Development of E-Recruitment as a Decision Support System for Employee Recruitment

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Abstract. This research aims to design and develop an employee recruitment system that can manage applicant data and provide recommendations for eligible applicants to be accepted or rejected by applying the Profile Matching method. Current problems in the employee selection process at PT. Duta Tata Echoindo is still done with a manual calculation system so that the recruitment process takes a long time and allows the company to get employees who are not in accordance with the desired competencies. The criteria used in the employee selection process are General Skills Assessment and Special Skills Assessment. The Profile Matching Method will calculate the gap between the criteria score and the applicant's profile score. Applicants with the highest match score level have a great chance of being accepted. The result of this research is a web-based E-Recruitment system that can automatically calculate the match level of each applicant based on the Profile Matching method. The impact of this research is that the E-Recruitment system will speed up the recruitment process and make it easier for the HR division to make decisions to recruit employees.

1. Introduction
E-recruitment is an electronic-based employee recruitment system that has a significant impact on the effectiveness of the Human Resource Department [1], [2]. E-Recruitment can be used to determine employees who will be accepted by implementing a Decision Support System method. Decision Support System can increase effectiveness of decision making in an organization [3]. There are many studies on the implementation of decision support systems in hiring employees, including research [4], [5], [6]. Based on this research, Decision Support System is able to solve problems in determining applicants who will be accepted in the employee recruitment process.

Currently the selection process of employees at PT. Duta Tata Echoindo are still done with a manual system by recording the calculation of test scores and interviews on a form. The increasing number of applicants makes it difficult for the Human Resource Department to manage applicant data so that the recruitment process takes a long time and allows the company to get employees who are not in accordance with the desired competencies. In this research, the decision-making method implemented is the Profile Matching method. The profile matching method was chosen because this method can match the profile of the applicant with the job profile applied. Some activities can be completed using the Profile Matching Method as in research [7], [8]. The application of the Profile Matching method related to staffing activities includes [9] discusses employee selection for promotion. The implementation of the Profile Matching method in employee recruitment was carried out in [10] that discussed the calculation of Profile Matching Method in recruiting employees.
This research aims to solve problems in the employee recruitment process by designing and building an E-recruitment system by implementing a profile matching method to help determine applicants who will be accepted.

2. Method

2.1. Profile Matching Method
In general profile matching process is the process of comparing individual competencies into job competencies so that differences in competency can be known (also called gaps) [10].

2.1.1. Competency Gap Mapping
Competency gap is the difference in value from each aspect or attribute with the target value. The formula for calculating gap is shown below:

\[
\text{Gap} = \text{Minimal Profile} - \text{Data Testing Profile}
\]  

The results of the gap calculation can be mapped as in Table 1.

| Gap | Weight Value | Information                      |
|-----|--------------|----------------------------------|
| 0   | 5            | Not Gap (Competence as needed)   |
| 1   | 4,5          | Individual competencies have an excess of 1 level |
| -1  | 4            | Individual competencies lack 1 level |
| 2   | 3,5          | Individual competencies have an excess of 2 level |
| -2  | 3            | Individual competencies lack 2 level |
| 3   | 2,5          | Individual competencies have an excess of 3 level |
| -3  | 2            | Individual competencies lack 3 level |
| 4   | 1,5          | Individual competencies have an excess of 4 level |
| -4  | 1            | Individual competencies lack 4 level |

2.1.2. Calculating Values of Core Factors and Secondary Factors
After calculating the gap of each criterion, then determine the weight of values and determine the factors that become the core and secondary factors. Core factors are the aspects most needed by a job position, while secondary factors are supporting aspects in a job position. The core factor calculation formula can be seen below.

\[
NCF = \frac{\sum NC}{\sum IC}
\]  

Information:
NCF : Average Value Core Factor
NC : Total Value Core Factor
IC : Number of Items Core Factor

The secondary factor calculation formula can be seen below:

\[
NSF = \frac{\sum NS}{\sum IS}
\]  

Information:
NSF : Average Value Secondary factor
2.1.3. Calculating Total Value.

After calculating core factors and secondary factors from each aspect, then the calculation of each aspect is then carried out. The calculation formula for the total value can be shown below.

\[
N = (X)\%NCF + (X)\%NSF
\]  

Information:
N : Total value of each aspect
NCF : Average Value Core Factor
NSF : Average Value Secondary factor
(X)\% : Percentage Value

2.1.4. Calculating Ranking

The final result of the profile matching process is ranking. Ranking determination is obtained from the calculation formula shown below:

\[
\text{Ranking} = 70\%N1 + 30\%N2
\]  

Information:
N1, N2 : Total Value Per Criteria
\% : Percentage Criteria Value

2.2. Rapid Application Development

In developing this E-Recruitment system, the method used is Rapid Application Development. Rapid Application Development (RAD) is a life cycle strategy that is intended to provide development that is much faster and gets results with better quality compared to the results achieved through traditional cycles [11]. The RAD model is described in Figure 1.

![Figure 1. Rapid Application Development Model [11]](image_url)

The RAD phase are as follows

1. Requirement Planning
   - In this phase, users and meeting analysts to identify the objectives of the application or system and to identify the requirements of information generated from these objectives.

2. Design Workshop
   - This phase is the phase for designing and repairing which can be described as a workshop.

3. Implementation
   - In this implementation phase, analysts work intensely with users during workshops and design business aspects and non-technical companies.
3. Results and Discussion

In the employee selection process, there are two assessment criteria used, namely General Skills Assessment with a percentage of 30% and Special Skills Assessment with a percentage of 70%. Assessment is carried out during tests and interviews by HR divisions and supervisors. Each job position has different criteria value. This study uses five sample data as data testing. The work position that will be occupied is the Purchasing Staff.

3.1. Calculating Competency Gaps

At this step, determine Core Factor and Secondary from each sub-criteria. Then determine the profile value of the minimum job position that must be achieved by the applicant as shown in the Table 2.

| Criteria         | Sub Criteria | Job Position Profile | Type            |
|------------------|--------------|----------------------|-----------------|
| General Skills   | VM : Personal Vision & Mission | 3 | Secondary Factor |
| General Skills   | KD : Confidence | 3 | Core Factor      |
| General Skills   | PD : Self Confidence | 3 | Secondary Factor |
| General Skills   | KM : Ability to Explain | 3 | Core Factor      |
| General Skills   | PTJ : Responsibilities | 3 | Core Factor      |
| General Skills   | PL : Loyalty Potential | 3 | Secondary Factor |
| General Skills   | PKS : Team work Potential | 3 | Core Factor      |
| General Skills   | BK : Talent and Leadership | 3 | Core Factor      |
| Special Skills   | KA : Analytical Skills | 3 | Core Factor      |
| Special Skills   | BI : English | 3 | Secondary Factor |

Table 3 is a table of values from sub-criteria.

| Value | Information                   |
|-------|--------------------------------|
| 1     | Ability is very less than expected |
| 2     | Ability is less than expected   |
| 3     | Ability as expected             |
| 4     | Ability exceeds expectations    |

3.2. Calculating Values of Core Factors and Secondary Factors

The gap value that has been obtained will be converted into the weight gap value based on Table 1. Formula (2) and (3) are used at this step to calculate the average value of core factors and secondary factors. Table 4 and Table 5 is the calculation result for each core factor and secondary factor in each aspect.
Table 4. Weight Factor Value of General Skills Assessment

| Applicant ID | Weight Gap Value | NCF   | NSF   |
|--------------|------------------|-------|-------|
|              | VM   | KD   | PD   | KM   | PTJ  | PL   | PKS  | BK   | KA   |       |
| PL-001       | 4    | 5    | 4.5  | 4.5  | 5    | 5    | 4.5  | 5    | 5    | 4.83  |
| PL-002       | 5    | 4.5  | 4.5  | 5    | 5    | 5    | 4.5  | 5    | 5    | 4.75  |
| PL-003       | 4    | 4.5  | 4    | 4.5  | 5    | 5    | 4.5  | 5    | 5    | 4.75  |
| PL-004       | 5    | 4    | 3.5  | 3.5  | 4    | 4    | 5    | 4    | 3.5  | 4.25  |
| PL-005       | 4.5  | 4.5  | 5    | 4    | 5    | 5    | 4.5  | 5    | 4.5  | 4.33  |

Table 5. Weight Factor Value of Special Skills Assessment

| Applicant ID | Weight Gap Value | NCF | NSF |
|--------------|------------------|-----|-----|
| PL-001       | 4                | 0   | 4   |
| PL-002       | 5                | 0   | 5   |
| PL-003       | 5                | 0   | 5   |
| PL-004       | 4                | 0   | 5   |
| PL-005       | 5                | 0   | 5   |

3.3. Calculating Total Value

At this step, it is determined that the percentage for the Core Factor is 60% and Secondary factor is 40%.

By using formula (4), it will produce the total value of each aspect as in the Tables 6 and 7.

Table 6. Total Value of General Skills Assessment

| Applicant ID | NCF   | NSF   | Total Value |
|--------------|-------|-------|-------------|
| PL-001       | 4.83  | 4.5   | 4.7         |
| PL-002       | 4.75  | 4.83  | 4.78        |
| PL-003       | 4.75  | 4.33  | 4.58        |
| PL-004       | 4.25  | 4.5   | 4.35        |
| PL-005       | 4.33  | 5     | 4.6         |

Table 7. Total Value of Special Skills Assessment

| Applicant ID | NCF | NSF | Total Value |
|--------------|-----|-----|-------------|
| PL-001       | 0   | 4   | 1.6         |
| PL-002       | 0   | 5   | 2           |
| PL-003       | 0   | 5   | 2           |
| PL-004       | 0   | 5   | 2           |
| PL-005       | 0   | 5   | 2           |

3.4. Calculating Ranking

The final result of the calculation of the profile matching method is a ranking of the final scores of each aspect. Formula (5) is used to calculate the ranking of the total final values displayed in Table 8.
| Applicant ID | General Skills Assessment Value | Special Skills Assessment Value | Total Value |
|--------------|---------------------------------|---------------------------------|-------------|
| PL-002       | 4.78                            | 2                               | 3.35        |
| PL-001       | 4.7                             | 1.6                             | 3.29        |
| PL-003       | 4.58                            | 2                               | 3.21        |
| PL-005       | 4.6                             | 2                               | 3.23        |
| PL-004       | 4.35                            | 2                               | 3.05        |

Based on the results at Table 8, it can be seen that the biggest match results obtained by applicants with Applicant ID PL-002 with matching profile value of 3.35. Thus, PL-002 is a suitable applicant to be accepted.

3.5. Implementation Systems
The functionality of the E-Recruitment system can be described in the form of a Use case diagram in Figure 2. E-Recruitment can manage the entire employee recruitment process. Applicants can apply for job vacancy and upload requirements with online systems. The HR Division checks all requirements. Assessment of tests and interviews are inputted into the E-Recruitment system. The E-Recruitment system will display the ranking of the final results from the calculation of the Profile Matching method.

![Figure 2. E-Recruitment Use Case Diagram](image-url)
4. Conclusion
Profile Matching can be used in the employee selection process. The criteria used are General Capability Assessment and Special Capability Assessment. By using 5 sample applicant data, resulting in a total final value of applicant code PL-001 = 3.29, PL-002 = 3.35, PL-003 = 3.21, PL-004 = 3.05, PL-5 = 3.23. PL-002 has the highest level of a match so it is recommended to be accepted. This Profile Matching method is implemented on a web-based E-Recruitment system which is built to be able to manage the entire recruitment process. The impact of this research is that the E-Recruitment system will speed up the recruitment process and make it easier for the HR division to make decisions to recruit employees.

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