# *Decision Support System For New Employee Recruitment Using Weighted Product Method*

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***Abstract*—Companies need new employees that are expected to meet the assessment of each criteria. The criteria set by the company is expected to become a quality standard for the employee's own personal progress. One of the problems in the recruitment of new employees is the problem of subjectivity in the decision for the determination of a new employee candidates. The research objective is to facilitate decision-making on issues related to making decision of new employees recruitment. Processing of data on research using *Weighted Product* methods with the concept of multiplication to connect rating attributes which should be raised to advance with the relevant weights. The criteria used in the research of new employees recruitment taken in general that is flexible in the sense that can be added or the opposite of education, GPA, work experience, interview and test basic skills. Results of the research is a decision support system application web-based recruitment of new employees who provide information to the last of the top-ranked candidate new employees as consideration for taking the right decision and is expected to simplify the process of decision the best.**

***Keywords—decision support systems; new employee recruitment; weighted product***

## I. INTRODUCTION

Companies need new employees that are expected to meet their respective assessment criteria established by the company. Each company has a criteria in determining each employee recruitment which is expected to become a quality standard for the employee's own personal progress. Weigthed Product Methods (WP) used in this study for the processing of data as this method is considered more efficient and have a shorter time needed in a calculation [1]. Given the importance of employees as one element of the company's achievement of corporate goals and development of the company, the development of decision support systems is expected to be a solution for companies/agencies in the candidate selection process of new employees the right and objective.

Their decision support systems in the selection process for new employees would be easier for the company/institution specified in the selection process is done in terms of time and effort, especially supported by the application method so results are more objective.

## II. DECISION SUPPORT SYSTEMS

Decision Support System (DSS) is a computer-based information system that produces a variety of alternative decisions to assist management in handling various problems in semi-structured or unstructured using data and models. [2]

Decision-making is the result of a process of selecting from a variety of alternative actions that may be selected by a particular mechanism, with the aim to deliver the best outcome. Where the decision process gradually, systematically, consistently, and in every step from the beginning has been to include all parties, will give good results. [3]

The goal of DSS is to help decision makers choose various alternative decisions that are processing the information obtained or provided by using a decision-making model. The main characteristic simultaneously superiority of the decision support system is its ability to solve problems of unstructured. [4]

The decision support system characteristics [2]:

1. The decision support system designed to help decision makers in solving problems that are semi-structured or unstructured.
2. The decision support system is designed such that it can be used Easily by people who do not have the basic capability of computer operation is high.
3. Decision support systems are designed with emphasis on the flexibility and adaptability are

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high. So Easily adapted to a variety of environmental changes that occur in the user's needs.

## III. FUZZY MULTIPLE ATTRIBUTE DECISION MAKING (FMADM)

Fuzzy Multiple Attribute Decision Making (FMADM) is a method used to find the optimal alternative of a number of alternatives to certain criteria. The essence of FMADM is to determine the weight values for each attribute, followed by ranking process that will select the alternative that has been given. [1]

There are several methods that can be used in solving the problem FMADM. Among others :

*1*) Simple Additive weighting method (SAW)
2) Weighted Product (WP)
3) ELECTRE
4) Tehnique for Order Preference by Similarity to Ideal Solution (TOPSIS)
5) Analytic Hierarchy Process (AHP)

## IV. WEIGHTED PRODUCT

Product Weighted method is one method of settling the FMADM problem. This method evaluates several alternatives to a set of attributes or criteria, where each attribute is not interdependent with each other.

According to Yoon Weighted Product method using multiplication techniques to connect rating attributes, where each attribute rating should be raised to advance with the corresponding attribute weights. This process is similar to the process of normalization. [1]

The steps undertaken in problem solving using the weighted product method is:

1. Determine the criteria (Cj)
   To determine recommendation of new employees recruitment who will be accepted, then it takes some criteria for decision-making. These criteria have been established by the company
2. Determine the weight value of each of the existing criteria (w)
   The weight is the value or the relative importance of each criterion (Cj) provided by the Company. Value weight given as a value Σwj = 1.

$$W = \{w1, w2w3, ....., wn\} \quad (1)$$

   Where W (w1, w2w3, ....., wn) is weight value of each interest criteria, while Σwj is the sum of all the weights add up to reach a value of 1.
3. Simplify the weight criteria (normalization)
   Simplification of each weighting each criterion according to the formula:

$$W_j = \frac{w_j}{\sum w_j} \quad (2)$$

   Normalization or improvement of weights to generate value $w_j = 1$ where j = 1, 2, ... .., n are a lot of alternatives and $\sum w_j$ is the sum of the weights.
4. Calculate the value of vector S
   Counting results vector S by the formula:

$$(S_i = \prod_{j=1}^{n} X_{ij} W_j \text{ ; with i = 1,2 .....,m}) \quad (3)$$

   Determining the value of the vector (S) by multiplying all of the criteria with an alternative outcome normalization or improvement positive exponential weights to the criteria profits (benefits) and negative exponential to the criteria of cost (cost). Where (S) is the preference criteria, (x) is the value of the criteria and (n) is the number of criteria
5. Calculate the value of Vector V
   After the vector S of each alternative is obtained the next step is to calculate the value vector V by the formula:

$$Vi = \frac{Si}{\sum_{j=1}^{m} Si} \text{ ; with i = 1,2 ..... m} \quad (4)$$

   Determining the value of the vector (V) in which the vector (V) is an alternative preferences that will be used to rank of each number vector value (S) with the total value of the vector (S).

## V. WEIGHTED PRODUCT FOR PROBLEM SOLVING

Weighted product method is used as a solution in the case of acceptance of new employees for such methods to evaluate several alternatives for a set of attributes or criteria where each attribute is not interdependent with each other. Recruitment will certainly have a lot of alternatives or candidates who register with diverse competencies to then selected using a set of criteria established by the company/institution so it needs proper methods to overcome such conditions.

The problem Settlement in terms of selection of new employees recruitment is to follow the steps or the algorithm of weighted product method.

1. Determination of the Criteria

The criteria used in this study was taken in general in terms of the criteria used by the company /institution in the selection process for employees. But flexible on the built system so that the criteria can be added or otherwise. Criteria ($C_{j}$ that used are:

1) Education
2) GPA
3) Work experience
4) Interview test
5) Tes Basic Capabilities

2. Weight Determination Criteria

There weighting of each criterion that is performed using the value of the benefit. Each criteria there are five (5) the level of interest shown in Table 1.

TABLE I. WEIGHT DESCRIPTION

| Weight | Value of Benefit |
|---|---|
| 3 | Important |
| 2 | Quite Important |
| 1 | Less Important |

The weighting of each criteria that is used on each interest given rate by 1 (one) up to the value of 3 (three), see Table 2 until Table 6.

1) Education (C1), the latest education of new employees candidate.

TABLE II. WEIGHTS EDUCATION ASSESSMENT CRITERIA

| Value of Benefit / Criteria Weight | Criteria |
|---|---|
| 3 | S1/equivalent |
| 2 | D3/equivalent |
| 1 | SMA/SMK/equivalent |

2) GPA (C2), the value of GPA of new employees candidate. Terms used by the company or agency that is with a minimum GPA is 2.75.

TABLE III. WEIGHT ASSESSMENT CRITERIA GPA

| Value of Benefit / Criteria Weight | Criteria |
|---|---|
| 3 | 3.50 – 4.00 |
| 2 | 3.00 – 3.49 |
| 1 | 2.75 – 2.99 |

3) Work Experience (C3), the number of work experience of new employees candidates in accordance with the criteria proposed by the company/institution.

TABLE IV. WEIGHT ASSESSMENT CRITERIA WORK EXPERIENCE

| Value of Benefit / Criteria Weight | Criteria |
|---|---|
| 3 | > 2 |
| 2 | 1 – 2 |
| 1 | There is No |

4) Interview (C4), interview test results conducted by the company / institution.

TABLE V. WEIGHT ASSESSMENT CRITERIA INTERVIEW

| Value of Benefit / Criteria Weight | Criteria |
|---|---|
| 3 | Good |
| 2 | Enough |
| 1 | Less |

5) Basic Ability Test (C5), tests conducted by the company / institution to measure the academic level of new employees candidates.

TABLE VI. WEIGHT ASSESSMENT CRITERIA BASIC ABILITY TEST

| Value of Benefit / Criteria Weight | Criteria |
|---|---|
| 3 | > 80 |
| 2 | 60 – 80 |
| 1 | < 60 |

3. Weight Improvement or Normalization

If the test data is given by 4 (four) alternate potential employees with the criteria that can be seen in Table 7.

TABLE VII. VALUES FOR EACH ALTERNATIVE CRITERIA

| | C1 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|
| **Abdullah** | S1 | 3.14 | 2 | Good | 84 |
| **Hendra** | D3 | 3.21 | 2 | Enough | 90 |
| **Zainal** | S1 | 3.00 | 1 | Good | 80 |
| **Putra** | S1 | 2.88 | 3 | Enough | 82 |

From Table 7 do repairs/normalization weights first. Weight of preference which is used as the testing seen from the level of importance based on the assumption of the consideration of each criteria, namely:

1) Education (C1), is worth very important with assumption standardization value al ready recognized in in the form of national diplomas.
2) GPA (C2), is worth quite important with assumption standardization value be guaranteed by school or college origin.
3) Work Experience (C3), is worth quite important assuming work experience different from each employee candidates.
4) Interview (C4), worth very important, assuming the interview is a question and answer process to test the oral communication skills of employees candidates.

5) Basic Ability Test (C5), worth very important, assuming standardized test scores basic ability to measure the level of academic of employees candidates.

With the result to get the weights for each of the criteria that can be seen in Table 8.

TABLE VIII. WEIGHTS FOR EACH CRITERIA

| Criteria (C) | Weight (W) | Value of Benefit |
|---|---|---|
| $C_1$ | 3 | Very Important |
| $C_2$ | 2 | Quite Important |
| $C_3$ | 2 | Quite Important |
| $C_4$ | 3 | Very Important |
| $C_5$ | 3 | Very Important |

Before the calculation, first normalization performed using weights equation 2, thus obtained:

$$W_1 \text{ (Weight } C_1) = \frac{3}{3+2+2+3+3} = 0.231$$

$$W_2 \text{ (Weight } C_2) = \frac{2}{3+2+2+3+3} = 0.154$$

$$W_3 \text{ (Weight } C_3) = \frac{2}{3+2+2+3+3} = 0.154$$

$$W_4 \text{ (Weight } C_1) = \frac{3}{3+2+2+3+3} = 0.231$$

$$W_5 \text{ (Weight } C_1) = \frac{3}{3+2+2+3+3} = 0.231$$

Results normalization weights shown in Table 9.

TABLE IX. WEIGHT NORMALIZATION CRITERIA

| Criteria (C) | Weight (W) |
|---|---|
| $C_1$ | 0.231 |
| $C_2$ | 0.154 |
| $C_3$ | 0.154 |
| $C_4$ | 0.231 |
| $C_5$ | 0.231 |

4. Calculating the Value of Vector S

Determining the value of vector S using equation 3 where the vector S expressed a preference alternatives, so that:

$S_1 = (3^{0.231})(2^{0.154})(2^{0.154})(3^{0.231})(3^{0.231})$
$= (1.289)(1.113)(1.113)(1.289)(1.289)$
$= 2.653$

$S_2 = (2^{0.231})(2^{0.154})(2^{0.154})(2^{0.231})(3^{0.231})$
$= (1.174)(1.113)(1.113)(1.174)(1.289)$
$= 2.201$

$S_3 = (3^{0.231})(2^{0.154})(2^{0.154})(3^{0.231})(2^{0.231})$
$= (1.289)(1.113)(1.113)(1.289)(1.174)$
$= 2.416$

$S_4 = (3^{0.231})(1^{0.154})(3^{0.154})(2^{0.231})(3^{0.231})$
$= (1.289)(1)(1.184)(1.174)(1.289)$
$= 2.310$

5. Calculating the Value Vector V

Calculation of the vector V is done after the calculation of the vector S is found. Determining the value of the vector V using the equation 4, so that:

$$V_1 = \frac{2.653}{2.653+2.201+2.416+2.310} = \mathbf{0.277}$$

$$V_2 = \frac{2.201}{2.653+2.201+2.416+2.310} = \mathbf{0.230}$$

$$V_3 = \frac{2.416}{2.653+2.201+2.416+2.310} = \mathbf{0.252}$$

$$V_4 = \frac{2.310}{2.653+2.201+2.416+2.310} = \mathbf{0.241}$$

From the results of the vector V is obtained, then the alternative recommendation obtained from the perangkingan is the value V1 which has the highest score is 0.277, so that the system recommends a new employee candidates being accepted recommendation is the first alternative. For more details on the results of ranking the candidates of new employees from the test data can be seen in Table 10

From the results of the obtained vector V, then the recommendation of alternative obtained from the rank is value $V_1$ which has the highest value namely 0.277, so that the system recommends a new employee candidates being accepted recommendation is the first alternative. For more details on the results of ranking the candidates of new employees from the test data presented in Table 10.

TABLE X. RESULTS RANKING OF RECOMMENDATIONS

| Rank Alternative | Candidates Employees | Final Score (Vector V) |
|---|---|---|
| **1** | Abdullah | **0.277** |
| **2** | Zainal | **0.252** |
| **3** | Putra | **0.241** |
| **4** | Hendra | **0.230** |

For the implementation of the system can be seen in Figure 1 which displays the data of each alternative potential employees on each criteria.


Fig. 1. Data Value for all Alternative

To begin the process of calculating the data in the system admin have to input the value of the degree of importance of each criteria as shown in Figure 2.


Fig. 2. Input Level of Interest Criteria.

From the input level of importance criteria we then analyze the data processing system by applying the method of weighted product into the system to generate alternative recommendations of new employees who will be received by looking at the value scoring vector V, as in Figure 3.

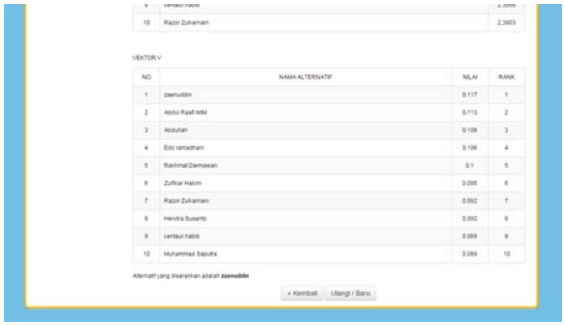

Fig. 3. Alternative Employee Recommendations Results.

## VI. CONCLUSION

Based on the results of research on the reception of selection of candidates using the method of Weighted Product, it can be concluded that the system performs the calculation process alternative data based on criteria and weight criteria by using the value of the interest rate. From the test results by using test data as much as 4 (four) alternate potential employees, then the resulting sequence of recommendations based on the highest value of the vector V as the main alternative candidates on new employees.

Based on the results of research on the selection of new employees recruitment using the method of Weighted Product, it can be concluded that the system performs the calculation process alternative data based on criteria and weighting criteria by using the value of the interest rate. From the test results by using test data as much as 4 (four) alternate potential employees, then the resulting vector V rank of value with the value vector V supreme as the main alternative candidates on new employees.

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