TOPSIS Method on Selection of New Employees' Acceptance

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***Abstract*— A hospital is a labor-intensive organization that requires many personnel and professions from various disciplines. Employees are one of the determinants of the success of a company. One way that agencies use to obtain qualified employees is by making a selection at the time of employee recruitment. The problem that is often encountered is that part-time employee selection is calculated objectively so that it is less efficient and accurate in the selection process. Decision support systems with the TOPSIS method are considered suitable to assist the personnel section of the public Hospital in selecting prospective part-time employees. TOPSIS is a multicriteria decision-making method based on a concept where the chosen alternative has the closest distance from a positive ideal solution and also has the farthest distance from a negative ideal solution. The completion criteria applied to the selection of employees include the results of written tests, psychological tests, health tests, and interviews. The results of the tests show that the TOPSIS method can be used well in selecting and sorting from the largest to the smallest value with an accuracy rate of 85% in the amount of 20 data.**

***Keywords*— employee selection, decision support system, Hospital, TOPSIS.**

I. INTRODUCTION

Hospitals in Indonesia until now still receive a lot of criticism and suggestions for dissatisfaction from the community, especially regarding services provided [1]. As a public health service institution with several management domains, this is closely related to the management of Human Resources at the Hospital. In order to create excellent service, a competent workforce is needed in their field. That is why the process of recruiting new employees is the primary key in choosing competent employees.

Although the new employee selection test has been done computer calls, the processing of the results of this selection is still done manually. As a result, the process of determining the graduating employees is often inefficient and accurate. It takes a system that can process the results of the selection and provide a list of prospective employees who graduate quickly.

A technique for Order Performance of Similarity to Ideal Solution (TOPSIS) is a multicriteria decision-making method based on the concept where the best or chosen alternative not only has the closest distance from a positive ideal solution but also has the farthest distance from a negative ideal solution [2]. TOPSIS has been used in several studies, for example, to determine the priority of healthy or unhealthy homes to be inhabited [3], the priority of developing small and medium industries [4], the selection of exemplary teachers [5], the determination of contracted employees [6], qualifications for candidate teacher certification [7]. This method can answer the problems we found. This paper explains about the implementation of the TOPSIS method in the selection of new hiring staff.

II. TOPSIS METHOD

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is one of the multicriteria decision-making methods first introduced by Yoon and Hwang (1981). TOPSIS uses the principle that the chosen alternative must have the closest distance from the positive ideal solution and the farthest from the negative ideal solution from a geometric point of view using Euclidean distance to determine the relative proximity of

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an alternative with the optimal solution. Positive ideal solutions are defined as the sum of all the best values that can be achieved for each attribute, while the negative ideal solution consists of all the worst values achieved for each attribute. The steps to solving the problem using the TOPSIS method are as follows[8][9][10]:

1. Making a normalized decision matrix. TOPSIS requires a work rating of each Ai alternative on each normalized Cj criterion, with the equation below:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

Where: rij = Result of normalization of R. decision matrix

2. Create a weighted normalized decision matrix. Building weighted normalized decision matrices with weights W - (w1, w2, ..., wn), then normalizing the weight of matrix V is:

$$Y = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \cdots & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & \cdots & w_n r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ w_1 r_{m1} & w_2 r_{m2} & \cdots & w_n r_{mn} \end{bmatrix} \quad (2)$$

3. Determine the matrix of positive ideal solutions and matrix ideal negative solutions. Positive ideal solutions are denoted by A + and negative ideal solutions with A- can be determined based on the normalized (yij) weight ranking as follows:

$$A^+ = (y_1^+, y_2^+, \ldots, y_n^+); \quad (3)$$

$$A- = (y_1^-, y_2^-, \ldots, y_n^-); \quad (4)$$

With

$$y_j^+ = \begin{cases} \max_i y_{ij}; \\ \\ \min_i y_{ij}; \end{cases} \qquad y_j^- = \begin{cases} \min_i y_{ij}; \\ \\ \max_i y_{ij}; \end{cases}$$

4. Determine the distance between the values of each alternative with a matrix of positive ideal solutions and a matrix of negative ideal solutions. The distance between the alternative Ai and the positive ideal solution is formulated as:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(y_i^+ - y_{ij}\right)^2}; \quad (5)$$

The distance between the alternative Ai and the negative ideal solution is formulated as:

$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^-\right)^2}; \quad (6)$$

5. Determine the preference value for each alternative. The preference value for each alternative (Vi) is given as:

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}; \quad i=1,2,...,m \quad (7)$$

A larger Vi value indicates that alternative Ai is more feasible to choose.

III. Result

A. Use Case Diagram

Use case diagram describes the interactions between actors or also called users with applications; all activities carried out in the system with actors are written in use case diagrams. The use case has one actor, namely admin who can log in, process candidate data, and process assessment criteria based on the TOPSIS method [14][15][16].

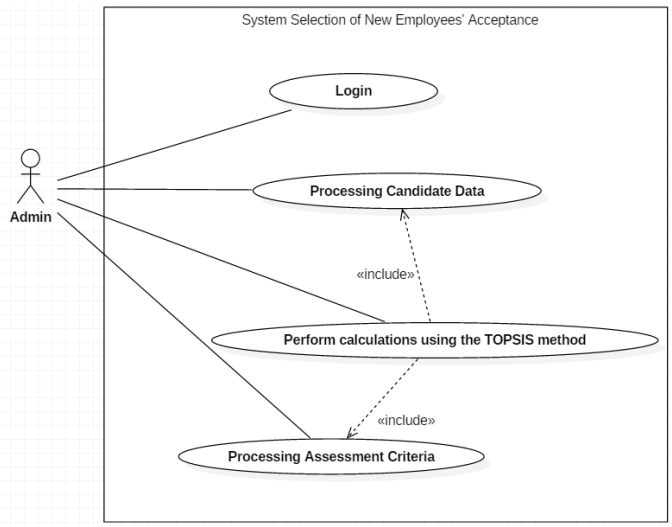

Figure 1. Use Case Diagram

B. Implementation of the Interface

Interface implementation is an implementation of a system that has been created containing the appearance of a system application, such as the appearance of logins, criteria, candidates, calculations, and passwords. On the home page, the admin can log into the system. There are three menus after the login is successful, namely: Criteria, to determine what criteria are the weight of graduation assessment, Candidates, containing a list of prospective employees, and Calculations, containing the results of the value of each criterion that has been processed using the TOPSIS method. Figure 1. is a display calculation page; in this menu, there are several employees who are found eligible to be accepted.

In this study, the test criteria carried out were: Essay tests, psychological tests, health tests, and interviews. Admin will input the value of each participant and directly represented by the system into criteria Very good, good, enough, bad, and very bad. The suitability rating of each candidate on each criterion is assessed with 1 to 5 provided that:

1 = Very Bad,
2 = Bad,
3 = Enough,
4 = Good, and
5 = Very Good.

While the level of importance that will be used as the preference weight of each criterion is also assessed with 1 to 5, provided that:

3 = Enough,
4 = High,
5 = Very High.

1 = Very Low,
2 = Low,

SELEKSI PEGAWAI BARU | Criteria | Candidate | Calculation | Password | Logout

CALCULATION

2018

Result

#	Essay Test	Psychological Test	Health Test	Interview
Candidate 1	Very Good	Bad	Very Bad	Enough
Candidate 2	Very Good	Very Bad	Very Bad	Enough
Candidate 3	Very Good	Enough	Very Bad	Good

#	C1	C2	C3	C4
A1	5	2	1	3
A2	5	1	1	3
A3	5	3	1	4

Normalize

#	C1	C2	C3	C4
A1	0.5774	0.5773	0.5774	0.577
A2	0.5774	0.5763	0.5774	0.577
A3	0.5774	0.5784	0.5774	0.5781

Normal Weighted

	C1	C2	C3	C4
Weigth	4	5	3	2
Candidate 1	2.3094	2.88675	1.73205	1.15397
Candidate 2	2.3094	2.88134	1.73205	1.15397
Candidate 3	2.3094	2.89215	1.73205	1.15617

Matrix Ideal Solution

	C1	C2	C3	C4
Positive	2.3094	2.89215	1.73205	1.15617
Negative	2.3094	2.88134	1.73205	1.15397

Distance of Solution and Preference Value

	Positive	Negative	Preferensi
A1	0.00584	0.00541	0.48088
A2	0.01103	0	0
A3	0	0.01103	1

Ranking

	Essay	Psychological Test	Healt Test	Interview	Total	Rank
A3 - Candidate 3	85.00	68.00	48.00	76.00	1	1
A1- Candidate 1	90.00	55.00	48.00	70.00	0.4809	2
A2- Candidate 2	87.00	48.00	49.00	72.00	0	3

Figure 2. Display of Calculation Page

In the calculation interface, there is a calculation display until the final Result of the TOPSIS method that processes the data entered by the previous user. The calculation results are a ranking of all candidates so that the best candidate recommendations can be known to be accepted as employees.

IV. Testing

A comparison of the results of calculations that have been done by calculating the selection of new employees using the TOPSIS method manually with the TOPSIS method in the system is presented in Table 1.

TABLE I. Accuracy Test result

No	*Name*	*Manual Result*	*System Result*	*Conclusion*
1	MRS	0.7062	0.7062	Accurate
2	RMD	0.5460	0.5460	Accurate
3	NDP	0.6554	0.6554	Accurate
4	HM	0.3446	0.3446	Accurate
5	GBM	0.7306	0.7306	Accurate
6	DP	0.5126	0.5126	Accurate
7	YP	0.5339	0.5337	Inaccurate
8	NAS	0.6554	0.6554	Accurate
9	IW	0.1867	0.1858	Inaccurate
10	MII	0.7062	0.7062	Accurate
11	CHS	0.5337	0.5337	Accurate
12	WS	0.5126	0.5126	Accurate
13	ASM	0.8684	0.8684	Accurate
14	FF	0.2178	0.2178	Accurate
15	NS	0.7306	0.7306	Accurate
16	DIS	0.5337	0.5337	Accurate
17	MSR	0.5339	0.5337	Inaccurate
18	DYA	0.1858	0.1858	Accurate
19	AI	0.2178	0.2178	Accurate
20	YN	0.1858	0.1858	Accurate

Table 1. shows from 20 data, the results of TOPSIS method accuracy reached testing 85%, namely 17 experiments with accurate values and three experiments with inaccurate values. Inaccurate because it takes four numbers behind the comma. So that when you take the two numbers behind the decimal point, it's more accurate the accuracy you get. The results of the largest order to the smallest from a system testing manual are very accurate, marked by a system capable of ranking. Evidenced by applying the TOPSIS method, the process of determining employee selection decisions can be more time-effective and accurate [9].

V. Conclusion

The TOPSIS method applied to the new recruitment selection system produces final values which can then be sorted starting from the highest value to the smallest value so that it can be determined who can be accepted to be an employee at Subang Hospital. The new employee recruitment decision support system built using the TOPSIS method has an accuracy rate of 85% in testing accuracy with manual calculations and can be applied properly so that it can assist in selecting prospective employees of Subang Hospital.

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