Employee Recruitment Fraud Prevention with the Implementation of Decision Support System

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Abstract. Decision Support System is a system commonly used to assist management in assisting decision-making in top managerial sections, Multi-Criteria Decision Making (MCDM) is one of many decision-making methods that can be used to select the best alternative from a number of alternatives based on certain criteria, one of the methods that can be utilized is the Elimination Et Choix Traduisant la Realite (ELECTRE) method that works based on the concept of outranking using pairwise comparisons of each alternative based on appropriate criteria, this paper applies the ELECTRE method in a web based application that can be employed for input and output dynamic for alternative, criteria, user values and also a fast ranking process, the choice of web based application because there is many research about decision support system but only few that applied to application, and this research tries to applied ELECTRE method to web based application.

1. Introduction

Employee[1] is a vital asset in supporting the progress of an organization whether it is a company, department or institution[1]. Without a qualified workforce, it will be difficult for an organization to develop itself and compete with the times. One of the important factors in the national development framework is related to human resources (HR)[2]. An organization cannot run by itself without human resources; thus reliable and qualified human resources are needed to support the survival of an organization[1], [2].

When there is an employee recruitment, an organization will not be arbitrary to choose the person who can occupy a required position[3]. An organization must get a decent and competent person in their field[2], [3], in the hope that the individual who has selected will be able to perform the job well under the job that has assigned.

Fraud[4] in the recruitment process may occur, and of course this could lead to economic losses[5] within company in the future, fraud prevention can be performed by using decision support system[6] to select employees based on the company requirement, a decision support system[6]–[12] can be one alternative solution for minimize fraud and the results of the selection process can also be obtained easily and for the managerial get valid data from each prospective employee[13], [14].
Profile Matching[15], [16] is a method that works by comparing the competence of prospective employees with vacancies profiles, candidates who have the greatest weight means have a greater chance to occupy vacancies, to optimize the potential competence assessment process of a prospective worker, a computer-based system is built. The system to be created will be more helpful for policymakers in making decisions[17], [18] and minimizing fraud regarding possible recruitment.

2. Methodology
Profile Matching[13], [16] is a method often used as a mechanism in decision-making by assuming that there is an ideal level of predictor variable that must be met by the subjects, rather than the minimum level that must be fulfilled or skipped. Profile Matching is a process of comparing[19] the actual value of a profile to be assessed with the expected profile value so that it can be known the difference in gap criteria, the smaller the gap, the greater the value, the gap criteria can be obtained by using this formula:

\[
\text{Gap} = \text{Aspect Value} - \text{Target Value}
\]

Gap criteria value can see in table 1 below:

| Gap | Weight Value |
|-----|--------------|
| 0   | 5            |
| -1  | 4            |
| 1   | 4,5          |
| 2   | 3,5          |
| -2  | 3            |
| 3   | 2,5          |
| -3  | 2            |
| 4   | 1,5          |
| -4  | 1            |

The weight of gap value in table 1 is used in the selection process of prospective employees, so it is also known the difference between each prospective employee, criteria, and sub-criteria employed in this research can see in table 2 below:

| Criteria and Sub Criteria | Criteria | Sub_Criteria |
|---------------------------|----------|--------------|
| Work Achievement          | KK       | KET          |
|                           | TJ       | KI           |
|                           | SK       |              |
| Attitude                  | E        | KED          |
|                           | MO       | PE           |
|                           | PD       |              |
| Teamwork                  | JK       | IN           |
|                           | KO       | KB           |
Next is to determine the weight value of each sub-criteria that can see in table 3 below:

| Criteria | Sub_Criteria |
|----------|--------------|
|          | PK           |
|          | SB           |
|          | LP           |
|          | KR           |

Table 3. Sub Criteria Value

| Sub Criteria Value | 1   | 2   | 3   | 4   | 5   |
|--------------------|-----|-----|-----|-----|-----|
|                    | Very Bad | Bad | Pretty Good | Good | Very Good |

After determining the weight of the required gap value and criteria itself, then each criterion is grouped into two groups, core factor and the secondary factor [13] [14].

\[
CF = \frac{\sum WCF}{\sum ICF} \\
SF = \frac{\sum WSF}{\sum ISF}
\]

Where is:
CF = Core Factor
SF = Secondary Factor
WCF = Weight Core Factor
ICF = Item Core Factor
WSF = Weight Secondary Factor
ISF = Item Secondary Factor

The result of the profile matching process is the ranking of the most eligible candidate until it does not qualify for admission to the company, the determination refers to the ranking calculated by the formula below:

\[
V = 60\% \ CF + 40\% \ SF
\]

Where is:
V = Total Value
CF = Core Factor
SF = Secondary Factor

The last thing for this experiment is the prospective employee (alternative) to be in the selection process, and table 3 is an alternative sample were used in this experiment.

Table 4. Alternative

| ID | Alternative |
|----|-------------|
| A1 | Antoni      |
| A2 | Michael Cussack |
| A3 | Robbi Rahim |
| A4 | Demi Moore |
| A5 | Bryan       |

Application of Profile Matching method created by using programming language PHP 6.0, MySQL Database and Apache Server and run on Mozilla Browser.
3. Result and Discussion
Employee recruitment experiments using Profile Matching methods to help fraud prevention are performing step by step, the first step is to determine the value of each alternative for each criterion, see table 5 until table 8 to each criteria value

| Table 5. Work Achievement Gap Criteria |
|----------------------------------------|
| No | Alternative | KK | Ket | TJ | KI | SK | Gap |
|----|-------------|----|-----|----|----|----|-----|
| 1  | A1          | 5  | 5   | 3  | 5  | 4  |     |
| 2  | A2          | 4  | 5   | 4  | 3  | 4  |     |
| 3  | A3          | 4  | 4   | 5  | 4  | 3  |     |
| 4  | A4          | 3  | 3   | 4  | 5  | 3  |     |
| 5  | A5          | 4  | 3   | 5  | 4  | 5  |     |
| Required Value | 3 | 4 | 4 | 5 | 4 | (⁺) (⁻) |

| No | Alternative | E | Ked | MO | PE | PD | Gap |
|----|-------------|---|-----|----|----|----|-----|
| 1  | A1          | 2 | 1   | -1| 0  | 0  | 3   |
| 2  | A2          | 2 | -1  | -1| -2 | -0 | 2   |
| 3  | A3          | 1 | 0   | 1 | -1 | -1 | 2   |
| 4  | A4          | 0 | -1  | 0 | 0  | -1 | 0   |
| 5  | A5          | 1 | -1  | -1| 1  | 1  | 2   |

| Table 7. Teamwork Gap Criteria |
|--------------------------------|
| No | Alternative | JK | IN | KO | KB | PK | Gap |
|----|-------------|----|----|----|----|----|-----|
| 1  | A1          | 5  | 5  | 4  | 4  | 4  |     |
| 2  | A2          | 5  | 4  | 4  | 5  | 4  |     |
| 3  | A3          | 4  | 5  | 5  | 4  | 4  |     |
| 4  | A4          | 4  | 4  | 5  | 5  | 4  |     |
| 5  | A5          | 4  | 5  | 4  | 5  | 4  |     |
| Required Value | 3 | 4 | 4 | 5 | 4 | (⁺) (⁻) |

| No | Alternative | JK | IN | KO | KB | PK | Gap |
|----|-------------|----|----|----|----|----|-----|
| 1  | A1          | 2  | 1  | 0  | -1| 0  | 3   |
| 2  | A2          | 2  | 0  | 0  | 0  | 0  | 2   |
| 3  | A3          | 1  | 1  | 1  | -1| 0  | 3   |
| 4  | A4          | 1  | 0  | 0  | 0  | 0  | 2   |
| 5  | A5          | 1  | 1  | 0  | 0  | 0  | 2   |
### Table 8. Intellectual Gap Criteria

| No | Alternative | SB | LP | KR | Gap |
|----|-------------|----|----|----|-----|
| 1  | A1          | 4  | 5  | 4  |     |
| 2  | A2          | 4  | 4  | 5  |     |
| 3  | A3          | 5  | 5  | 5  |     |
| 4  | A4          | 5  | 5  | 4  |     |
| 5  | A5          | 4  | 5  | 4  |     |

**Required Value**

| No | Alternative | SB | LP | KR | Gap |
|----|-------------|----|----|----|-----|
| 1  | A1          | 3  | 4  | 4  | (+) |
| 2  | A2          | 1  | 1  | 0  | 2   |
| 3  | A3          | 2  | 1  | 1  | 3   |
| 4  | A4          | 2  | 1  | 0  | 3   |
| 5  | A5          | 1  | 1  | 0  | 2   |

Weight value based on gap can be seen table 9 below:

### Table 9. Gap Value Description

| Gap | Value | Description |
|-----|-------|-------------|
| 0   | 5     | There was no difference |
| 1   | 4,5   | Competence individual excess 1 level |
| -1  | 4     | Competence individual less 1 level |
| 2   | 3,5   | Competence individual excess 2 level |
| -2  | 3     | Competence individual less 2 level |
| 3   | 2,5   | Competence individual excess 3 level |
| -3  | 2     | Competence individual less 3 level |
| 4   | 1,5   | Competence individual excess of 4 level |
| -4  | 1     | Competence individual less of 4 level |

Based on table 9 above; each of the gaps has different weight values and below are the value of the weights for each alternative based on the criteria

### Table 10. Weight Value for Work Achievement

| No | Alternative | KK | Ket | TJ | KI | SK |
|----|-------------|----|-----|----|----|----|
| 1  | A1          | 3.5| 4.5 | 4  | 5  | 5  |
| 2  | A2          | 4.5| 4.5 | 5  | 3  | 5  |
| 3  | A3          | 4.5| 5   | 4.5| 4  | 4  |
| 4  | A4          | 5  | 4   | 4.5| 4.5| 4  |
| 5  | A5          | 4.5| 4   | 4.5| 4.5| 4  |

### Table 11. Weight Value for Attitude

| No | Alternative | E  | Ked | MO | PE | PD |
|----|-------------|----|-----|----|----|----|
| 1  | A1          | 3.5| 5   | 5  | 5  | 4.5|
| 2  | A2          | 3.5| 3   | 4  | 5  | 3.5|
| 3  | A3          | 3.5| 4   | 4.5| 4.5| 4  |
| 4  | A4          | 3.5| 4   | 4.5| 4.5| 4  |
| 5  | A5          | 3.5| 5   | 4.5| 4.5| 4  |
Table 12. Weight Value for Teamwork

| No | Alternative | JK  | IN  | KO  | KB  | PK  |
|----|-------------|-----|-----|-----|-----|-----|
| 1  | A1          | 3.5 | 3.5 | 5   | 5   | 5   |
| 2  | A2          | 3.5 | 4.5 | 5   | 4.5 | 5   |
| 3  | A3          | 4.5 | 3.5 | 4.5 | 5   | 5   |
| 4  | A4          | 4.5 | 4.5 | 4.5 | 4.5 | 5   |
| 5  | A5          | 4.5 | 3.5 | 5   | 4.5 | 5   |

Table 13. Weight Value for Intellectual

| No | Alternative | SB  | LP  | KR  |
|----|-------------|-----|-----|-----|
| 1  | A1          | 4   | 3.5 | 5   |
| 2  | A2          | 4   | 4.5 | 4.5 |
| 3  | A3          | 3.5 | 3.5 | 4.5 |
| 4  | A4          | 3.5 | 3.5 | 5   |
| 5  | A5          | 4.5 | 3.5 | 5   |

Next process is to group the value of weight into core factor and secondary factor, consider the calculation below for Work Achievement:

1. Work Achievement Process
\[
NCF = KK, TJ, KI, SR \\
NSF = KET \\
NCF = \frac{3.5+4+5+5}{4} = 4.38 \\
NSF = \frac{4}{1} = 4.5
\]
\[
NCF = \frac{4.5+5+3+5}{4} = 4.38 \\
NSF = \frac{4}{1} = 4.5
\]
\[
NCF = \frac{4.5+4.5+4.4}{4} = 4.25 \\
NSF = \frac{5}{1} = 5
\]
\[
NCF = \frac{5+5+5+4}{4} = 4.75 \\
NSF = \frac{4}{1} = 4
\]
\[
NCF = \frac{4.5+4.5+4.5}{4} = 4.38 \\
NSF = \frac{4}{1} = 4
\]

2. Attitude Process
\[
NCF = E, KED \\
NSF = MO, PE, PD \\
NCF = \frac{3.5+5}{2} = 4.25 \\
NSF = \frac{5+5+4.5}{3} = 4.83
\]
\[
NCF = \frac{3.5+3}{2} = 3.25 \\
NSF = \frac{4+5+3.5}{3} = 4.17
\]
\[
NCF = \frac{3.5+4}{2} = 3.75 \\
NSF = \frac{5+4.5+4.5}{3} = 4.67
\]
\[
NCF = \frac{3.5+4}{2} = 3.75 \\
NSF = \frac{4.5+4.5+4.5}{3} = 4.50
\]
\[
NCF = \frac{3.5+5}{2} = 4.25 \\
NSF = \frac{5+4.5+4.5}{3} = 4.67
\]

3. Teamwork Process
\[
NCF = KO, KB, PK \\
NSF = JK, IN \\
NCF = \frac{5+5+5}{3} = 5 \\
NSF = \frac{3.5+3.5}{2} = 3.5
\]
NCF = $\frac{5+4.5+5}{3} = 4.83$  
NSF = $\frac{3.5+4.5}{2} = 4$

NCF = $\frac{4.5+5+5}{3} = 4.83$  
NSF = $\frac{4.5+3.5}{2} = 4$

NCF = $\frac{4.5+4.5+5}{3} = 4.67$  
NSF = $\frac{4.5+3.5}{2} = 4.50$

NCF = $\frac{5+4.5+5}{3} = 4.83$  
NSF = $\frac{4.5+3.5}{2} = 4$

4. Intellectual Process
NCF = KR  
NSF = SB, LP
NCF = $\frac{5}{1} = 5$  
NSF = $\frac{4.5+3.5}{2} = 4$

NCF = $\frac{4.5}{1} = 4.5$  
NSF = $\frac{4.5+4.5}{2} = 4.5$

NCF = $\frac{4.5}{1} = 4.5$  
NSF = $\frac{3.5+3.5}{2} = 3.5$

NCF = $\frac{4.5}{1} = 4.5$  
NSF = $\frac{3.5+3.5}{2} = 3.5$

NCF = $\frac{5}{1} = 5$  
NSF = $\frac{4.5+3.5}{2} = 4$

From the above calculation results then recalculated the total value based on the core factor and secondary factor that affect the assessment of each profile, for the calculation can be seen in the formula below:

$$N = (x)\%CF(x)\%SF$$

The calculation of the total value first determines the value of core factor 60% and secondary factor 40%, see example below:

1. Work Achievement  
   $A1 = (60\% \times 4.38) + (40\% \times 4.5) = 2.62 + 1.8 = 4.42$

2. Attitude  
   $A1 = (60\% \times 4.25) + (40\% \times 4.83) = 2.55 + 1.93 = 4.48$

3. Teamwork  
   $A1 = (60\% \times 5) + (40\% \times 3.5) = 3 + 1.4 = 4.4$

4. Intellectual  
   $A1 = (60\% \times 5) + (40\% \times 4) = 3 + 1.65 = 4.65$

Before displaying the final result of the calculation process, the data and formulas already described are made into the application with the results as shown in Figures 1 through 9, here is the picture:
Figure 1. List of Alternative Employee

Figure 2. List of Value

Figure 1 and Figure 2 is the initial data used for the calculation process with Profile Matching method, for the calculation result can be seen in the following figure 3 and 4:
Figure 3. Core Factor and Secondary Factor Value

Figure 4. Ranking in Profile Matching

Figure 4 is the result of the core calculation process and the secondary factor, where each alternative (the employee) is calculated the total value based on the existing criteria, the ranking displayed can be used as decision support for policymakers to accept employees working in the company and also can be a solution avoiding existing cheats.

Conclusion
The use of profile matching method on decision support system can assist the managerial in obtaining competent candidates, and fraud prevention can also be minimized with data obtained from decision support system.

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