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Recruitment of prospective employees application using SMART and Promethee method

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Recruitment of prospective employees application using SMART and Promethee method

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Abstract. Decision support applications are made based on the website and focus on assisting HRD in selecting prospective employees based on ranking and final grades. The calculation process for employee recruitment uses 2 methods to find the best results, namely the SMART method with the final results obtained from the utility value multiplied by the normalization weight and the Promethee method with NetFlow based on the reduction of Leaving Flow and Entering Flow. The results of testing manual calculations and programs obtained on the data of 10 prospective employees with 5 attempts a different vacancy is equal to 100%. The average value of the questionnaire distributed to 31 examiners was 42.87 of the maximum value of 50 or in percentage was 85.74%.

1. Background

Human resources can be said to be one of the absolute things to invest for an office so that all things supporting the support of each decision is not subjective. An objective attitude is required for every decision made to be used. Well for the future program in a relatively long period of time. Employee satisfaction is also worth noting before getting to know his new workplace such as salary, transportation and other factors. But reality in the field, this is very much proportional to what should be implemented. As a result of a subjective judgment attitude leads to a failure of decision making in the acceptance process of new members. Of course, this cannot be allowed especially in a very long period of time because while it is risky to make an organization unable to achieve its goals or targets. To overcome the above problem is required a system that can help the recruitment process. The proposed solution is to design a decision support system application. The proposed application uses 2 methods as a comparison to get the most precise results, in this case the applications developed using the SMART method (Simple Multi Attribut Rating Technique) and Promethee (Preference Rangking Organization Method for Enrichment Evaluation) method so that the recruitment process of prospective employees in accordance with the standardization of the company.

2. Literatur Study

The application of this decision support system is given the name "Implementation of SMART Method & Promethee for recruitment of prospective employees at PT "X". According to Kustiyahningsih, Anamisa, and Syafa'ah (2013), the SMART (Simple Multi

Attribute Rating Technique) method is a multi-attribute decision making method [1]. Multi-attribute decision making (MADM) is to select the most desirable alternative(s) from a given finite set of alternatives according to a collection of attributes by using a proper means [2]. Simple Multi Attribute Rating Technique (SMART) method is a multi criteria decision making method based on the theory that each alternative consists of a number of criteria that have a value and each criterion has a weight to illustrate how important its value is compared to the other criteria. [3]. According to Jianmin Jia et.all (1998), each attribute has weights that illustrate how important it is compared to other attributes [4]. With SMART-weighted attributes are done in two steps:

a. Sorts the importance of an attribute from the worst level to the best level.

b. Make comparisons of each attribute's importance ratio with other attributes underneath.

The program created requires user in the form of HRD own party and many applicants who use this program. The application Program will be created using the SMART and Promethee methods. For the process of warning for new prospective employees are required to create an account, then after the account successfully created prospective applicants are required to fill in data such as personal biodata and upload CV (Curiculum Vitae). For HRD, it is necessary to input the criteria for each job vacancy such as education, age and age, etc. with a qualitative and quantitative weight for the minimum acceptable employment conditions for prospective employees. The assessment of potential new employees on each criterion is done by HRD as a result of the interview against potential new employees.

After all the criteria and weights in the Job vacancy section is filled, the HRD party is required to fill the values of the prospective applicants ' data in the form of CV as well as the results of the interview into the program. The program will then process the calculation automatically and display the output of the matrix multiplication into the table Form and the final result in the form of a rank inside the computer screen.

In this program will be used 5 data testing job openings for the head of warehouse (8 criteria with additional criteria of interview results), head of warehouse (7 criteria without additional criteria of interview results), Finance Staff (6 criteria), Accounting Staff (6 criteria), and warehouse Staff (5 criteria) with data of prospective employees (alternative data) as much as 5 data, we call X1, X2, X3, X4, X5. For each of the criteria symbols we call F1, F2, F3, F4,..., Fn.

Here is a sample table for the Staff accounting job testing with criteria, normalizing weights, and parameters:

Table 1. Accounting Staff Criteria

JobVacancy	Criteria (Min)	Company valuation	Weight % (Normalized)	Parameters (Promethee)
Staff Warehouse\	Experience	>= 1 years (100) < 1 years (0)	0,2	7
	Understand tax	Yes (100) No (0)	0,2	8
	Can operate computer	Yes (100) No (0)	0,2	6
	Age	20-30 years (100) <=35 years (50) >35 years (0)	0,15	6
	Education	S1	0,15	10

	Accounting(100) D3(50) SMA/SMK(0)			
Interview Result	0-100		0,1	5

Here are the assessments of each prospective employee (X1 until X5) for each job:

Table 2. Employees Value

Prospective employees	Criteria	Value
(X1)	Experience	0
	Understand Tax	0
	Can Operate Computer	100
	Age	50
	Education	50
	Interview Result	75
(X2)	Experience	100
	Understand Tax	100
	Can Operate Computer	100
	Age	0
	Education	0
	Interview Result	60
(X3)	Experience	100
	Understand Tax	0
	Can Operate Computer	100
	Age	50
	Education	0
	Interview Result	50
(X4)	Experience	0
	Understand Tax	0
	Can Operate Computer	100
	Age	100
	Education	0
	Interview Result	70
(X5)	Experience	100
	Understand Tax	100
	Can Operate Computer	100
	Age	100
	Education	50
	Interview Result	80

3. Method

The methods used are 2 namely SMART and Promethee. SMART method is a Multiattribute decision making method developed by Edward in the year 1977. This Multiattribute decision-making technique is used to support decision makers in choosing between several alternatives. Each decision maker must choose an alternative that is suitable for the purpose that has been formulated. Each alternative consists of a set of attributes and each attribute has values. This value is on average with a specific scale [5]. Data used in the SMART method in the form of values with a range of 1 to 10 based on the results of interviews with Human Resources Development (HRD) for each criteria with a specified weight. In addition, each criterion is given a value according to the value given by the HRD. The last value of the criteria is multiplied by each weight. It is then performed and the recommended applicants are based on the greatest criterion values. The preference structure of PROMETHEE is based on pairwise comparisons. In this case the deviation between the evaluations of two alternatives on a particular criterion is considered. For small deviations, the decision-maker will allocate a small preference to the best alternative and even possibly no preference if he considers that this deviation is negligible. The larger the deviation, the larger the preference. There is no objection to consider that these preferences are real numbers varying between 0 and 1 [6]. The Promethee methods require very clear additional information, that is easily obtained and

understood by both decisionmakers and analysts [7]. In addition Promethee has the ability to handle many comparisons, the decision makers only define their own size scales without limitation, to indicate their priorities and preferences for each criterion by revisiting the value, without thinking about the method of calculation. The data used in the form of values with a range of 1 to 10 is identical to the data used by the SMART method above. The value is then multiplied by each of the criteria weights. The final output of this method is the NetFlow value. Prospective applicants are the highest NetFlow value that will be most recommended to be accepted in decision making by HRD.

The formula used in the SMART method:

$$u\ (a_i) = \sum_{J=1}^{m} \quad w_j u_i\ (a_i), i = 1, 2, \dots m \tag{1}$$

Description:
W_j: The value of weighted criteria to-J and K criteria
$u(a_i)$: Utility value of the to-I criteria for the to-I criteria

The steps to settle in using the SMART method are:
Step 1: Determine the number of criteria
Step 2: The system by default gives a scale of 0-100 based on the priorities that have been inputed and normalized.

$$Normalized = \frac{Wj}{\sum Wj} \tag{2}$$

Step 3: Assign the criteria value to each alternative and be taken maximum and minimum values
Step 4: Calculate the utility values for each criterion

$$u_i(a_i) = 100\ \frac{(Couti-Cmin)}{(Cmax-Cmin)}\ \% \tag{3}$$

Description:
$u_i(a_i)$ = Value Utility 1st criteria for the to-I criterion
C_{max} = max value of each criteria
C_{min} = min value of each criteria
$C_{out\ i}$ = criteria value for the to-i
Step 5: Calculate the end value of each by scaling the value of the utility with already normalised weights

The steps of completion in using Promethee method are:
Step 1: Define the Criteria (Fn (.)) and the pre-normalized weights so that Fn (Xn) is obtained
Step 2: Calculate the value of difference from the Fn (Xn) subcriterion and the criteria values of each applicant one (Fn (Xm)) with other applicants (Fn (Xn)) so that the Fn is obtained (Xm, Xn)
Step 3: Perform preference calculations for each criterion

$$\varphi\ (a1, a2) = \sum_{i=1}^{k} \pi Pi\ (a1, a2);\ \forall\ a1, a2\ \varepsilon\ A \tag{4}$$

Description:
$\varphi(a1, a2)$ is the intensity of the decision-maker's preference stating that the A1 alternative is better than the A2 alternative with simultaneous consideration of all the criteria. It can be presented with a value between 0 and 1 value, with the following provisions:

1. $\varphi(a1, a2) = 0$ indicates weak preference for any alternative more than alternatives based on all criteria.

2. $\varphi(a1, a2) = 1$ indicates a strong preference for alternate alternatives based on all criteria.

Step 4: Calculating index values based on criteria

Step 5: Calculating *Entering flow*, *Leaving flow*, and *Net flow*

1. Leaving Flow

$$\emptyset^{+}(a1) = \frac{1}{n-1}\sum \varphi\,(a1, x)\; x\; \varepsilon\; A \tag{5}$$

Description:

$\emptyset^{+}(a1) = $ *leaving flow*, Used to determine the order of priority on the Promethee process using a partial order

2. Entering Flow

$$\emptyset^{-}(a1) = \frac{1}{n-1}\sum \varphi\,(a1, x)\; x\; \varepsilon\; A \tag{6}$$

Description:

$\emptyset^{-}(a1) = $ *entering flow*, Used to determine the order of priority on the Promethee process using a partial order

3. Net Flow

$$\emptyset(a1) = \emptyset^{+}(a1) - \emptyset^{-}(a1) \tag{7}$$

Description:

$\emptyset(a1) = $ *net flow*, Leaving Flow and Entering Flow reduction results are used to generate the final decision of order determination in resolving the problem resulting in a complete order.

4. Result and Discussion

Based on table 3 and table 4 in point number 2 above the final result is obtained in the form of Utility value for the SMART method and NetFlow on the Promethee method based on the formula previously described, then obtained as follows (Additional: Fn is Criteria, Xn is Applicant):

Table 3. Final Result for SMART method

Xn	Fn	Value	Utility	Weight	Result
X1	F1	0	0	0,2	40
	F2	0	0	0,2	
	F3	100	100	0,15	
	F4	50	50	0,15	
	F5	50	50	0,2	
	F6	75	75	0,1	
X2	F1	100	100	0,2	61
	F2	100	100	0,2	
	F3	100	100	0,15	
	F4	0	0	0,15	
	F5	0	0	0,2	
	F6	60	60	0,1	
X3	F1	100	100	0,2	47,5
	F2	0	0	0,2	

Xn	Fn	Value	Utility	Weight	Result
	F3	100	100	0,15	
	F4	50	50	0,15	
	F5	0	0	0,2	
	F6	50	50	0,1	
X4	F1	0	0	0,2	37
	F2	0	0	0,2	
	F3	100	100	0,15	
	F4	100	100	0,15	
	F5	0	0	0,2	
	F6	70	70	0,1	
X5	F1	100	100	0,2	88
	F2	100	100	0,2	
	F3	100	100	0,15	
	F4	100	100	0,15	
	F5	50	50	0,2	
	F6	80	80	0,1	

Table 4. NetFlow value for Promethee method

Applicants	Leaving Flow (LF)	Entering Flow (EF)	Net Flow	Rank
X1	-1,69184	1,69184	-3,38368	5
X2	1,11526	-1,11526	2,23052	2
X3	-0,33574	0,33574	-0,67148	3
X4	-1,54184	1,54184	-3,08368	4
X5	5,01526	-5,01526	10,03052	1

5. Conclusion

Based on the final results from point number 4 above it can be concluded that:

1. Accounting Staff with minimum 1 year experience criteria, understand tax, be able to operate computers, maximum age of 35 years, S1 Accounting education, and interview results obtained the final results for the SMART method are 40.0, 61.0, 47.5, 37.0, 88.0, 35.0, 36.5, 30.0, 36.2 , 90.0. Where the highest final value is 90.0 of X10. Whereas for the Promethee method the results obtained are Net Flow of -3.38, 2.23, -0.67, -0.38, 10.03, -3.88, -3.28, -5.38, -3.40, 10.83. Where the highest Net Flow is 10.83 belongs to X10.
2. There is a ranking difference between the SMART and Promethee methods in the Accounting Staff vacancies with 6 criteria because the SMART method uses the initial input in the form of normalized weights while the Promethee method uses the input in the form of normalized weights and in particular the parameters where the initial input should be adjusted to the normalized weight due to affect the calculation end.

6. References

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