Employee Recruitment Analysis using Computer Based Weighted Product Model

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Abstract. The purpose of this study is to help the employee recruitment activity to fit the criteria of the company. Weighted Product Model was the method used in this research. For this purpose, this method provided an alternative decision in the process of employee recruitment activities. From this result, companies get the employee according to the criteria and have high performance in their job. This method considers various criteria needed for the employee acceptance process so that it can provide alternative decisions to assist in the process of employee recruitment in accordance with the criteria desired by the company. This method uses multiplication to connect the attribute rating, where the rating of each attribute must be raised first with the weight of the attribute in question. So, this method can help companies get the employees according to the required criteria.

1. Introduction
The employee is an individual hired by an employer to do a specific job [1]. Recruitment is a series of processes for withdrawing candidates to fill vacant positions in a company [2]. Recruitment is also an activity to select and evaluate employees needed by the company [3]. The way the company recruits can influence the type of employee employed [4]. Company performance is significantly influenced by recruitment and selection criteria. The more objective the criteria and recruitment, the better the performance of the company[5].

An effective recruitment process is able to present the best resources that have special abilities and skills to meet the required specifications. However, there are often obstacles in the recruitment process that are caused by a mismatch of criteria with the company's needs. Heater et al [6] state that the mistakes that occur in the recruitment process will result in employee disobedience to his work. The lack of commitment to work, absenteeism and high turnover is a result of mistakes in the recruitment process [7]. On the research, [8] states that personality tests and the ability of prospective employees as important factors to get ideal employees. Mamadova et al [9] state that TOPSIS is a method that can be used for the recruitment process. However, there is no determination of the weighting criteria so that the value given is based on subjective considerations. On the research, Afshari et al. [10] state that Simple Additive Weighting (SAW) is a method to get the best employees because it considers the qualitative criteria needed by the company. But the disadvantages of this method are the difficulty in weighting criteria and the length of time for decision making.

In fact, difficulties in determining criteria, weight, and the limited time of acceptance will add to the problems in the employee recruitment process. Therefore, the purpose of this study is to assist employee recruitment activities using the Weighted Product Model method to fit the company's criteria [11]. This
method is a multi-criteria decision-making method that considers the various criteria needed for recruitment activities according to the needs so that the company will more easily get employee recommendations with a relatively faster time.

2. Method
This research used a quantitative approach using descriptive methods by conducting a comparative study of the phenomena found [12]. The first step, find and formulate the problems by conducting interviews, observations, and literature studies for theories in this study.

The second steps are collecting data and analysed. Employee data from PT. X in 2017 is the data used for this study. PT. X is a company that has problems in the process of employee recruitment. After analysing, monitoring and determining the number of employee needs, the next step is to determine employee acceptance using the Weighted Product Model, or it called WPM. The first step of WPM is determining criteria and weighting criteria based on job requirements. WPM is a finite set of decision alternatives described in terms of several decision criteria. The decision can be expressed in the matrix, where each row i corresponds to the candidate i in each column according to the specified attribute. The formula is [13]:

\[ S(A_i) = \prod_{j=1}^{n} x_{ij}^{w_j} \]  

Where \( x_{ij} \) is attribute j of candidate i, \( w_i \) is the weight of attributed j, \( w_j \) is the initial weight that has been fixed.

After that, the calculated vector value \( V \) to get the best candidate for decision making. The formula is [13]:

\[ V_i = \frac{S(A_i)}{S(A^*)} = \frac{\prod_{j=1}^{n} x_{ij}^{w_j}}{\prod_{j=1}^{n} x_{ij}^{w_j}} \]  

After finding the best candidate for employee recruitment then the final step is to conclude the results according to the research objectives.

3. Results and Discussion
Based on employee monitoring data in 2017, there was a need 2 employee in the HR department. According to these needs, job vacancies are opened for that position. The first step from WPM is determining criteria and weighting criteria. Criteria needed form this position is Education (\( x_1 \)), age (\( x_2 \)), language and computer skill (\( x_3 \)), organizational experience (\( x_4 \)), work experience (\( x_5 \)) written test (\( x_6 \)) and interview scores (\( x_7 \)). The value weight from 4 applicants (\( A \)) is in Table 1.

| \( A \) | \( x_1 \) | \( x_2 \) | \( x_3 \) | \( x_4 \) | \( x_5 \) | \( x_6 \) | \( x_7 \) |
|-------|--------|--------|--------|--------|--------|--------|--------|
| \( A_1 \) | 1      | 2      | 2      | 4      | 4      | 75     | 80     |
| \( A_2 \) | 2      | 4      | 3      | 2      | 2      | 80     | 75     |
| \( A_3 \) | 1      | 3      | 4      | 2      | 2      | 85     | 75     |
| \( A_4 \) | 3      | 4      | 4      | 4      | 2      | 80     | 75     |
Based on Table 1, the reference weight for each criterion is:
\[ w_j = (0.17, 0.14, 0.10, 0.10, 0.14, 0.14, 0.17) \] and \[ \sum w_j = 0.96 \]
After \( w_j \) is determined, then determine the vector value \( S \) where the data will be multiplied and previously will be carried out with the initial weight. Based on the formula, the calculation of vector value \( S \) is:

\[
S(A_i) = \prod_{j=1}^{n} x_{ij}^{w_j}
\]

\[
S(A_i) = (x_1^{w_1}) (x_2^{w_2}) (x_3^{w_3}) (x_4^{w_4}) (x_5^{w_5}) (x_6^{w_6}) (x_7^{w_7})
\]

\[
S(A_i) = (1^{0.17}) (2^{0.14}) (2^{0.1}) (4^{0.1}) (4^{0.14}) (75^{0.14}) (80^{0.17}) = 6.35
\]

The conclusion vector value \( S \) for all applicants are listed in Table 2.

| \( A \) | \( S(A) \) |
|---|---|
| \( A_1 \) | 6.35 |
| \( A_2 \) | 6.93 |
| \( A_3 \) | 6.14 |
| \( A_4 \) | 8.19 |

The next step is calculating vector value \( V \) for finding the best candidate for employee recruitment. The formula is:

\[
V_i = \frac{S(A_i)}{S(A^+)} = \frac{\prod_{j=1}^{n} x_{ij}^{w_j}}{\prod_{j=1}^{n} x_{ji}^{w_j}}
\]

\[
V_i = \frac{S_i}{\sum_{i=1}^{n} S_i}
\]

\[
V_1 = \frac{6.35}{6.35 + 6.93 + 6.14 + 8.19} = \frac{6.35}{27.61} = 0.23
\]

The conclusion vector value \( V \) for all applicants are listed in Table 3.

| \( A \) | \( V(A) \) |
|---|---|
| \( A_1 \) | 0.23 |
| \( A_2 \) | 0.25 |
| \( A_3 \) | 0.22 |
| \( A_4 \) | 0.30 |

After we know the calculation of \( V \), the last step is to rank \( V \) from the largest to the smallest value. This step is to examine the result of selecting prospective employees who will be the best choice to be chosen and accepted by the company. The rank of \( V \) is listed in Table 4.
Table 4. The rank of V

| V   | V(A) | Ranking |
|-----|------|---------|
| V_4 | 0.30 | I       |
| V_5 | 0.25 | II      |
| V_1 | 0.23 | III     |
| V_3 | 0.22 | IV      |

Table 4 is a model used to get the best candidate by sorting the values V from highest to lowest. The highest value is obtained by alternative V_4 because there are 2 people HR staff needs candidates who are ranked 1 and 2 will be recommended to occupy that position. From these results, it is easier for companies to get employee recommendations according to the required criteria because the recommended candidates are candidates who have the highest score.

Why companies need this model? Because company performance is significantly influenced by recruitment and selection criteria. The more objective the criteria and recruitment, the better the performance of the company [5]. In addition, this method provides recommendations for employee acceptance according to company needs in a relatively fast time compared to the TOPSIS and SAW methods. This is because the TOPSIS method does not have a determination of the weighting criteria so the value given is based on subjective considerations [9] and the SAW method requires a relatively long time in recruitment activities [10]. So, with this method, the company easier to find the employees consider the various criteria needed for recruitment activities according to the needs of the company and relatively fast time.

4. Conclusion

This study concludes that the Weighted Product model can assist in employee recruitment activities. So based on company interviews, the company will find it easier to get employees who meet the required criteria with a shorter recruitment time.

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