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

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# 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:

$$\text{Gap} = \text{Minimal Profile} - \text{Data Testing Profile} \tag{1}$$

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

**Table 1.** Weight Gap Value

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.

$$NCF = \frac{\sum NC}{\sum IC} \tag{2}$$

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:

$$NSF = \frac{\sum NS}{\sum IS} \tag{3}$$

Information:

- NSF : Average Value Secondary factor

NS : Total Value Secondary factor  
 IS : Number of Items 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.

$$N = (X)\%NCF + (X)\%NSF \tag{4}$$

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:

$$\text{Ranking} = 70\%N1 + 30\%N2 \tag{5}$$

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.

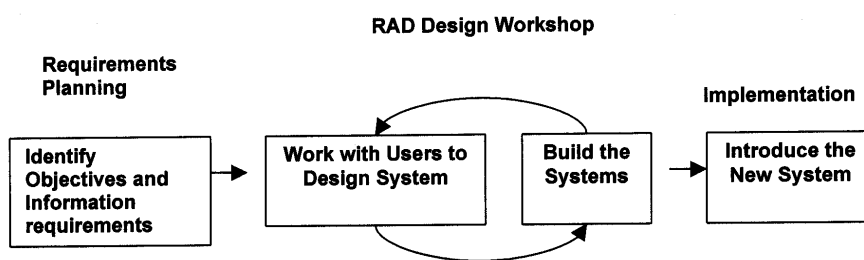


Figure 1. *Rapid Application Development Model [11]*

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.

**Table 2.** Aspect Criteria

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 Potential	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
General Skills	KA : Analytical Skills	3	Core Factor
Special Skills	BI : English	3	Secondary Factor

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

**Table 3.** Sub Criteria Value

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	4.5
PL-002	5	4.5	4,5	5	4,5	5	5	5	4,5	4.75	4.83
PL-003	4	4.5	4	4.5	5	5	4,5	5	5	4.75	4.33
PL-004	5	4	3.5	3.5	4	4	5	4	3.5	4.25	4.5
PL-005	4.5	4.5	5	4	4	5	4.5	4.5	4.5	4.33	5

**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.

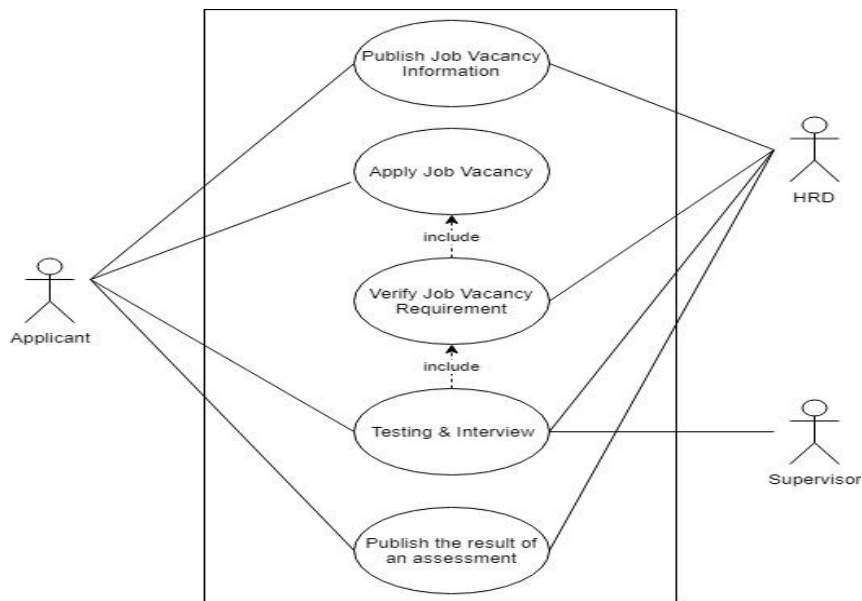
**Table 8.** Profile Matching Ranking

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

The screenshot shows a web application interface for profile matching. On the left is a sidebar menu with options like 'Beranda', 'Pengaturan User', 'Pengaturan Lowongan', 'Pengaturan Profile-Matching', 'Data Calon Pegawai', 'Seleksi Kelengkapan Pegawai', 'Form Penilaian', 'Proses Profile-Matching', 'Hasil Profile-Matching', and 'Laporan'. The main content area is titled 'Beranda' and contains a table of applicants under the heading 'DATA PELAMAR'. The table has a dropdown menu to filter by job type and a 'Tampilkan' button. The table data is as follows:

No	No Register	Nama	Lowongan Jabatan	Status	Ubah Status	Nilai Akhir	Nilai Umum	Nilai Khusus
1	140720180003	amel	Purchasing Staff	Diterima	UBAH	2.73	LIHAT	LIHAT
2	130720180001	rahmatun hasanah	Purchasing Staff	Sebagai Cadangan	UBAH	2.62	LIHAT	LIHAT
3	150720180004	santi	Purchasing Staff	Ditolak	UBAH	2.16	LIHAT	LIHAT
4	150720180006	riyanti	Purchasing Staff	Tidak Lolos Seleksi Administrasi		0	LIHAT	LIHAT
5	150720180007	neneng	Purchasing Staff	Tidak Lolos Seleksi Administrasi		0	LIHAT	LIHAT
6	150720180008	astrid	Purchasing Staff	Tidak Lolos Seleksi Administrasi		0	LIHAT	LIHAT
7	150720180009	aris	Purchasing Staff	Tidak Lolos Seleksi Administrasi		0	LIHAT	LIHAT
8	150720180010	hemat	Purchasing Staff	Tidak Lolos Seleksi Administrasi		0	LIHAT	LIHAT

Figure 3. E-Recruitment Interface

**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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