Multi-Attribute Decision Making Model for Acceptance of Prospective Corporate Employees with Interpolation Method

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Abstract. PT PERSADA is one of the companies engaged in the field of labor management. Partner satisfaction is the most important thing for PT PERSADA; therefore in providing maximum service to partners PT. PERSADA, it requires a workforce that can serve the needs of companies with qualifications that can provide maximum benefits and low costs for the company. This can be seen and calculated from the criteria given by the company for the selection process of the prospective employees and of course different in each function of the job required. In supporting PT PERSADA to make decisions on the acceptance of these corporate employees, we propose an evaluation mechanism using the interpolation method. The interpolation method that we use is to convert the criteria value, then give the value of the numeric format after being compared with the minimum requirements of the position. After that we calculated the rating of each criterion per alternative (per candidate) and gave a rating recommendation based on the results of the candidate rating. The final result we got from the assessment mechanism was to get recommendations from prospective corporate employees with high benefits and low costs for the company.

1. Introduction

PT PERSADA is a company with two types of employee recruitment methods. The first is the acceptance of corporate employees who are tasked to serving the needs of the company and the second is the recruitment of employees who will be assigned to the company's partners. In this study we will discuss the acceptance of corporate employees.

The admission process is fairly easy, prospective employees do not need to take part in 5 stages\[1\], such as partner employees; there are only 3 steps that must be passed by the corporate employee. First step is Administration, interviews with users such as director or managers and the last is psychological tests. Along with the growth of PT PERSADA, routine employee recruitment is carried out in a ratio of 1: 5 (one position with five candidates for prospective employees). However, employees who are accepted must have maximum potential as company assets. High benefits and low cost for the company side. The quality of corporate employees will certainly determine the level of partner satisfaction for PT PERSADA services.

One of the way to support decisions and assess prospective employees is to use the interpolation decision support methods\[2\]. Where criteria will be divided into potential benefits and cost candidates.
This method is actually a numerical method that supports multi-attributes in a structured manner. But with a few steps, it can also solve multi-attribute problems by unstructured manner.

The purpose of this paper is to provide support for decisions on the acceptance of corporate employees who have high benefit value and a low cost factor for PT PERSADA. Because PT PERSADA accepts that for customer and the company is very important, customer satisfaction is determining the corporate success\cite{3}.

In order to be able to explain more to the reader about this study, we write this paper into the four parts, 1. Introduction, explain the background, problems, objectives and systematic writing. 2. Methods and Theories, explain the supporting theories used in this study also explain the methods used and the steps taken in this study. 3. Result and Discussions, explain with detailed results from the study and 4. Conclusions, explain the final conclusions from the results of the study.

2. Theories and Methods
2.1. Research Methods
This research is based on applied and descriptive methods\cite{4}. Because the purpose of this study is to find the employees who had the qualification for a high benefit and low cost for the company side. The keyword for benefit and cost also for the employee selection that means the company had something to do about a decision in practically multi attribute decision making (MADM)\cite{5}. So we narrowed our choice to the interpolation method because it fit properly to support the decision for highly benefit and low cost. And the other method that often used for supporting the MADM such as profile matching and AHP are having different purpose than this study purpose. In our previous study\cite{6} we have been using those two methods. which is used to find prospective employees who will be placed in the PT PERSADA partner that best matches the criteria requested.

2.2. Data Collection Methods
In data collection, we use methods of observation, interviews and analysis of work documents\cite{7}. Our observations are interacting directly with the work process of selecting corporate employees such as psychological tests, selection of administrative files and user interview tests. for interviews we frequently ask questions directly with HR staff who have a significant relationship to the process. for work documents that we analyze, among others, user interview forms, psychograms and documents for application documents for prospective corporate employees.

Data that we gathered such as, criterias for decision making, boundary for minimum requirement, example of decision, sample of selection batch and interpolation formula.

2.3. Sample Selection Method
In sample selection we used purposive sampling\cite{8}. The example taken in this study is one of part of the staff selection process for the liaison officer function because it directly describes the actual population and represents the objective characteristics of the study.

2.4. Data Analysis Methods
In this section we use the full interpolation method\cite{9}, starting from analyzing criteria in the benefit and cost categories to calculating the criteria per alternative.

3. Result and Discussions
3.1. Data Collection
3.1.1. Criteria
This paper is based on selection staff requirement minimum; there are three types of criteria. Administrative minimum requirement (K1), psychological test minimum requirement (K2) and user interview minimum requirement (K3).
3.1.2. Boundary
The boundary in administrative minimum requirement for liaison officer staff is explained in Table 1.

| No. | Administrative Requirement                              | Minimum Requirement |
|-----|---------------------------------------------------------|---------------------|
| 1.  | Minimum job experience in related work                  | 2 Years             |
| 2.  | Minimum level of education                              | Bachelor Degree     |
| 3.  | Minimum age                                            | 35 Years Old        |
| 4.  | Minimum marital status                                  | Preferably Single   |
| 5.  | Domicile                                               | Preferably Jakarta  |

The boundary in psychological test minimum requirement is explained in Table 2.

| No. | Psychological Test Requirement                          | Minimum Requirement |
|-----|---------------------------------------------------------|---------------------|
| 1.  | Intellectual Test                                       | Considered          |
| 2.  | Work Pace Test                                          | Recommended         |
| 3.  | Personality Test                                        | Recommended         |

And the boundary in user interviews test minimum requirement is recommended from 2 interviewers.

3.1.3. Sample Decisions
The decision for prospective staff candidates is listed in the Table 3.

| No. | Prospective Test Result                               | Decisions           |
|-----|-------------------------------------------------------|---------------------|
| 1.  | Administrative (K1) – Passed, Psychological test (K2) – Passed, User interview test (K3) – Passed | Accepted            |
| 2.  | Administrative (K1) – Passed, Psychological test (K2) – Considered, User interview test (K3) – Passed | Conditional Accepted |
| 3.  | Administrative (K1) – Passed, Psychological test (K2) – Considered, User interview test (K3) – Considered | Conditional Accepted |
| 4.  | Administrative (K1) – Considered, Psychological test (K2) – Considered, User interview test (K3) – Considered | Rejected            |
| 5.  | Administrative (K1) – Considered, Psychological test (K2) – Considered, User interview test (K3) – Passed | Conditional Accepted |
| 6.  | Administrative (K1) – Considered, Psychological test (K2) – Passed, User interview test (K3) – Passed | Conditional Accepted |

3.1.4. Sample of Selection Batch
The sample of the selection Batch is using the example of the group prospective employees for the liaison officer function as listed in the Table 4, which have passed the psychological test and user interview test.

| Candidate | SK11 | SK12 | SK13 | SK14 | SK15 | SK21 | SK22 | SK23 | SK31 |
|-----------|------|------|------|------|------|------|------|------|------|
| A1        | 4 Years | MD   | 36 YO | S    | Depok | C    | R    | R    | R    |
| A2        | 2 Years | BD   | 28 YO | S    | Bogor | R    | R    | R    | R    |
| A3        | 1 Year  | MD   | 32 YO | M    | Jakarta | R    | R    | R    | R    |
| A4        | 1 Year  | BD   | 24 YO | S    | Tangerang | R    | R    | R    | R    |
| A5        | 3 Years | BD   | 28 YO | M    | Bekasi | C    | R    | R    | R    |
Note:
A1-5: Alternative, MD: Master Degree, BD: Bachelor Degree, YO: Years Old, S: Single, M: Married, C: Considered, R: Recommended.

3.1.5. Interpolation Formula to Rate the Criteria

\[
\text{Rating} = \frac{(D - D_{\text{min}})}{(D_{\text{max}} - D_{\text{min}})}(R_{\text{max}} - R_{\text{min}}) + R_{\text{min}}
\]

Note:
the above formula is obtained from the modification of the straight-line linear interpolation formula\textsuperscript{[10]}

D : Criteria Numerical Format
Dmin: Lowest data for alternative value in criteria numerical format
Dmax: Highest data for alternative value in criteria numerical format
Rmin: Lowest rating value that could be given to alternative
Rmax: Highest rating value that could be given to alternative

3.2. Data Collection Analysis

3.2.1. Format Criteria Distribution
The breakdown criteria in benefit and cost for the company is listed in Table 5.

| Code | Sub Criteria       | Criteria | Distribution |
|------|--------------------|----------|--------------|
| SK11 | Job Experience     | K1       | Benefit      |
| SK12 | Education          | K1       | Benefit      |
| SK13 | Age                | K1       | Cost         |
| SK14 | Marital Status     | K1       | Cost         |
| SK15 | Domicile           | K1       | Cost         |
| SK21 | Intellectual       | K2       | Benefit      |
| SK22 | Work Pace          | K2       | Benefit      |
| SK23 | Personality        | K2       | Benefit      |
| SK31 | Interview          | K3       | Benefit      |

3.2.2. MADM Decision Modelling on Hierarchy Format
As a decomposition of the problems, we use mapping with hierarchical method from the data that we collected to present the multi-attribute decision making format in Fig. 1.
3.2.3. **Numerical Format**

For the purpose of facilitating the calculation using the interpolation formula so that there can be found prospective employees who have a high level of benefit and low cost, then some types of sub criteria that do not have a numerical format definition will be given the numerical format. Numerical format for benefit and cost type criteria is explained in **Table 6**.

**Table 6. Benefit Type Numerical Format**

| No. | Criteria / Sub Criteria               | Benefit | Cost |
|-----|---------------------------------------|---------|------|
| 1.  | No or Less than Minimum Requirement   | 1       | 5    |
| 2.  | Minimum Requirement                   | 2       | 2    |
| 3.  | More than minimum requirement         | 3       | 1    |

3.2.4. **How to rate criteria using the interpolation formula**

In this paper we will show you the example how to rate the criteria. The criteria we used for example is SK11.

To give rating into criteria, we should follow the steps, first convert the value of alternatives into numerical format, the example shown at **Table 7**. Second, from the process before, set the Dmax, Dmin, Rmax and Rmin. For this study Rmax is 1 and Rmin is 0. You can also set another value for Rmax and Rmin, but for our easiness to calculate the rating, we use 1 and 0 only. After that, we calculate the rating with the formula we state at section 3.1.5. above.

**Table 7. Numerical Format Convert for SK11**

| Criteria             | Minimum Requirement | Alternative | A1 | A2 | A3 | A4 | A5 |
|----------------------|---------------------|-------------|----|----|----|----|----|
| Job Experience       | 2 Years             | 4 Years     | 2 Years | 1 Year | 1 Year | 3 Years |
| Numerical Format     | 3                   | 2           | 1   | 1   | 3  |

Note: Dmax: 3, Dmin: 1, Rmax: 1, Rmin: 0

Rating calculation:

Rating SK11 A1 = \((D - D\text{min}) / (D\text{max} - D\text{min})\) \((R\text{max} - R\text{min}) + R\text{min}\) = \((3 - 1) / (3 - 1)\) \((1 - 0) + 0 = 1\)

Rating SK11 A2 = \((D - D\text{min}) / (D\text{max} - D\text{min})\) \((R\text{max} - R\text{min}) + R\text{min}\) = \((2 - 1) / (2 - 1)\) \((1 - 0) + 0 = 0,5\)

Rating SK11 A3 = \((D - D\text{min}) / (D\text{max} - D\text{min})\) \((R\text{max} - R\text{min}) + R\text{min}\) = \((1 - 1) / (1 - 1)\) \((1 - 0) + 0 = 0\)

Rating SK11 A4 = \((D - D\text{min}) / (D\text{max} - D\text{min})\) \((R\text{max} - R\text{min}) + R\text{min}\) = \((3 - 1) / (3 - 1)\) \((1 - 0) + 0 = 0\)

Rating SK11 A5 = \((D - D\text{min}) / (D\text{max} - D\text{min})\) \((R\text{max} - R\text{min}) + R\text{min}\) = \((3 - 1) / (3 - 1)\) \((1 - 0) + 0 = 1\)

3.3. **Result**

In the manner of calculation from example that we include before at section 3.2.4., we calculate every and each criterias, then we get the result that we listed in **Table 9**.

**Table 8. Rating Calculation Result**

| Criterias | Alternatives Rating |
|-----------|---------------------|
| A1        | A2      | A3      | A4      | A5      |
| SK11      | 1.00    | 0.50    | 0.00    | 0.00    | 1.00    |
| SK12      | 1.00    | 0.00    | 1.00    | 0.00    | 0.00    |
| SK13      | 0.00    | 1.00    | 1.00    | 1.00    | 1.00    |
| SK14      | 1.00    | 1.00    | 0.00    | 1.00    | 0.00    |
| SK15      | 0.00    | 0.00    | 1.00    | 0.00    | 0.00    |
4. Conclusion
As per result that listed at Table 8, we’ve gain the conclusion that Candidate A3 have the most high quality for the chosen liaison officer corporate employee. Because the most of benefit factor is maximum high among the other alternatives and the cost is maximum low among the other alternatives. So this interpolation method is supporting properly to the evaluation mechanism for gaining a high quality corporate employee.

As per conclusion we gain, the results of this study are feasible of being the basis for the decision support system for our next research project to make the mechanism of evaluation more faster and

5. References
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