Implementation of a Decision Support System for Contract Employee Recruitment Selection using the Simple Multi Attribute Rating Technique (SMART) Method

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Abstract

LPMP West Sumatra is a company in the technical implementation department of the Ministry of Education and is led by leadership and is responsible to the Director General for Improving the Quality of Educators and Education Personnel (PMPTK). The selection process for hiring contract employees has difficulties because the system is still manual where all the processes from the initial stage of registration selection to the final stage of registration selection are all done manually so it takes quite a long time and is troublesome and drains a lot of energy and energy for the company management. . So there is a need for an online selection information system for contract employee recruitment at LPMP West Sumatra such as a decision support system. This Decision Support System (DSS) uses the Simple Multi Attribute Rating Technique (SMART) method. The SMART method is a decision-making method for handling multi-criteria problems based on calculating the criteria weights for each alternative. The aim of this decision support system was to be able to assist the selection process for hiring contract employees at LPMP West Sumatra quickly, precisely and accurately. The results obtained by the alternative with the name of the prospective contract employee were Ririn Novrianti with a score of 0.755. This helps West Sumatra LPMP leaders in determining prospective contract employees who meet the requirements for employment.

Keywords: Decision Support Systems, SMART Method, Contract Employees, Criteria, Selection,

1. Introduction

The Education Quality Assurance Institute (LPMP) is a technical implementation department of the Ministry of Education and is led by leadership and is responsible to the Director General for Quality Improvement of Educators and Education Personnel (PMPTK). LPMP is responsible for ensuring the quality of primary and secondary education, including kindergarten (TK), Raudatul Athfal (RA), or other equivalent forms in West Sumatra, based on National Education Minister Policy. One of LPMP's activities is the recruitment of contract employees with the aim of helping companies deal with various problems.

Several companies in various regions in Indonesia often have problems with outsourcing employees. The majority of employees in a company only stay for a short time. The reason that usually occurs is an error when recruiting employees. After working, it turns out that the employee does not have the skills and standards required by the company. Every time an employee terminates their employment contract or requires additional employees, the company of course opens up empty seats or hires new employees to fill the required positions. At LPMP West Sumatra, the recruitment process is unprofessional and still uses non-transparent methods . This is because there is no consistent and systematic way to assess prospective employees.

Another obstacle in accepting new employees at LPMP West Sumatra is the system which is still manual, where all the processes from the initial stage of registration selection to the final stage of registration selection are all done manually so it takes quite a long time and is troublesome and drains a lot of energy and energy for the management. company. These problems require a decision support system that can help the personnel department make decisions about assessing prospective new employees.

Decision Support Systems is a special system concept that connects computerized information with decision makers as users. A decision support system is a collection of elements that are combined together to work together to create a single unit to achieve a common goal, [1][2]. A decision support system is an interactive system that helps make decisions using data and decision models to solve semi-structured and unstructured problems, [3] [4].

A decision support system is a system device that can solve problems efficiently and effectively, which aims to assist decision making in choosing various alternative decisions which are the result of processing information obtained using a decision making model [5].

A decision support system is a specific information system intended to assist management in making

decisions related to semi-structured issues. This system has the facility to generate various alternatives that are interactively used by users [6][7][8]. Decision Support Systems (DSS) are flexible, interactive and adaptable computer-based information systems, which were developed to support solutions to specific, unstructured management problems [9]. Decision Support Systems use data, provide an easy user interface and can incorporate decision making thinking [10].

Simple Multi Attribute Rating Technology (SMART) is a multi-criteria decision making method developed by Edward in 1977. SMART is a multi-criteria decision making technique which is based on the theory that each alternative consists of many criteria that have values and each criterion has a weight. to explain how important it is compared to other criteria. This weighting is used to evaluate each alternative to reach the best alternative [11].

SMART uses a linear additive model to predict the value of each alternative. SMART is a flexible decision-making method. SMART is more widely used because of its simplicity in responding to the needs of decision makers and analyzing their responses. Because the relevant analysis is transparent, this method provides a high level of understanding of the problem and can be accepted by decision makers [12]. The SMART method is a decision making method for handling multi-criteria problems based on calculating the criteria weights for each alternative [13].

Previous research on a decision support system for new student admissions using the SMART method obtained very helpful results in the process of admitting new students to SD Luqman Al Hakim Surabaya, especially in terms of giving points (assessment) for each criterion used. Then, from system testing it can be shown that the assessment of prospective new students is fast which can shorten the time for the admission process so that if prospective students fail in the admission selection process they can immediately look for another school [14]. Further research on the Implementation of a Decision Support System using the SMART Method for Ranking Poverty in the Process of Determining PKH Assistance Recipients obtained results from experiments, testing with 14 criteria and 13 criteria showing the same total value of 3 data, for testing with 12, 11, and 10 criteria shows the same total value of 13 data, for testing with 9 and 8 criteria shows the same total value of 14 data, for testing with 7 and 6 criteria shows the same total value of 15 data, and for testing with 5 The criteria show the same total number of values as 16 data. From this test, the criteria influence the total value output, the more criteria used, the more varied the value that comes out, and the fewer criteria, the more the total value appears the same . Testing with 14 criteria and 13 criteria shows the best results because the values that come out are varied compared to other criteria with the same value of 3 data [15]

Based on the previous explanation , this research aims to recruit contract employees to the West Sumatra LPMP. It is hoped that this research can obtain results to assist in decision making, so that the decisions obtained become a reference in making decisions effectively and efficiently.

2. Research methodology

The research framework is a sequence of activities that will be carried out in a study. The research will be carried out using the Simple Multi Attribute Rating Technique (SMART) method. The SMART method is a flexible decision-making method and is widely used because of its simplicity in responding to decision-making needs, so that decisions can be made effectively and efficiently.
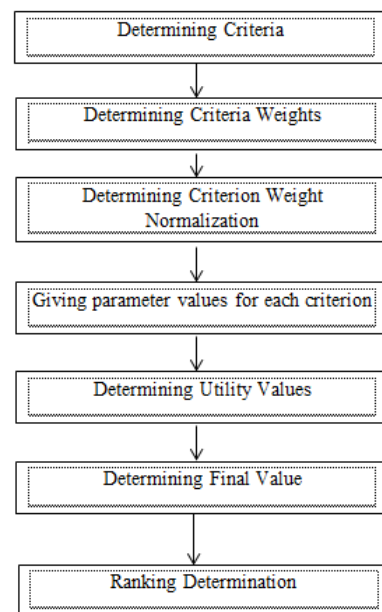

Figure 1. Research Framework

The stages carried out by the SMART method framework. Calculations using the SMART method are the calculations that we will use in making decisions in selecting contract employees at the West Sumatra LPMP.

2.1 SMART Method Calculation
1. Determine the criteria and alternatives that will be used to resolve decision-making problems.
2. Determine the weight for each criterion using a scale of 1 to 100, taking into account the most important priorities.

$$W_{ij} = \frac{C_{out} - C_{min}}{C_{max} - C_{min}} \qquad (1)$$

Where :

Wij = Criteria weight in row i column j
Cout = record value

Cmin = minimum value for the xth criterion
Cmax = maximum value for the xth criterion

3. Criteria Weight Normalization

$$W_j = \frac{w_j}{\sum_{n=1}^{k} w_n} \qquad (2)$$

Where:

n W_j is the normalized weight of the jth criterion.

w_j is the weight value of the jth criterion.

k is the number of criteria.

w_n is the weight of the nth criterion.

4. Giving parameter values for each criterion. If the data is still in qualitative form, then the data will be made into quantitative data first by creating parameter values in the criteria.

5. Determine the *Utility Value,* by changing the criteria score for each criterion into a standard data criteria score. For criteria in the profit category, it is calculated using the following equation

The utility value is calculated using the following benefit equation properties:

$$u_i(a)_i = 100 \frac{(C_{out} - C_{min})}{(C_{max} - C_{min})} \% \quad (3)$$

The utility value is calculated using the cost equation properties as follows:

$$u_i(a)_i = 100 \frac{(C_{max} - C_{out})}{(C_{max} - C_{min})} \% (4)$$

Where:
$u_i(a)_i$ is the utility value of the ith criterion for alternative i.
C_{max} is the maximum criterion value.
C_{min} is the minimum criterion function.
C_{out} is the value of the ith criterion.
With i =1 ,2 ,…m and i = 1,2,…,n

6. Calculate the final value by adding up the total multiplication results of the normalized criteria weight results obtained from the normalization of standard data criteria scores with the normalized criteria weight scores.

$$u(a_i) = \sum_{j=1}^{m} w_j * u_j (a_i) \qquad (5)$$

Where:

$u(a_i)$ = Alternative final value
w_j = results of normalization of criteria weighting
$u_j (a_i)$ = the resulting value of utility

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

3. Results and Discussion

1. Determining Criteria

SMART method requires determining criteria that serve as guidelines in determining whether a prospective contract employee can be selected or not to become a contract employee. The criteria for assessing the selection of prospective contract employees can be explained in Table 1.

Table 1 Criteria for Prospective Contract Employees

No	Criterion Id	Type Criteria
1.	C001	Age
2.	C002	Education
3.	C003	Computer Skills Test Results
4.	C004	Psychological Test Results
5.	C005	Interview result

The alternatives used in assessing the selection of prospective contract employees can be explained in Table 2.

Table 2 Alternatives for prospective contract employees

No	Alternative ID	Name
1.	A001	Ibn Safmid
2.	A002	Yandra Prawinata
3.	A003	Khabib Muafi
4.	A004	Fakhri Firdaus
5.	A005	Ririn Novrianti

Because a numerical value cannot be directly input for each criterion that can be processed using formulas from the SMART method, sub-criteria for each criterion are required. Sub-criteria can be explained in Table 3.

Table 3 Criteria for assessing prospective contract employees

No	Criteria Code	Criteria	Information	Mark
1.	C001	Age	19-22	100
			23-26	80
			27-30	60
			31-34	40
			35	20
2.	C002	Education	S1	100
			D4	80
			D3	60
			SENIOR HIGH SCHOOL	40
			vocational school	20
3.	C003	Computer Skills Test Results	A	100
			B	80
			C	60
			D	40
			E	20
4.	C004	Psychological Test Results	Total score (67-70)	100
			Total score (63-66)	80
			Total score (59-62)	60
			Total score (55-58)	40
			Total score (< 55)	20
5.	C005	Interview result	Very satisfactory	100
			Satisfying	80
			Good enough	60
			Less satisfactory	40
			Not satisfactory	20

2. Determination of Criteria Weights

Give weight to each criterion described in Table 4 .

Table 4 Target Value Criteria for Assessment of Prospective Contract Employees

No	Criterion ID	Type Criteria	Weight
1.	C001	Age	40
2.	C002	Education	45
3.	C003	Computer Skills Test Results	60
4.	C004	Psychological Test Results	50
5.	C005	Interview result	50

3. Criteria Weight Normalization

Provide weights and attributes for each criterion, then normalize the weights of the criteria described in Table 5.

Table 5 Normalization of Weights

No	Criterion Id	Type Criteria	Weight	Weight Normalization
1.	C001	Age	40	0.163265
2.	C002	Education	45	0.183673
3.	C003	Computer Skills Test Results	60	0.244898
4.	C004	Psychological Test Results	50	0.204082
5.	C005	Interview result	50	0.204082

4. Giving Parameter Values for Each Criteria

Determine the alternatives that will be selected in decision making and assign criteria values to each alternative. In the decision support system for selecting prospective contract employees, these alternatives are requirements for assessing prospective contract employees. The data used will be explained in Table 6.

Table 6 Criteria Values for Each Alternative

No	Alternative	C001	C002	C003	C004	C005
1.	A001	100	40	80	80	40
2.	A002	80	60	60	80	60
3.	A003	40	80	80	40	80
4.	A004	20	100	60	40	80
5.	A005	80	100	80	60	60

5. Determining *Utility Values*

Calculations are carried out using formula (3) for benefit criteria and (4) for cost criteria. The results of these calculations are obtained in Table 7 below:

Table 7 Utility Values

No	Alternative	C001	C002	C003	C004	C005
1.	A001	1	0.75	0.25	0	0.75
2.	A002	0	0.333	0.667	1	1
3.	A003	1	0	1	0	1
4.	A004	1	1	0	0	0.5
5.	A005	0	0.5	1	1	0.5

6. Determining Final Value

Carry out rankings based on the final results obtained as shown in Table 8 below.

Table 8 Final Value

Alternative	C001	C002	C003	C004	C005	NA
A001	0.163	0,000	0.245	0.204	0,000	0.612
A002	0.122	0.061	0,000	0.204	0.102	0.49
A003	0.041	0.122	0.245	0,000	0.204	0.612
A004	0,000	0.184	0,000	0,000	0.204	0.388
A005	0.122	0.184	0.245	0.102	0.102	0.755

7. Ranking

From the final results of the smart method calculations in Table 8, they can be ranked based on the final results which can be seen from Table 9 as follows:

Table 3. 2 Ranking Data

Alternative	The final result	Rank
Ririn Novrianti	0.755	Rank1
Ibn Safmid	0.612	Rank 2
Khabib Muafi	0.612	Rank 3
Yandra Prawinata	0.49	Rank 4
Fakhri Firdaus	0.388	Rank 5

So the ranking value that meets the requirements is in the alternative with the name of the prospective contract employee, namely Ririn Novrianti with a score of 0.755 . This helps West Sumatra LPMP leaders in determining prospective contract employees who meet the requirements for employment.

4. Conclusion

After implementing a decision support system using the SMART method, it can help in recruiting contract employees at LPMP West Sumatra, the employee recruitment process can be carried out quickly, precisely and accurately.

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