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Simple multi atribut rating technique methods in a decision making for the best employees

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ABSTRACT

Providing periodic rewards to employees with the best qualities has several functions, including strengthening employee motivation to achieve achievements and also retaining employees from being targeted by other organizations. A good and attractive reward system can minimize the number of employees leaving. The weakness that is generally found in the best employee assessment system is the accuracy of the calculation results and the unavoidable nature of the subjectivity of the assessment team. The aim of this research is to implement the Simple Multi Attribute Rating Technique (SMART) method in minimizing the weaknesses of the best employee assessment system that is already running. The result of this research is a calculation system for assessing the best employees.

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1. INTRODUCTION

A decision support system is a method commonly used to assist decision making. In facing this challenge, a decision support system (DSS) can be an effective solution, although there are several other computer-based technologies that can be used to solve the problem, such as Machine Learning (Ramadan et al., 2023). A decision support system is a system that can quickly solve problems that occur in rankings and can find out the highest to lowest values in an election (Rony et al., 2023). The existence of a decision support system can make it easier for decision makers to make decisions based on the weight of predetermined criteria and alternatives. A common problem that occurs due to the absence of a decision support system is a low level of accuracy in the results, due to the variables used in both alternatives and criteria being inappropriate and the assessment system not being based on objectivity so that there is very little possibility of implementing a transparent assessment system. The urgency of this research is to minimize the weaknesses of the current decision support system. The case study that will be used in this research is the selection of the best employees to provide rewards to the best employees in a company. Providing periodic rewards to employees with the best qualities has several functions, including strengthening employee motivation to achieve

achievements and also retaining employees from being targeted by other organizations. With these criteria, good performance can be easily obtained. A supportive work atmosphere in daily life can also increase the motivation of an employee or educator (Setiawan et al., 2020). An employee's performance is a series of abilities, efforts and opportunities that can be measured from the results of their work (Mahalani & Rifai, 2022). Employee performance assessment is an evaluation process carried out by an institution with the provisions or criteria that have been determined regarding an employee's duties. Performance assessments are carried out in a structured and systematic manner on the appearance that can be seen from the employee's performance as well as on the potential level of employee performance in an effort to always develop themselves (Novita & Yulianti, 2020). The theoretical benefit of this research is to provide a scientific contribution regarding the implementation of SMART method in calculating the rank of the best employees. Practically, the results of this research can be used by companies that implement the best employee assessment system in giving rewards to employees.

There are several methods in decision support systems that are commonly used, namely Analytical Hierarchy Process (AHP), Simple Additive Weighting (SAW), Weighting Product (WP), Profile Matching, Simple Multi Attribute Rating Technique (SMART), PROMETHEE and System Determination Of Contractemployees To Be Permanent Employees Using The Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) (Paramitha & Azani, 2022) (Namoun et al., 2022). The method that will be used in this research is Simple Multi Attribute Rating Technique (SMART). The SMART method was chosen considering the advantages of the method in accordance with the case study used in this research. Simple Multi Attribute Rating Technique (SMART) is a method for making multi-criteria decisions that was developed in 1997 by Edward. The SMART method is based on the theory that each alternative consists of a number of criteria that have weights that describe how important the value of the weight is compared to other criteria (Andika & Sokibi, 2019). In this research, the SMART method is used because apart from objective data processing, this method is also simpler, easier and faster in terms of decision making compared to other methods (Hasugian & Hamdani, 2023). SMART is based on a theory that describes how important it is compared to other criteria (Ardana et al., 2022).

There are several previous studies that present definitions of the SMART method. According to research conducted by Maya Nur Amalia (2021), the Simple Multi Attribute Rating Technique (SMART) method is used to assist in the process of determining suppliers using standard criteria set by the company to produce more accurate and faster decisions (Amalia, 2021). According to research by Gumilar Ramadhan Pangaribuan et al (2019), SMART (Simple Multi-Attribute Rating Technique) is a multi-criteria decision making method (Pangaribuan et al., 2019). According to research by Rosnani Ginting (2020), SMART (Simple Multi Attribute Rating Technique) helps company leaders to make decisions on determining suppliers more quickly and accurately (Ginting, 2020). According to research by Cindi Wulandari et al (2021), the simple multi attribute rating technique (SMART) method is a multi-criteria decision making method where each alternative consists of a number of criteria that have a value and each criterion (Wulandari et al., 2021). According to research by Hidayatus Sibyan (2019), the SMART method, which stands for Simple Multi Attribute Rating Technology, is a method for dealing with multi-criteria problems in decision support systems (Sibyan, 2020). The SMART method is a decision making method that aims to collect information about all data relating to several attributes (multi attributes) and several criteria (multi criteria) (Hutagalung et al., 2021). SMART is more widely used because of its simplicity in responding to decision makers' needs and the way it analyzes responses.

2. RESEARCH METHOD

Research carried out uses quantitative research methods. quantitative research methods research methods based on the philosophy of positivism, objects that can be observed as targets in quantitative research, these objects can be observed in part (sample) or as a whole (population), data collected from The object is in the form of numbers which are then analyzed using statistical calculations. From these statistical calculations you can describe an object which can be displayed in the form of a table or graph (Sutisna, 2020). The sample selection method used by researchers is the probability sampling method, which is a sampling method where each member of the population has an equal chance of being selected as a sample. All single members of the population have a non-zero probability (Suriani et al., 2023).

Method of collecting data used in this research are interviews, literature review and observation. Interview method is the method used by the author to collect data by asking directly to the party concerned (Sari et al., 2020). At this stage, researchers carry out scientific deepening related to the preparation of this research report (Ramdhani & Aslamiyah, 2023). Observation is a data collection technique in which the researcher makes observations, either directly or indirectly, about the things being observed (Ahsanulkhaq, 2019).

This research stage begins with data collection, then conducting a literature study, analyzing criteria and weight data using the smart method and finally getting the ranking results (Fhuza et al., 2022).

Figure 1. Research steps

The decision support system method used is the Simple Multi Attribute Rating Technique (SMART) method. The SMART method is the easiest method to understand to be used in solving selection problems in ranking several criteria (Nurhidayat et al., 2022). This multi-criteria decision making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it is compared to other criteria (Istu & Gunawansyah, 2022). The stages of the SMART method are as follows (Syahputra et al., 2022):

a. Determine the number of criteria

The criteria in the SMART method are the measures used in the assessment. Based on research conducted by the author in determining an assessment of employees using several criteria. The Criterias are working period, presence, teamwork, achievements.

b. Determine the weight of the criteria

The next step after determining the category of the criteria, is to determine the weight of the criteria. The weight of a criterion is a number imposed and possessed by a criterion to indicate the weight of that criterion.

c. Weight Normalization

$$Normalization = \frac{\mathrm{Wj}}{\sum \mathrm{Wj}} \quad (1)$$

Explanation :

Wj : weight of the criteria

d. Determine alternative data for each criterion

In the SMART method, alternatives are objects or lists that are a choice between two or more and will later be assessed.

e. Determine the utility for each criterion and calculate the utility value.

$$U_i(\alpha_i) = 100\frac{(C_{max} - C_{out\ i})}{(C_{max} - C_{min})}\% \quad (2)$$

Explanation
Ui(ai): utility value of the 1st criterion for i
Cmax: maximum criterion value
Cmin: minimum criterion value
Cout i: i-th criterion value

f. Determine the final value of the criteria
Normalized criteria weight values x sub-criteria values

$$\mathcal{U}(\alpha_i) = \sum_{J=1}^{m} \mathcal{W}_j \mathcal{U}_i(a_i), \qquad i = 1,2,\ldots m \quad (3)$$

Explanation :
Wj = weighting value of the jth criterion and k criteria
U(ai) = utility value of the ith criterion for the ith criterion

3. RESULTS AND DISCUSSIONS

3.1 Criteria and Weights

The criteria, weights and attributes used in this research were taken from several samples from several different studies. The criteria used are Working period with a weight of 25, Presence with a weight of 20, Team Work with a weight of 20 and Achievements with a weight of 35. All criteria are included in the benefit category where the bigger the value, the better it is for assessment, in contrast to costs where the smaller the value is. It's getting better for assessment. The criteria used are as follows:

Table 1. Criteria and weights

Code	Criteria	Weight	Benefit/cost
C1	Working period	25	Benefit
C3	Presence	20	Benefit
C4	Team Work	20	Benefit
C4	Achievements	35	Benefit
Total			100

3.2 Weight normalization

At this stage, the weight values in Table 1 are converted into decimal values. Convert weight values to decimal values with formulas $\frac{w_j}{100}$.

Table 2. Weight normalization

Code	Criteria	Weight	Normalization
C1	Working period	25	0,25
C3	Presence	20	0,2
C4	Team Work	20	0,2
C7	Achievements	35	0,35
Total		100	1

3.3 Alternative Criterion value

After the criteria and weights have been normalized, the next step is to assign alternative values to each criterion. The criteria in this research are a sample of names

from a company. Each alternative has its own score for each specified criterion. The alternative values for the criteria used in this research are as follows:

Table 3. Alternative Criterion value

Alternatife	C1	C2	C3	C4
Hadi Satrio	100	75	80	100
Sayyidatina	80	70	90	40
Bilqis Sholihah	90	70	50	90
Yasmin Nuwairah	80	90	90	70

3.4 Alternative Final Value

After entering alternative criteria values, calculate the final value. Since all the criteria are benefits, the formula that will be used is:

$$U_i(\alpha_i) = 100\frac{(C_{out\,i} - C_{min})}{(C_{max} - C_{min})}\%$$

Explanation
Ui(ai): utility value of the 1st criterion for i
Cmax: maximum criterion value
Cmin: minimum criterion value
Cout i: i-th criterion value

Table 4 shows the score calculation for one of the alternative options, namely Hadi Satrio, using formula (2). The calculation is carried out by multiplying the benefit score with the normalization for each criterion.

Table 4. Hadi Satrio's score

Name	Criteria	Value of Criteria	Benefit Score	Normalization	Result
Hadi Satrio	C1	100	100	0,25	64
	C2	75	0	0,2	
	C3	80	20	0,2	
	C4	100	100	0,35	

Calculation in the table above:
= (100 * 0,25) + (0 * 0,2) + (20 * 0,2) + (100* 0.35)
= 25 + 0 + 4 + 35
= 64

Table 5 shows the score calculation for one of the alternative options, namely Sayyidatina, using formula (2). The calculation is carried out by multiplying the benefit score with the normalization for each criterion.

Table 5. Sayyidatina's score

Name	Criteria	Value of Criteria	Benefit Score	Normalization	Result
Sayyidatina	C1	80	80	0,25	52
	C2	70	60	0,2	
	C3	90	100	0,2	
	C4	40	0	0,35	

Calculation in the table above:
= (80 * 0,25) + (60 * 0,2) + (100 * 0,2) + (0 * 0,35
= 20 + 12 + 20 + 0
= 52

Table 6 shows the score calculation for one of the alternative options, namely Bilqis Sholihah, using formula (2). The calculation is carried out by multiplying the benefit score with the normalization for each criterion.

Tabel 6. Bilqis Sholihah's score

Name	Criteria	Value of Criteria	Benefit Score	Normalization	Result
Sholihah	C1	80	50	0,25	60
	C2	90	100	0,2	
	C3	90	100	0,2	
	C4	70	0	0,35	

Calculation in the table above:
= (80 * 0,25) + (100 * 0,2) + (100 * 0,2) + (0 * 0,35)
= 20 + 20 + 20 + 0
= 60

Table 7. Yasmin Nuwairah's score

Name	Criteria	Value of Criteria	Benefit Score	Normalization	Result
Yasmin Nuwairah	C1	90	100	0,25	66
	C2	70	50	0,2	
	C3	50	0	0,2	
	C4	90	100	0,35	

Table 7 shows the score calculation for one of the alternative options, namely Yasmin Nuwairah, using formula (2). The calculation is carried out by multiplying the benefit score with the normalization for each criterion.

Calculation in the table above:
= (100 * 0,25) + (60 * 0,2) + (0 * 0,2) + (100 * 0,35)
= 25+ 12 + 0 + 35
= 75

3.5 Alternative value results

The final results of the score calculation for each alternative are then summarized and compared with each other. After comparing the results, we get results like Table 8 which shows that Yasmin Nuwairah is superior with a score of 75 and is ranked 1st, Hadi Satrio is in second place with a score of 64, Bilqis Sholihah is in third place with a score 60 and Sayyidatina is in the last position with the lowest score.

Table 8. Alternative value results

No	Name	Score	Rank
1	Hadi Satrio	64	2
2	Sayyidatina	52	4
3	Bilqis Sholihah	60	3
4	Yasmin Nuwairah	75	1

4. CONCLUSION

From a series of calculations of weights and criteria using the Simple Multi Attribute Rating Technique (SMART) method, it was concluded that the calculation process for evaluating the best employees can be carried out using clear assessment attributes, thereby eliminating subjective assessment components from the assessment team. From the four research samples used, it was found that the employee named Yasmin Nuwairah was ranked 1st with the highest score among the other candidates. For future development of this research, it is recommended to implement the algorithm and calculation results on a medium that allows it to be accessed at any time by the assessment team, which could be a desktop or web-based application. The contribution of this research to knowledge is to provide a scientific contribution regarding the implementation of the SMART method in calculating the rank of the best employees using 4 types of criteria.

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