



# Application of ROC Criteria Prioritization Technique in Employee Performance Appraisal Evaluation

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## ABSTRACT

Employee performance appraisal is very supportive in human resource management that affects various strategic decisions of the company, such as giving bonuses, benefits, and promotions. An objective and fair evaluation is needed to ensure that outstanding employees get the appreciation they deserve. This research aims to apply the Rank Order Centroid (ROC) technique in determining the priority of assessment criteria. Using 5 main criteria used are productivity, quality of work, discipline, initiative and creativity, and teamwork. The Rank Order Centroid (ROC) method is used because it is easy to determine the weight of the criteria based on the order of the main priorities that have been determined by the decision maker. From the final results of ranking 5 alternatives to the 3 best alternatives, it can be analyzed that the CI criterion really determines the final score because it is the criteria with the highest priority so that it gets the greatest weight and can affect the assessment results. The implementation of this technique is expected to support more precise and objective decision making and can facilitate decision makers in determining the parameters of the assessment criteria obtained based on the level of priority order of criteria and criteria attributes.

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## 1. Introduction

Employee performance appraisal evaluation is a critical aspect of human resource management. This process not only helps companies identify high-performing employees but also serves as the basis for decision-making regarding employee promotion, training and development. However, in practice, performance appraisal often faces various challenges, especially in determining the right evaluation criteria and assigning appropriate weights to each criterion. Criteria prioritization techniques are a potential solution to this problem, and one effective technique is Rank Order Centroid (ROC).

Objective assessments in employee performance evaluations are essential to support the awarding of bonuses, benefits, and appreciation for exemplary employees. These decisions must be based on fair and accurate assessments in order to motivate employees and improve the overall performance of

the company (Wirawan et al., 2023). If evaluations are subjective or biased, this can lead to dissatisfaction, reduce employee motivation, and undermine trust between employees and management. Therefore, objective and measurable prioritization of criteria is crucial in a performance appraisal system (Sampe et al., 2023).

The urgency of the problem is that the prioritization of criteria in employee performance appraisal is very important to ensure that the evaluation is carried out objectively and fairly. Errors in prioritizing can result in bias, employee dissatisfaction, and even decisions that are detrimental to the company (Harjanti et al., 2023). Providing bonuses, allowances, and appreciation for exemplary employees must be based on objective assessments in order to provide the right incentives and encourage better performance (Sudarmo, 2020). Therefore, a systematic and measurable approach is needed to determine the weight of the assessment criteria. The ROC technique offers a simple yet effective way to prioritize criteria based on rank order (Santika et al., 2022; Wijaya et al., 2022), thereby improving accuracy and fairness in performance appraisal.

Several research have investigated different choice procedures for determining criterion weights in performance rating. For instance, the ROC strategy can generate criterion weights that closely align with the outcomes of more intricate procedures, while also being more efficient (Hairah et al., 2023). The utilisation of the ROC methodology in diverse multicriteria issues has demonstrated that it is straightforward to ascertain the weight of criteria or attributes depending on the priority level assigned by decision makers (Esangbedo et al., 2022; Karuru et al., 2023). Therefore, the ROC technique has the potential to become a commonly adopted method for determining weights.

This study aims to apply the ROC criteria prioritization technique in the evaluation of employee performance appraisal in Bina Prima company. Specifically, this research seeks to identify relevant performance appraisal criteria in the company context, apply the ROC technique to determine the weight of each criterion, and analyze the effectiveness and practicality of using the ROC technique in the performance evaluation process. With the application of the ROC technique, it is expected to increase objectivity and fairness in employee performance appraisal, which in turn will support decision-making related to promotion, training, development, as well as the provision of bonuses, benefits, and appreciation for exemplary employees. This research also aims to make a significant contribution to the field of human resource management by offering a simpler and more efficient approach in prioritizing evaluation criteria.

The results of this study are expected to make a significant contribution to the field of human resource management, especially in improving the accuracy and fairness of employee performance appraisals. In addition, the simpler application of the ROC technique may encourage more companies to adopt a more structured approach in prioritizing evaluation criteria. Ultimately, this research can assist companies in optimizing decisions related to employee promotion, training, and development, as well as improving employee satisfaction and motivation. Objective assessments will also support the proper awarding of bonuses, benefits and appreciation for exemplary employees, thereby improving overall motivation and performance.

## 2. Literature Review

Employee performance appraisal evaluation is a crucial aspect of organizational management, impacting motivation, commitment, and career development (Iqbal et al., 2019; Lesmana et al., 2024). Various factors within the performance appraisal system, such as purpose, criteria, leadership style, and evaluation methods, can influence employee motivation and job performance (Al-Jedaia & Mehrez, 2020). Prioritizing criteria in performance appraisal can be effectively achieved through techniques like the Analytical Network Process (ANP) and the Rank Order Centroid (ROC) method (Asana et al., 2021). These methods assign weights to different criteria based on their priority levels, aiding decision-makers in evaluating employees and making informed decisions (Usanto et al., 2023). Performance appraisal systems are designed to evaluate individual employees' performance. However, the effectiveness of these systems can be influenced by factors such as organizational justice, cultural considerations, and the impact of personal biases (Wei et al., 2019). Understanding

the impact of personal biases and cultural differences on performance appraisal is crucial for ensuring fairness and accuracy in evaluations (Kalalo et al., 2024; Sudarmo et al., 2022). Additionally, the utilization of performance appraisal systems can lead to improved employee productivity and job satisfaction. In conclusion, the application of the ROC criteria prioritization technique in employee performance appraisal evaluation is essential for enhancing the objectivity, transparency, and effectiveness of the appraisal process. By utilizing methods ROC, organizations can prioritize criteria effectively, leading to fairer evaluations and more informed decision-making processes.

### 3. Research Methods

This research uses the Rank Order Centroid (ROC) method in determining the priority of criteria in the decision-making process. ROC is the development of the SMARTS (Simple Multi Attribute Rating Technique Using Swings) method into SMARTER, by adding ROC calculations to determine elicitation weights for criteria. Initially, the SMARTS method still used swing weighting by decision makers on a scale of 0 to 100 or 0 to 1 (Kunsch & Ishizaka, 2019).

$$C_1 \geq C_2 \geq C_3 \geq \dots \geq C_n \quad (1)$$

To calculate the weight value, it is determined by the rule :

$$W_1 \geq W_2 \geq W_3 \geq \dots \geq W_n \geq 0; \sum_{j=1}^n \bar{W}_j = 1 \quad (2)$$

Where  $W_1$  is the weight for all criteria  $C_1$  , so the value of  $W_1$  to  $W_j$  is shown in the following equation.

$$\begin{aligned} W_1 &= (1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{k})/K \\ W_2 &= (0 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{k})/K \\ W_j &= (0 + \dots + 0 + \frac{1}{k})/K \end{aligned} \quad (3)$$

if  $K$  is the number of criteria, then the weight value of the  $j$ th criterion is formulated by multiplying  $1/K$  by the total number  $1/i$ , where  $i = 1,2,3\dots j$ , as follows:

$$W_j = \frac{1}{K} \sum_{i=j}^K \left(\frac{1}{i}\right) \quad (4)$$

Description:

$W_j$  = kth attribute weighting value

$K$  = number of attributes

$i$  = attribute priority order value

#### Overview of the Rank Order Centroid Method

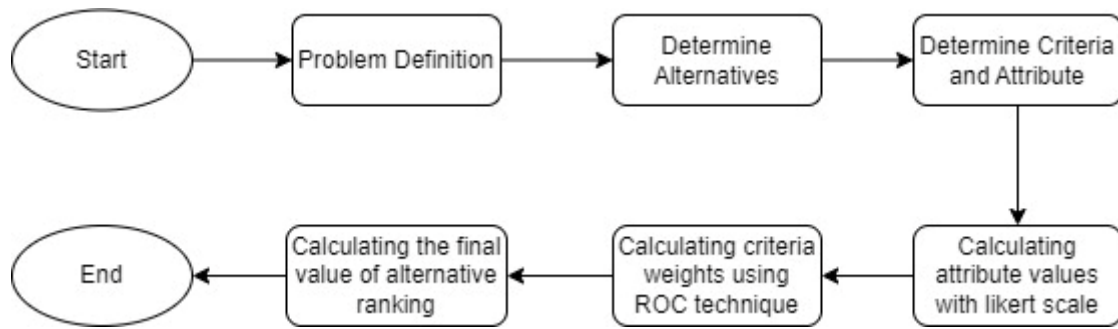


Fig.1. Flowchart of Rank Order Centroid Subsystem

In Figure 1, the stages can be explained starting from defining the problem, namely employee recruitment selection, the next stage determines alternative employee candidates. Then proceed with determining the assessment criteria by the decision maker and the criteria attributes. The weight value of the criteria is determined by giving manual weight with a value range of up to 1-100% by the decision maker. The ROC method is used to determine the value of the attribute rating scale based on the priority order level of the criteria attributes. In the final stage, calculating the final ranking value is by multiplying the alternative value on each criterion by the criterion weight value.

## 4. Results and Discussions

### 4.1. Data Analysis

Criteria data collection is obtained using a questionnaire technique. Questionnaires were given to HRD managers to determine the main criteria in employee performance appraisal. Criteria data is obtained from the decision maker, namely the HRD manager at Bina Prima company, while alternative data is obtained from internal company data. there are 5 alternatives that become alternatives in the employee performance selection process.

### 4.2. Criteria Analysis

Based on interviews with the Human Resource Management department at the Bina Prima company, there are 5 alternative employee candidates who will go through the selection process to find the 3 best alternatives. The assessment criteria in the employee recruitment selection process consist of Productivity (C1), Work Quality (C2), Discipline (C3), Initiative and Creativity (C4), Teamwork (C5). Furthermore, the calculation of the weight of the criteria using the ROC calculation technique, the decision maker determines the priority order of the criteria starting from priority 1 to 5 so that it can be calculated and produces the ROC weight for each criterion. Criteria details can be seen in Table 1.

Table 1. Details of Criteria and Attributes

Criteria (C)	Criteria Name	ROC weight (W <sub>j</sub> )
C1	Productivity	$W_1 = \frac{1}{4} \times (\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}) = 0,46$
C2	Quality of Work	$W_2 = \frac{1}{4} \times (\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}) = 0,26$
C3	Discipline	$W_3 = \frac{1}{4} \times (\frac{1}{3} + \frac{1}{4} + \frac{1}{5}) = 0,16$
C4	Initiative and Creativity	$W_4 = \frac{1}{4} \times (\frac{1}{4} + \frac{1}{5}) = 0,09$
C5	Teamwork	$W_5 = \frac{1}{4} \times (\frac{1}{5}) = 0,04$

Based on table 1, it can be explained that ROC Weight calculation process using equation (4). The criteria with the highest priority is the Productivity criterion (C1), so it gets the greatest weight. Furthermore, there are 2nd priority criteria, namely work quality, 3rd priority criteria, namely discipline, 4th priority criteria, namely initiative and creativity, and 5th priority criteria, namely teamwork.

### 4.3. Determining Attribute Criteria

Each criterion has attributes to facilitate the alternative assessment process. The assessment attributes are intended to find out the details of each, the value of each attribute uses a Likert scale value, namely 1 = very less, 2 = less, 3 = sufficient, 4 = good and 5 = very good. Each attribute is then given a scale value of 1 to 5 to facilitate the process of determining the value of the criteria.

Table 2. Attribute value of each criterion

Criteria	Attribute	Attribute value
Productivity (C1)	Number of Tasks completed	1 to 5
	Target achieved	1 to 5
	Time Efficiency	1 to 5
Quality of Work (C2)	Accuracy	1 to 5
	Customer Satisfaction	1 to 5
	Quality standard compliance	1 to 5
Discipline(C3)	Punctual Attendance	1 to 5
	Compliance with Rules	1 to 5
	Accuracy of Task Completion	1 to 5
Initiative and Creativity(C4)	Providing New Ideas	1 to 5
	Unsupervised Problem Solving	1 to 5
	Contribution to Work Process Improvement	1 to 5
Teamwork(C5)	Collaboration with Coworkers	1 to 5
	Effective Communication	1 to 5
	Contribution to the Team	1 to 5

### 4.4. Alternative Value

To calculate the ROC method, the initial process determines the alternative value for each criterion. There are five alternative employee candidates. Alternative data can be seen in table 3.

Table 3. Alternative Values on Each Criterion

Alternative	Criteria Values				
	C1	C2	C3	C4	C5
A1	5	4	3	4	4
A2	4	5	4	3	4
A3	5	3	4	4	4
A4	4	4	4	4	4
A5	4	5	5	3	3

Based on table 3, it can be explained that there are 5 alternative values selected for each criterion. The total value of the criteria is obtained from the calculation of the average alternative value on each criterion attribute according to table 2. Furthermore, the average value is the alternative value for each criterion.

### 4.5. Calculation of Final Score and Ranking

In the calculation of the final value, the multiplication process is carried out between the alternative value on each criterion (table 3) and the weight of the criteria (table 1), so that the final value of each alternative can be obtained. The process of multiplying alternative values on each criterion with weight values is a simple technique carried out in multi-attribute decision making based on assessment criteria and selected alternatives that have been determined by the decision maker.

Table 4. Alternative Value Scoring Results

Alternative	Criteria WeightValues				
	K1(0,46)	K2(0,26)	K3(0,16)	K4(0,09)	K5(0,04)
A1	5	4	3	4	4
A2	4	5	4	3	4
A3	5	3	4	4	4
A4	4	4	4	4	4
A5	4	5	5	3	3

To calculate the final value of the alternative is obtained by multiplying the alternative value on the criteria by the weight value of the criteria. Then add up the overall results. The final value of each alternative can be seen in the calculation below:

$$V_1 = (5*0.46)+(4*0.26)+(3*0.16)+(4*0.09)+(4*0.04) = \mathbf{4.34}$$

$$V_2 = (4*0.46)+(5*0.26)+(4*0.16)+(3*0.09)+(4*0.04) = \mathbf{4.21}$$

$$V_3 = (5*0.46)+(3*0.26)+(4*0.16)+(4*0.09)+(4*0.04) = \mathbf{4.24}$$

$$V_4 = (4*0.46)+(4*0.26)+(4*0.16)+(4*0.09)+(4*0.04) = \mathbf{4.04}$$

$$V_5 = (4*0.46)+(5*0.26)+(5*0.16)+(3*0.09)+(3*0.04) = \mathbf{4.33}$$

After calculating the final value of alternatives, then rank the alternative values based on the largest value to the smallest value. The results of the final ranking of alternatives can be seen in table 5 below.

Table 5. Final Alternative Ranking Score

Alternative	Value	Ranking
<b>A1</b>	<b>4,34</b>	<b>1</b>
<b>A5</b>	<b>4,33</b>	<b>2</b>
<b>A3</b>	<b>4,24</b>	<b>3</b>
A2	4,21	4
A4	4,04	5

From table 8, the final value of each alternative is obtained, the 3 best alternatives for employee performance evaluation are ranked 1 is alternative A1 with a value of 4.34. Then ranking 2 is alternative A5 with a value of 4.33 and ranking 3 is alternative A3 with a value of 4.24. From the final results of ranking, it can be analyzed that the C1 criterion really determines the final value because it is the criteria with the highest priority so that it gets the greatest weight and can affect the assessment results. Judging from the results of ranking the final ranking value that there are no equal values, so the ROC technique can be an alternative technique in the process of determining employee performance evaluation decisions.

## 5. Conclusion

The conclusion of solving employee performance evaluation problems is that by implementing decision-making techniques using the Rank Order Centroid (ROC) method, the best alternative can be obtained, and in this case the best 3 alternatives were selected from 5 alternative employee candidates. The use of attribute scoring techniques with priority order levels has proven to be able to produce alternative final scores, taking into account the competition between alternative scores on each criterion. From the final ranking results, it can be analyzed that the C1 criterion really determines the final value because it is the criteria with the highest priority so that it gets the greatest weight and can affect the assessment results. Judging from the results of ranking the final value of ranking that there is no equal value, so the ROC technique can be an alternative technique in the process of determining employee performance evaluation decisions. The implication of the research is that it can facilitate decision makers in determining the parameters of the assessment criteria obtained based on the level of priority order of criteria and criteria attributes. Suggestions for future research are to do more detailed modeling of each criterion attribute so that the assessment can be more objective.

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