Design of Acceptance Decision Support System for New Employees in the Technician Position Using AHP and TOPSIS Methods at CV. Techindo Global Solution

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Abstract

An agency cannot be separated from the role of human resources (HR) working in it. The quality of human resources is one factor to improve the productivity of an institution's performance. Therefore, an assessment in employee selection is an important part of providing qualified employees for the company. Problems that occur in CV Techindo Global Solutions is the process of receiving employees who are still using the manual way and based on subjective assessment results so that the process of acceptance of employees to be slow and inaccurate. The absence of an application program in support of decision making for employee recruitment. Based on this, the author designed the decision support system of employee appraisal on CV. Techindo Global Solutions using AHP (Analytic Hierarchy Process) and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) methods. Employee acceptance system is done by using Analytic Hierarchy Process method to determine the weight of each criterion and the use of Technique for Order Performance by Similarity to Ideal Solution to conduct ranking alternatives in the form of employee data. This system is built with PHP and MySQL programming language as database. With the program using AHP and TOPSIS method, the new employee's assessment is better than the individual assessment and with the decision support information system, the process of receiving the employee can be helped from the evaluation side.

I. INTRODUCTION

The quality of human resources (HR) is needed by a company to support every business activity of the company. With the quality of human resources can improve the performance of a company.

In the company, human resources are an important asset for the company because HR is the main driver in the company's operations. Quality human resources will produce good performance for the company and support the achievement of company goals. Quality resources will also make the company run smoothly by making good business strategies in carrying out business processes.

Seeing the importance of the quality of employees in the company, the selection process of prospective employees is an important part of providing quality employees to the company.

Decision support system is an interactive system that supports decisions in the decision making process through alternatives obtained from the results of data processing, information and model design.

The above problems can be improved by building a decision support system (SPK). For this reason, a decision support system (SPK) is needed by applying the Analytical Hierarchy Process (AHP) method and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The AHP method is used to calculate the weighting criteria and test the level of consistency of the pairwise comparison matrix. If the matrix has been consistent then it can be

continued using the TOPSIS method in making a curvature to determine the selected alternative by using the input weight criteria obtained from the previous results.

CV. Techindo Global Solusi assesses the feasibility of prospective employees based on interviews. Besides that, CV. Techindo Global Solusi also considers educational background, employment of prospective employees and also the age of employees. With the existing selection process, it is expected that CV. Techindo Global Solusi will get prospective employees with good competence.

II. METHODS

A. Definition of Data, Information, Decision Support System Information System

Data is a reality that describes the existence of an event, the data consists of facts and numbers that are relatively meaningless to the user. Facts are things that are captured by the human senses [1].

Information is the result of processing, manipulating, and organizing / structuring a group of data that has the value of knowledge for its users [2].

Information system is technically an interconnected component that collects (recovers), processes, stores and distributes information to support decision making and control in an organization [3].

Decision Support System (DSS) is a computer-based interactive application that combines data and mathematical models to help the decision making process in handling a problem [4].

B. Definition of Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) method is a method developed by Thomas L. Saaty, a mathematician at the University of Pittsburgh in the United States around 1970 where the main objective of the AHP (Analytical Hierarchy Process) was to make an alternative ranking of decisions and choose the best for a multi-criteria case that combines qualitative and quantitative factors in the overall evaluation of existing alternatives. AHP (Analytical Hierarchy Process) is also used to examine problems that begin by defining the problem carefully then feeding it into a hierarchy.

C. Principles of Analytical Hierarchy Process (AHP)

The hierarchy analysis process has the following basic principles [5]:

1. Arrange hierarchically.
   That is breaking the problem into separate elements. First we must define the situation carefully, include as many relevant details as possible, then construct a hierarchical model consisting of several levels of detail, namely the focus of the problem, criteria and alternatives.
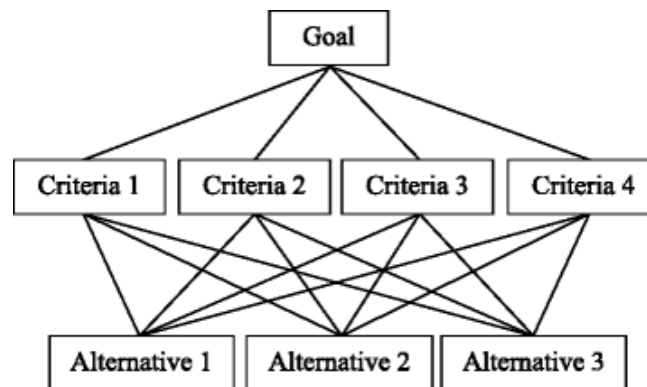

Figure 1 Hierarchical Structure Model [6]

2. Setting priorities
   That is to determine the elements according to relative importance. This assessment is the core of AHP, because it will affect the priorities of the elements. The results of this assessment are easier to see when presented in the form of a matrix (table) named pairwise matrix (pairwise comparison).

3. Synthesize comparisons

Synthetic is done by making normalization of the comparison matrix, which is obtained by dividing each entry by the number of columns in the entry in question.

4. Measure consistency

The AHP process includes measurement of consistency, namely whether the value in comparison between objects has been done consistently.

D. *Definition of Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)*

Method of Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is one of the multi-criteria decision-making methods first introduced by Yoon and Hwang (1981). TOPSIS uses the principle that the chosen alternative must have the closest distance from the positive ideal solution and the farthest distance from the negative ideal solution from a geometric point of view using Euclidean distance to determine the relative proximity of an alternative with the optimal solution [7].

III. DETERMINING CRITERIA WEIGHT

Make a comparison of pairs that compares elements in pairs according to the criteria given (table 2). Paired comparison matrix is filled using priority weight values in AHP of an element against other elements (table 3). AHP has an eigenvector concept that is used to do the priority ranking process for each criterion based on the pairwise comparison matrix.

Table 1 Pairwise Comparison Between Elemn

Criteria A	Scale									Criteria B
Interview	9	7	5	3	1	3	5	7	9	Education
Interview	9	7	5	3	1	3	5	7	9	Work Experience (Technician Field)
Interview	9	7	5	3	1	3	5	7	9	Computers and Networks
Interview	9	7	5	3	1	3	5	7	9	Age
Education	9	7	5	3	1	3	5	7	9	Work Experience (Technician Field)
Education	9	7	5	3	1	3	5	7	9	Computers and Networks
Education	9	7	5	3	1	3	5	7	9	Age
Work Experience (Technician Field)	9	7	5	3	1	3	5	7	9	Computers and Networks
Work Experience (Technician Field)	9	7	5	3	1	3	5	7	9	Age
Computers and Networks	9	7	5	3	1	3	5	7	9	Age

Table 2 Priority Weight on AHP [5]

Tingkat Kepentingan	Arti
1	Sama penting satu sama lain.
3	Agak penting dibanding yang lain.
5	Lebih penting dibanding yang lain.
7	Sangat penting dibanding yang lain.
9	Mutlak penting dibanding yang lain.
2,4,6,8	Nilai di antara dua penilaian yang berdekatan.

IV. DETERMINE ALTERNATIVE VALUES

TOPSIS considers both distance to positive ideal solutions and distance to negative ideal solutions by taking proximity relative to positive ideal solutions. Method steps TOPSIS is [8]:

A. *Make normalized pairwise comparison matrix.*

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}}$$

i = 1,2,3,…m; and j = 1,2,3,…n;

Where:

r_{ij} = Normalized matrix elements [i][j].

X_{ij} = Matrix element of decision X.

B. *Calculate the weighted normalised decision matrix*

$$y_{ij} = w_i r_{ij}$$

i= 1,2,3,…m; and j=1,2,3,…n;

Where:

y_{ij} = Normalized metric element [i] [j].

w_i = Weight [i] of the AHP process.

C. *Determine the worst alternative and the best alternative:*

$$A^+ = (y_1^+, y_2^+, \cdots, y_n^+)$$
$$A^- = (y_1^-, y_2^-, \cdots, y_n^-)$$
$$y_j^+ = \begin{cases} \max_i y_{ij} \text{ ; If } j \text{ is the advantage attribute} \\ \min_i y_{ij} \text{ ; If } j \text{ is the attribute of cost} \end{cases}$$
$$y_j^- = \begin{cases} \min_i y_{ij} \text{ ; If } j \text{ is the advantage attribute} \\ \max_i y_{ij} \text{ ; If } j \text{ is the attribute of cost} \end{cases}$$

D. *Determine the distance between values of each alternative with the positive and negative ideal solution matrix.*

$$D_i^+ \sqrt{\sum_{j=1}^{n} (y_{ij} - y_j^+)^2} \qquad D_i^- \sqrt{\sum_{j=1}^{n} (y_{ij} - y_j^-)^2}$$

Where:

D_i^+ = Alternative distance to i with positive ideal solution.

y_j^+ = Element of positive ideal solution [i].

D_i^- = Alternative distance to i with negative ideal solution.

y_j^- = Element of negative ideal solution [i].

y_{ij} = Elements of normalized matrix [i][j].

E. *Determine preference values for each alternative.*

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}$$

Where:

V_i = Distance of each alternative to the ideal solution.

D_i^+ = Distance from alternative [i] with positive ideal solutions.

D_i^- = Distance from alternative [i] with negative ideal solutions.

Alternative which has the largest V_i value, shows that the alternative [i] is preferred.

V.   RESULTS

A.   Class Diagram

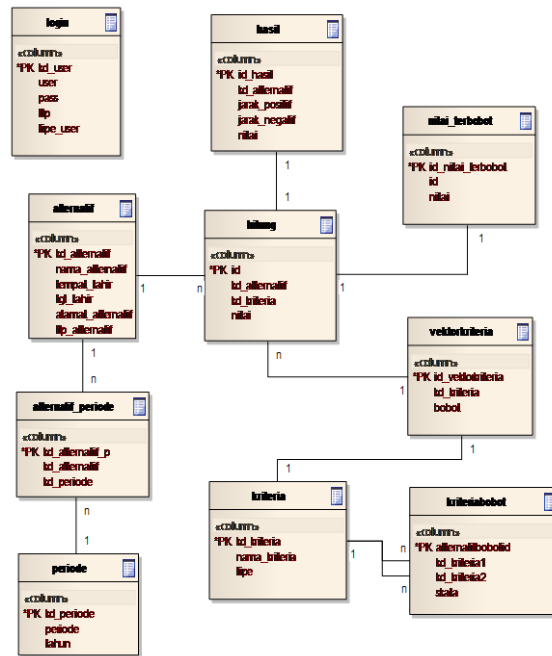Class diagrams are used to display the structure of a system. In this recruitment system there are 10 class tables.

Figure 2 Class Diagram

B.   Display of The Weighting of Criteria

This page is an overview table of comparison that is used to insert a value comparison between criteria. To save the data assessment can by clicking the Save icon at the top of the table comparison criteria. In this page there is also a value comparison, paired comparison matrix, and also vector pairs. Comparison table contains a value comparison between the criteria already in store, paired comparison matrix table contains the paired comparison between values of criteria based on AHP method and paired comparison vector in a table contains value comparisons are already normalized, and also contains the vector values of each of the criteria that will be used to perform the calculation next on TOPSIS.
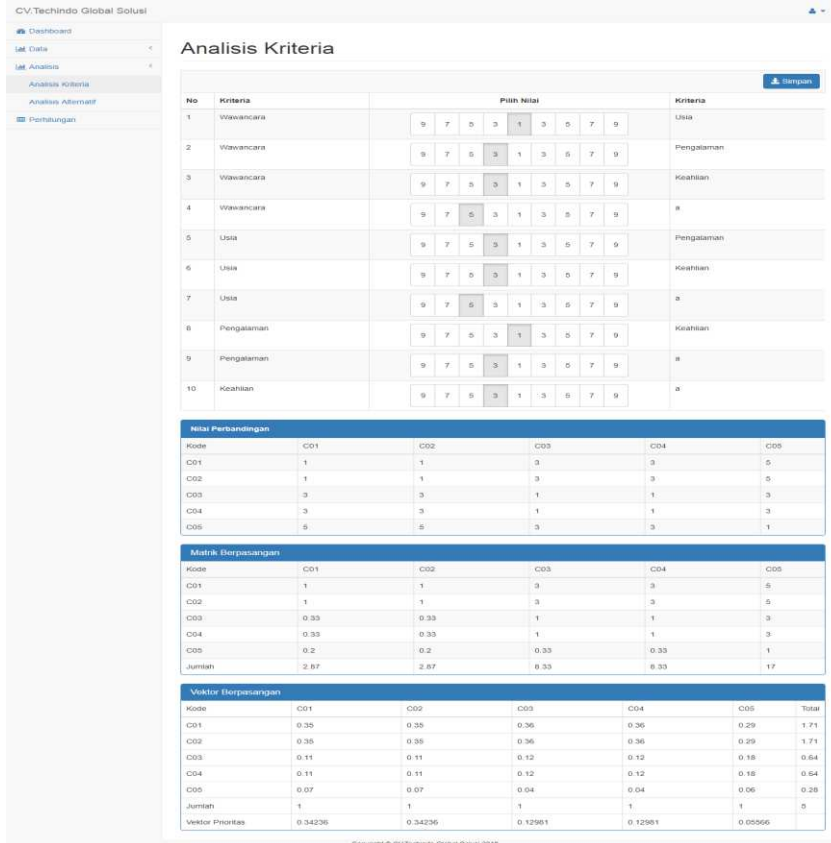
Figure 3 Display Of The Weighting Of Criteria

C. Calculation Result

This page is the display of the value of each alternative calculation based on the calculation of the period selected. In this view there is the final value of alternatives already in sort by rank and there is also an alternative value already created based on graphics.
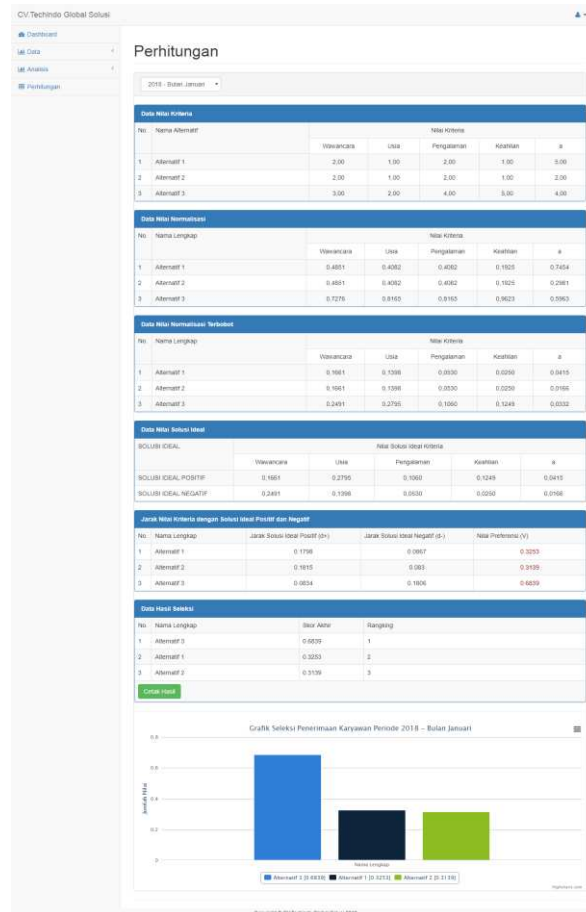
Figure 4 Calculation Result

VI. CONCLUSIONS

From the research that has been done, the acceptance of employees by using AHP method and TOPSIS can be summed up as follows:
1. With the program using the AHP and TOPSIS methods, the evaluation of new employees is better compared to individual assessments.
2. The final result is accurate data because through the calculation process using the AHP and TOPSIS methods.
3. With the existence of a decision support information system, the employee recruitment process can be helped from the assessment side.

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