

Permanent Employee Assessment Decision Support System using the Simple Multi Attribute Rating Technique (SMART) Method

Ryan A Pratama*, Romi Hardianto

Universitas Putra Indonesia YPTK Padang, Jl. Raya Lubuk Begalung Padang, Sumatera Barat – 25221, Indonesia

* ryanalvin1106@gmail.com

Abstract

Every agency or organization must be able to select and determine competent employees to fill vacant positions so that the main duties of that position can be carried out. To obtain information quickly and accurately about the assessment of permanent employees in accordance with the expected criteria, a decision support system is needed. Objective decisions are usually fair because they are in accordance with the facts and supported by data to produce a decision/recommendation that can make things easier for agency or organization leaders. By using the Simple Multi Attribute Rating Technique (SMART) method, it is hoped that it can help in making decisions about evaluating permanent employees. The SMART method uses a multiattribute decision technique which is used to support decision makers in choosing between several alternatives. This research aims to assist the leadership of the West Sumatra Ministry of Religion in making decisions regarding permanent employee recommendations for employees. The method used in this research is qualitative. Based on the test results, a weighting system is produced that takes into account the assessment factors that exist in employees. The results of the assessments that have been carried out will immediately produce data on employees who have competencies worthy of being promoted to a better career level. In the research, 6 criteria were used, namely cooperation, work ability, work discipline, loyalty, responsibility and communication. With 5 alternative data, calculations were carried out using the SMART method, the result that got the highest score was Endang Mesfitra with a final result of 0.7425. With the research results, the application can help leaders in providing assessments and the results of these assessments produce objective decisions so that leaders can recommend employees according to the criteria.

Keywords: Decision Support Systems, Permanent Employee Assessment, SMART, Criteria, Alternatives.

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1. Introduction

The Ministry of Religion is the agency with the largest number of civil servants, namely 233,910 (5.38 %) compared to other ministries. Apart from that, data obtained from Simpeg.kemenag.go.id, (2018), shows that the majority of civil servants at the Ministry of Religion are aged between 40-49 years, namely 109,208 people, followed by those aged between 50-57 years as many as 64,940, then age 30-39 years old as many as 45,702 people. Meanwhile, there are 5,568 civil servants aged over 57 years [1]. Human Resources are one of the valuable assets owned by every agency. One form of human resource management that must be carried out by agencies is employee assessment which is carried out periodically [2].

From several organized developments of functional area resources in strategic management, workforce/employees are also an important part for development. Employees who have the best performance will have an influence on the company. The best employees have a positive effect on the progress of a company, the work environment and even related to innovation. The best employees will

also help the company in progress, be it technology, new knowledge, or other fields that are useful for the company. Thus, companies must try to empower their employees so that their performance remains good. The strategy for empowering employees includes determining the best employees. In determining the best employees, an assessment is required based on criteria determined by the company itself [3].

To obtain information quickly and accurately about the assessment of permanent employees in accordance with the expected criteria, a decision support system is needed [4]. It is hoped that this system can help in making decisions regarding the assessment of permanent employees who require a decision support system. So there needs to be a system that can help the best employee assessment process be right on target. Decision Support Systems (DSS) are computer-based systems and are used to solve problems and as tools to support the decision-making process [5]. A method is needed

In building a SPK, one of them is the SMART method which stands for Simple Multi Attribute Rating Technology. This method is a method for making

decisions to handle multi-criteria problems based on calculating the criteria weights for each alternative, so that the best alternative results will be obtained [6].

SPK is a system used for the decision making process which can help the decision maker's tasks. The components for building a Decision Support System include (1) data sub-system, namely the data storage area in the system; (2) the model subsystem is a decision model that is integrated with data; and (3) the dialogue subsystem is a user interface as a means of interactive communication between the user and the system [7].

SMART (Simple Multi-Attribute Rating Technique) is a multi-criteria decision making method developed by Edward in 1997 [8]. 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 [9]. Moreover, according to Siregar et al, decision making is always correlated with the uncertainty of the results of the decisions taken, to reduce this risk factor, weighting was created [109]. Borissova et al used SMART to develop E-Learning tools in decision-making systems, which, according to him, are very dynamic and require quantitative methods based on one-factor regression analysis [11]. SMART, which can be applied to many cases of this decision making system, was then used by Wahana et al to determine the growth of toddlers [12], used by Sihombing et al and Setiawan et al to determine the level of employee Key Performance Index [13], [14], used by Mahdiana et al and Putra et al to determine the best teachers based on achievements [15], [16], even used by Tangkesalu to determine the ranking of the best startup businesses [17].

Previous research on the application of the AHP and SMART methods for selecting the best supplier at CV. Hizkia Tirta Gemilang resulted in the greatest value being obtained by CV. Bina Karya Mandiri as the best alternative in selecting suppliers with a final value of 0.9792[18]. Furthermore, the SAW and SMART method research was compared in the SPK for determining Smart Indonesia Card (KIP) recipients. The research results show that the SMART method is better than the SAW method for implementation in SPK in assisting schools in carrying out the selection process in determining KI P recipients [19].

The MAUT method is also implemented in creating SPK for employee recruitment at PT. Dos Ni Roha Jambi. The system design used is Use case Diagrams, Activity Diagrams, Class Diagrams and the Adobe Dreamweaver CS6 application. The SPK that was built produced 4 (four) recommended employees out of 9 (nine) people, namely with scores of 14.75, 14.25, 12.26 and 10.49 [20].

Based on the problems that have been presented previously and in accordance with previous research studies, this research builds a SPK that applies a comparative ranking method in determining the best employees using the SMART method.

2. Research methodology

The research framework is the concept or stages that will be carried out in the research. So that the steps taken by the author in this design do not deviate from the main discussion and are easier to understand, the sequence of research steps will be made systematically so that it can be used as a clear and easy guide for solving existing problems. The research framework that the author carried out in the research can be depicted in Figure 1 .

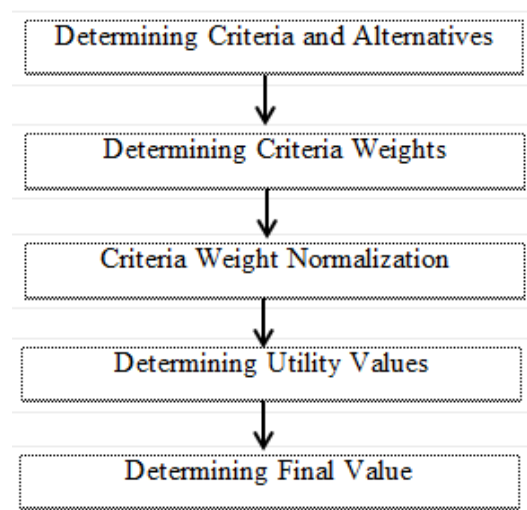


Figure 1. Research Framework

The stages of the *Simple Multi Attribute Rating Technique* (SMART) method can be seen as follows:

- a. Determine the alternatives and criteria that will be used to solve decision-making problems.
- b. Give weight to each criterion using a scale of 1 to 100, taking into account the most important priorities.
- c. After the weights are given, then calculate the normalized criteria weights for each criterion. To calculate the score on the criteria weights, the formula presented in Equation (2.1) is used.

$$Normalisasi = \frac{w_j}{\sum w_j} \quad (2.1)$$

Where the formula with the symbol (w_j) represents the weight score and ($\sum w_j$) represents the total weight

of all criteria and will be divided by the criteria weight score.

d. Give a criteria score to each alternative.

Calculate the utility value by converting the criterion score for each criterion to the standard data criterion score. For criteria with benefit categories , it is calculated using Equation (2.2).

$$u_i(a)_i = \frac{(c_{max}-c_{min})}{(c_{out}-c_{min})} \quad (2.2)$$

Meanwhile, the criteria with cost categories are calculated using Equation (2.3).

$$u_i(a)_i = \frac{(c_{out}-c_{min})}{(c_{max}-c_{min})} \quad (2.3)$$

Where the formula with this symbol $u_i(a)_i$ represents the utility score of the ith criterion, c_{out} symbolizes the score of the ith criterion, Symbol c_{max} represents the maximum criteria score, and the symbol c_{min} represents the minimum criteria score.

e. Calculate the final value by adding up the total multiplication results of the normalized weight criteria number results presented in Equation (2.4).

$$u_i(a)_i = \sum_{j=1}^m W \quad (2.4)$$

Where the Symbol $u(a)_i$ is the final alternative value, W_j is the result of normalization of criteria weighting, and $u_j(a)_i$ is the result of utility value.

Ranking is the process of sorting the final values from largest to smallest. The best alternative is the alternative that obtains the greatest value [17].

3. Results and Discussion

3.1 Simple Multi Attribute Rating Technique (SMART) Method

a. Determine Criteria and Alternatives

Stage beginning on method SMART that is determine Criteria can be seen in Table 1.

Acronym	Criteria	Attribute
K1	Cooperation	B
K2	Work ability	B
K3	Work Discipline	B
K4	Loyalty	B
K5	Responsibility	B
K6	Communication	B

Alternative Which used in permanent employees assessed are Endang Mesfitra, Muhammad Ridha, Vari Gusman Pratiwi, Sri Hastuti, and Risna Yanti who will become recommendation permanent employee. In this research There is 5 alternatively, yes seen from Table 2 .

Table 2. Alternatives

No	Alternative
1.	Endang Mesfitra
2.	Muhammad Rida
3.	Varia Gusma Pratiwi
4.	Sri Hastuti
5.	RisnaYanti

This alternative table is a list of individuals or entities that will be assessed or compared using the criteria previously determined in the criteria weight table

b. Determine the weight of the criteria

Weights and Normalization Formula for each criterion listed use For selection in permanent employee assessment is cooperation , work ability, work discipline, loyalty, responsibility and communication can be seen on Table 3 .

Table 3. Criteria Weights

Acronym	Criteria	Weight
K1	Cooperation	15
K2	Work ability	25
K3	Work Discipline	35
K4	Loyalty	5
K5	Responsibility	10
K6	Communication	10
Total		100

The total weight for all criteria is 100, indicating that the assessment is based on the weight distribution that has been determined for each criterion. Thus, the table provides a framework for evaluating performance or characteristics based on certain criteria that are considered important in the relevant context.

c. Provide Alternative Values for Each Criteria

Create alternative values for each criterion such as Table 4.

Table 4. Ratings Alternative Value

Alternative	K1	K2	K3	K4	K5	K6
Endang Mesfitra	SB	C	SB	C	SB	B
Muhammad Rida	C	K	C	B	SB	C
Varia Gusma Pratiwi	K	C	C	SB	K	SB
Sri Hastuti	B	SB	K	C	B	K
RisnaYanti	C	K	K	SB	SB	SB

Information:

SB=Very Good

B=Good

C=Fair

K=Less

Based on Table 4, the alternative value rating is converted becomes the weight value for each variable in the table5 .

Table 5. Alternative Value Rating based on criteria weight values

Alternative	K1	K2	K3	K4	K5	K6
Endang Mesfitra	100	60	100	60	100	80
Muhammad Rida	60	40	60	80	100	60
Varia Gusma Pratiwi	40	60	60	100	40	100
Sri Hastuti	80	100	40	60	80	40
RisnaYanti	60	40	40	60	100	100

d. Determining Utility Values

The utility value results are obtained from converting the criterion values for each criterion into the criterion values in Table 6.

Table 6. Utility Value

Alternative	K1	K2	K3	K4	K5	K6
Endang Mesfitra	1	0.33	1	0	1	0.67
Muhammad Rida	0.33	0	0.33	0.5	1	0.33
Varia Gusma Pratiwi	0	0.33	0.33	1	0	1
Sri Hastuti	0.67	1	0	0	0.67	0
RisnaYanti	0.33	0	0	0	1	1

e. Determining Final Value

The final value results are obtained from each by multiplying the value obtained from the normalization of the criterion values by the normalized value of the criteria weights. Then the values of the multiplication data are added up and can be seen in Table 7.

Table 7. Final Value

Alternative	K1	K2	K3	K4	K5	K6	Results
Endang Mesfitra	0.15	0.83	0.35	0	0.1	0.67	0.7425
Muhammad Rida	0.05	0	0.12	0.03	0.1	0.33	0.325
Varia Gusma Pratiwi	0	0.83	0.12	0.05	0	0.1	0.348
Sri Hastuti	0.1	0.25	0	0	0.07	0	0.4165
RisnaYanti	0.05	0	0	0	0.1	0.1	0.2499

From the results of Table 6. The results obtained , the recommendation for new employees based on the results of calculations using the SMART method is Endang Mesfitra with a final result of 0.7425.

4. Conclusion

With the application of a decision support system, it can provide optimal and appropriate results in making decisions regarding the selection of permanent employees at the Ministry of Religion, West Sumatra Province. It can determine the best permanent employee according to the results of the SMART method calculation to make the final decision.

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