

Technique for Order Preference Method by Similarity to Ideal Solution in Determining Contract Employees to Become Permanent Employees

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Abstract: Mandala Perkasa (RMP) is a refractory cement manufacturing company. The company also operates in the manufacture of refractory cement made for the repair of hot coatings, boilers, rotary kilns, incinerators, ovens and chemicals for steel, as well as ferrous & non ferrous. In this company there are contract employees and permanent employees, contract employees are employees or workers whose working period is limited by a certain time according to the agreement within the company. Meanwhile, permanent employees are workers whose working period is less until they receive certain benefits according to the work agreement. This research was conducted to assist companies in determining the specified criteria, namely Knowledge and Skills at Work, Responsibilities at Work, Initiative at Work, and Compliance with regulations or Discipline. The results of this study indicate that the candidates for permanent employees are obtained from the calculation of TOPSIS, where the results of prospective employees are based on predetermined administrative criteria. Prospective permanent employees who have the highest rank have the right to be surveyed first. Implementation of the accuracy of the TOPSIS method on the system which plays a major role in the effectiveness and efficiency of the company's services to consumers compared to before the system was implemented. With the implementation of this DSS system, it can help companies to make it easier to make decisions to survey prospective permanent employees and optimize employee performance.

Keywords: Decision Support System, Preference Ordering Techniques Based on Similarity With Ideal Solutions (TOPSIS),

INTRODUCTION

Every company needs employees as workers who carry out every activity in the company's organization. Employees are the most important asset that affects the success of a company. If grouped based on their status, employees in the company can be divided into two types, namely contract employees and permanent employees. Contract employees are employees who are only hired when the company requires additional labor and operates manually, contract employees can usually be terminated at any time by the company when the company no longer needs additional workers (Carvalho, 2017). While permanent employees are employees who already have a contract or work agreement with the company for an indefinite period of time (permanent). Manpower Law regulates the working relationship between workers/labourers and employers, which regulates the interests of individuals. The working relationship that regulates between workers and the company basically contains the rights and obligations of the parties. The understanding of rights and obligations is always reciprocal between one another. The rights of workers or laborers are the company's obligations. Vice versa, the employment relationship cannot be separated from the work agreement made by the parties. In Indonesian law, some translate by agreement and some translate by engagement (Suhartoyo, 2019)

Changing the status of contract employees to permanent employees in every company requires a logical process and must show fairness to all employees to produce the right decision so that the company and employees do not feel disadvantaged. Determination of the selection of contract employees to become permanent employees at PT. RMP (Refractory Mandala Perkasa) still looks inaccurate and takes a lot of time, because the assessment and

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calculation of the results of determining contract employees to become employees still be carried out in stages such as evaluating work abilities, making observations from attendance to assessing discipline, processing data and publishing. So that the possibility of errors in the final result of determining contract employees to become permanent employees often does not meet the criteria needed by the company and hampers company performance.

Decision support system (DSS) is a computer-based interactive system intended to assist in decision making by utilizing certain data and models to solve structured, unstructured and semi-structured problems (Zuraidah, 2019). In addition to speeding up and simplifying, decision support systems also work by combining models and analytical techniques by inputting existing data and having an information search function. One method that can be used in decision making for determining contract employees to become permanent employees is the TOPSIS method (Setiawan et al., 2020).

The topsis method is a method based on the concept that the best chosen alternative not only has the shortest distance from the positive ideal solution but also has the longest distance from the negative ideal solution. The concept is simple and easy to understand, computationally efficient, and has the ability to measure the relative performance of decision alternatives in a simple mathematical form. (Mallu, 2015). According to the problems above, a decision support system can be used to help determine contract employees to become permanent employees at PT. RMP, because this system can speed up and simplify a decision. Based on this background, the authors chose PT. RMP as the object of research writing with the title "Decision Support System for Determining Contract Employees to Become Permanent Employees Using the Technique for Order Preference by Similarity to Ideal Solution (Topsis) Method"

LITERATURE REVIEW

The term DSS refers to a system that utilizes computer support in the decision-making process. To provide a better understanding, there are several definitions of DSS by several experts. Decision Support System (DSS) is a flexible, interactive and adaptable computer-based information system developed to support solutions to unstructured specific management problems (Mariskhana et al., 2021). Decision Support Systems use data, provide an easy user interface and can incorporate decision-making thinking. (Ragestu & Sibarani, 2020) Decision support systems are not intended to automate decision making, but provide interactive tools that allow decision makers to perform various analyzes using available models. (Setyoadi & Widhiyanti, 2014) Decision support system is a computer-assisted decision-making process to assist decision-makers by using certain data and models to solve some unstructured problems. The existence of DSS in a company or organization is not to replace the tasks of decision makers, but is a tool that helps them in making decisions (Supriyanti & Destiana, 2019). By using data that is processed into information to make decisions on semi-structured problems. In the implementation of DSS, the results of the decisions of the system are not the benchmark, decision making remains with the decision maker. The system only produces output that calculates the data as considered by a decision maker so that the decision maker's work in considering decisions can be facilitated. (Wolo et al., 2019). Decision support system is a technology-based system that helps decision makers in deciding a problem, whether structured, semi-structured or unstructured. Decisions taken to solve a problem seen from its structure can be divided into 3 parts, namely structured decisions (structured decisions), semi-structured decisions (semistructured decisions), and unstructured decisions (unstructured decisions) (Sihombing et al., 2021).

METHOD

The topsis method uses the principle that the chosen alternative must have the closest distance from the positive ideal solution and the farthest from the negative ideal solution from a geometric point of view using the distance Q. Then to determine the relative proximity of an alternative to the optimal solution. The positive ideal solution is defined as the sum of all the best values that can be achieved for each attribute, while the negative ideal solution consists of all the worst values achieved for each attribute. (Santiary et al., 2018). Topsis considers both, the distance to the positive ideal solution and the distance to the negative ideal solution by taking the relative proximity to the positive ideal solution based on the comparison to the relative distance, the arrangement of alternative priorities can be achieved. This method is widely used to complete decision making. This is because the concept is simple, easy to understand, computationally efficient, and has the ability to measure the relative performance of alternative decision alternatives (Handayani et al., 2020). Topsis has been used in many applications including financial investment decisions, performance comparisons of companies, performance comparisons in a particular industry, customer evaluation operating system selection, and robot design. Topsis assumes that each criterion will be maximized or minimized. therefore the value of the positive ideal solution and the negative ideal solution of each criterion is determined. and each alternative is considered from the information (Setiawan et al., 2020). The positive ideal solution is defined as the sum of all the best values that can be achieved for each attribute while the negative ideal solution consists of all the worst values achieved for each

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attribute. however, positive ideal solutions rarely solve real-life problems. then the basic assumption of topsis is that when a positive ideal solution cannot be achieved, the decision maker will seek a solution that is as close as possible to the positive ideal solution. gives a relative positive ideal solution rather than an absolute positive ideal solution. In the classical topsis method, the weight value of each criterion is clearly known. each criterion weight is determined based on its level of importance according to the decision maker(Santiary et al., 2018). Topsis will rank alternatives based on the priority value of the relative proximity of an alternative to the positive ideal solution. The alternatives that have been ranked are then used as a reference for decision makers to choose the best desired solution. This method is widely used to complete practical decision making. This is because the concept is easy to understand, computationally efficient, and has the ability to measure the relative performance of decision alternatives.(Muzakkir, 2017)

Topsis method steps

1. Determine the performance rating of each alternative on each criterion.
2. Determine the weight for each criterion (w). The weight value for each criterion must be based on the same range of values.
3. Create a normalized decision matrix.
4. Create a weighted normalized decision matrix.
5. Determine the positive ideal solution matrix and the negative ideal solution matrix.
6. Determine the distance between the values of each alternative and the positive and negative ideal solution matrices.
7. Determine the preference value for each alternative.

TOPSIS requires a performance rating of each alternative A_i on each criterion C_j normalized, namely:

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

With $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$

The positive ideal solution and the negative ideal solution can be determined based on the normalized weight rating (y):

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

$$A^+ = (y_1^+, y_2^+, \dots, y_n^+)$$

$$A^- = (y_1^-, y_2^-, \dots, y_n^-)$$

$$y_j^+ = \begin{cases} \max_i y_{ij}, & \text{jika } j \text{ adalah atribut keuntungan} \\ \min_i y_{ij}, & \text{jika } j \text{ adalah atribut biaya} \end{cases}$$

$$y_j^- = \begin{cases} \min_i y_{ij}, & \text{jika } j \text{ adalah atribut keuntungan} \\ \max_i y_{ij}, & \text{jika } j \text{ adalah atribut biaya} \end{cases}$$

The distance between alternative A_i and the positive ideal solution is formulated as:

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

The distance between alternative A_i and the negative ideal solution is formulated as:

$$D_i^- = \sqrt{\sum_{j=1}^n (y_{ij} - y_i^-)^2} \quad V_i = \frac{D_i^-}{D_i^- + D_i^+}$$

Preference value for each alternative (V):

A larger value of V indicates the chosen alternative.

RESULT

The DSS concept is an interactive computer-based system that helps decision making by utilizing data and models to solve unstructured and semi-structured problems. DSS is designed to support all stages of decision-making, starting from the stage of identifying problems, selecting relevant data, determining the approach used in

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the decision-making process to evaluating alternative selection activities. In the research that the author conducted, it can be concluded that the problem under study is an unstructured problem because it does not occur repeatedly or does not always occur. The decision requires experience and a variety of external sources. Furthermore, in the decision system for the need for criteria data, the criteria for selecting prospective permanent employees consist of several aspects of the criteria that have been set as a reference by the head of HRD at PT. Refratech Mandala Perkasa, here are the five criteria, namely:

Before looking for the r_{ij} value, we will look for the X_n value or the denominator value for each criterion and alternative with the following formula:

$$[x_1] = \sqrt{100^2 + 95^2 + 90^2 + 95^2 + 90^2 + 95 + 100^2 + 95^2 + 95^2 + 95^2} = 299,957$$

$$R_{11} = \frac{x_{11}}{x_1} = \frac{100}{299,957} = 0,3334$$

$$R_{21} = \frac{x_{11}}{x_1} = \frac{95}{299,957} = 0,3167$$

$$R_{31} = \frac{x_{11}}{x_1} = \frac{90}{299,957} = 0,3000$$

$$R_{41} = \frac{x_{11}}{x_1} = \frac{95}{299,957} = 0,3167$$

$$R_{51} = \frac{x_{11}}{x_1} = \frac{90}{299,957} = 0,3000$$

$$R_{61} = \frac{x_{11}}{x_1} = \frac{93}{299,957} = 0,3100$$

$$R_{71} = \frac{x_{11}}{x_1} = \frac{100}{299,957} = 0,3334$$

$$R_{81} = \frac{x_{11}}{x_1} = \frac{95}{299,957} = 0,3167$$

$$R_{91} = \frac{x_{11}}{x_1} = \frac{95}{299,957} = 0,3167$$

$$R_{101} = \frac{x_{11}}{x_1} = \frac{95}{299,957} = 0,3167$$

$$[x_2] = \sqrt{95^2 + 95^2 + 90^2 + 93^2 + 75^2 + 80^2 + 95^2 + 95^2 + 90^2 + 80^2} = 281,734$$

$$R_{12} = \frac{x_{11}}{x_1} = \frac{95}{281,734} = 0,3372$$

$$R_{22} = \frac{x_{11}}{x_1} = \frac{95}{281,734} = 0,3372$$

$$R_{32} = \frac{x_{11}}{x_1} = \frac{90}{281,734} = 0,3195$$

$$R_{42} = \frac{x_{11}}{x_1} = \frac{95}{281,734} = 0,3301$$

$$R_{52} = \frac{x_{11}}{x_1} = \frac{75}{281,734} = 0,2662$$

$$R_{62} = \frac{x_{11}}{x_1} = \frac{80}{281,734} = 0,2840$$

$$R_{72} = \frac{x_{11}}{x_1} = \frac{95}{281,734} = 0,3372$$

$$R_{82} = \frac{x_{11}}{x_1} = \frac{95}{281,734} = 0,3372$$

$$R_{92} = \frac{x_{11}}{x_1} = \frac{90}{281,734} = 0,3195$$

$$R_{102} = \frac{x_{11}}{x_1} = \frac{80}{281,734} = 0,2840$$

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$$[x_3] = \sqrt{80^2 + 85^2 + 75^2 + 85^2 + 80^2 + 90^2 + 80^2 + 80^2 + 75^2 + 75^2} = 255,000$$

$$R_{13} = \frac{x_{11}}{x_1} = \frac{80}{255,000} = 0,3137$$

$$R_{23} = \frac{x_{11}}{x_1} = \frac{85}{255,000} = 0,3333$$

$$R_{33} = \frac{x_{11}}{x_1} = \frac{75}{255,000} = 0,2941$$

$$R_{43} = \frac{x_{11}}{x_1} = \frac{85}{255,000} = 0,3333$$

$$R_{53} = \frac{x_{11}}{x_1} = \frac{80}{255,000} = 0,3137$$

$$R_{63} = \frac{x_{11}}{x_1} = \frac{90}{255,000} = 0,3529$$

$$R_{73} = \frac{x_{11}}{x_1} = \frac{80}{255,000} = 0,3137$$

$$R_{83} = \frac{x_{11}}{x_1} = \frac{80}{255,000} = 0,3137$$

$$R_{93} = \frac{x_{11}}{x_1} = \frac{75}{255,000} = 0,2941$$

$$R_{103} = \frac{x_{11}}{x_1} = \frac{75}{255,000} = 0,2941$$

$$[x_4] = \sqrt{84^2 + 75^2 + 70^2 + 80^2 + 80^2 + 90^2 + 80^2 + 80^2 + 75^2 + 75^2} = 250,062$$

$$R_{14} = \frac{x_{11}}{x_1} = \frac{84}{250,062} = 0,3359$$

$$R_{24} = \frac{x_{11}}{x_1} = \frac{75}{250,062} = 0,2999$$

$$R_{34} = \frac{x_{11}}{x_1} = \frac{70}{250,062} = 0,2799$$

$$R_{44} = \frac{x_{11}}{x_1} = \frac{80}{250,062} = 0,3199$$

$$R_{54} = \frac{x_{11}}{x_1} = \frac{80}{250,062} = 0,3199$$

$$R_{64} = \frac{x_{11}}{x_1} = \frac{90}{250,062} = 0,3599$$

$$R_{74} = \frac{x_{11}}{x_1} = \frac{80}{250,062} = 0,3199$$

$$R_{84} = \frac{x_{11}}{x_1} = \frac{80}{250,062} = 0,3199$$

$$R_{94} = \frac{x_{11}}{x_1} = \frac{75}{250,062} = 0,2999$$

$$R_{104} = \frac{x_{11}}{x_1} = \frac{75}{250,062} = 0,2999$$

$$[x_5] = \sqrt{75^2 + 75^2 + 70^2 + 75^2 + 75^2 + 75^2 + 75^2 + 75^2 + 75^2} = 235,637$$

$$R_{15} = \frac{x_{11}}{x_1} = \frac{75}{235,637} = 0,3183$$

$$R_{25} = \frac{x_{11}}{x_1} = \frac{75}{235,637} = 0,3183$$

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$$R_{35} = \frac{x_{11}}{x_1} = \frac{75}{235,637} = 0,3334$$

$$R_{45} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{55} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{65} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{75} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{85} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{95} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

$$R_{105} = \frac{x_{11}}{x_1} = \frac{70}{235,637} = 0,3183$$

Table 5 Multiplying normalized data and parameter weights

W	40	30	10	10	10
	c1	c2	c3	c4	c5
a1	13,3353	10,1159	3,1373	3,3592	3,1829
a2	12,6685	10,1159	3,3333	2,9993	3,1829
a3	12,0017	9,5835	2,9412	2,7993	2,9707
a4	12,6685	9,9030	3,3333	3,1992	3,1829
a5	12,0017	7,9863	3,1373	3,1992	3,1829
a6	12,4018	8,5187	3,5294	3,5991	3,1829
a7	13,3353	10,1159	3,1373	3,1992	3,1829
a8	12,6685	10,1159	3,1373	3,1992	3,1829
a9	12,6685	9,5835	2,9412	2,9993	3,1829
a10	12,6685	8,5187	2,9412	2,9993	3,1829

Determine the Positive Ideal Solution (A+) and the Negative Ideal Matrix (A-).

Formula: $A^+ = \max(y_1^+, y_2^+, \dots, y_n^+)$ and $A^- = \max(y_1^-, y_2^-, \dots, y_n^-)$ Value of Positive Ideal Solution.

$$y_1^+ = 13,3353$$

$$y_2^+ = 10,1159$$

$$y_3^+ = 3,5294$$

$$y_4^+ = 3,5991$$

$$y_5^+ = 3,1829$$

$$y_1^- = 12,0017$$

$$y_2^- = 7,9863$$

$$y_3^- = 2,9412$$

$$y_4^- = 2,7993$$

$$y_5^- = 2,9707$$

After determining the positive and negative values, the result will be as follows:

Table 6 Results of Positive and Negative Values

Y+	13,3353	10,1159	3,5294	3,5991	3,1829
Y-	12,0017	7,9863	2,9412	2,7993	2,9707

Here's how to find the preferred value of each alternative:

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$$\begin{aligned}V_1 &= \frac{2,5905}{2,5905+0,4597} = 0,8493 \\V_2 &= \frac{2,2845}{2,2845+0,9181} = 0,7133 \\V_3 &= \frac{1,5973}{1,5973+1,7585} = 0,4760 \\V_4 &= \frac{2,1159}{2,1159+0,8296} = 0,7183 \\V_5 &= \frac{0,4933}{0,4933+2,5744} = 0,1608 \\V_6 &= \frac{1,2142}{1,2142+1,8500} = 0,3962 \\V_7 &= \frac{2,5607}{2,5607+0,5601} = 0,7846 \\V_8 &= \frac{2,2855}{2,2855+0,8708} = 0,7241 \\V_9 &= \frac{1,7552}{1,7552+1,1974} = 0,5945 \\V_{10} &= \frac{0,9017}{0,9017+1,9240} = 0,3191\end{aligned}$$

Based on the results of the calculation of preference values, the order of values from the largest to the smallest is V1, V7, V8, V4, V2, V9, V3, V6, V10, V5 which shows that V1 is a prospective permanent employee who has the highest value of 0.8493.

DISCUSSIONS

Based on analysis and research, the determination of the selection of contract employees to become permanent employees at PT. RMP (Refractory Mandala Perkasa) using the TOPSIS method, make it easy for companies to determine prospective permanent employees and provide alternative decisions in choosing based on the calculation results obtained v1 has the highest value of 0.8493.

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