943
8	Sunarjo	0,378402
9	Aritonang	0,22032
10	Junaidi	0,406047
11	Idris	0,411668
12	Darno	0,430254
13	Niko	0,800981
14	Santro	0,515746
15	Rasyid	0,577268
16	Sukirman	0,421828
17	Anang hendro	0,388932
18	Syakeh	0,537239
19	Sarmen	0,419955
20	Hermansyah SRG	0,69051

Table 6. Recommended Employee Bonus

No	Alternative	Weight Value
1	Niko	0,800981
2	Rikanto	0,69051
3	Hermansyah SRG	0,69051
4	Rasyid	0,577268
5	Syakeh	0,537239

IV. CONCLUSION

Based on the results of the research, the implementation of Technique Order Preference method By Similarity to Ideal Solution for the decision support process of disciplinary bonus recipients who have been designed, Ir can write the following conclusions:

1. The process of determining the criteria of employee bonus recipients used are absent, behavior, achievement, teamwork
2. Application of Technique Order Preference method By Similarity To Ideal Solution is quite easy to use as a way to determine employees who receive bonuses because the steps are quite simple settlement

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