



# Employee Recruitment Decision Support System Using SMARTER

Pandi Barita Nauli Simangunsong<sup>1</sup>, Novriadi Antonius Siagian<sup>2</sup>

<sup>1,2</sup>Universitas Katolik Santo Thomas, Medan, Indonesia

Author Email: simangunsong.pandi@gmail.com<sup>1</sup>, novriadi.antonius95@gmail.com<sup>2</sup>

**Abstract.** Employee recruitment is a crucial process in human resource management to obtain the best candidates who meet the organization's needs. This process is often subjective and time-consuming. Therefore, a decision support system (DSS) is needed to assist in making objective and structured decisions. The SMARTER method (Simple Multi-Attribute Rating Technique Exploiting Ranks) is an effective Multi-Criteria Decision Making (MCDM) approach for selecting alternatives based on predefined criteria. This study aims to design and implement a recruitment decision support system using the SMARTER method. The results of this study indicate that the decision support system applying the SMARTER method can provide systematic and objective recommendations for the best candidates based on criteria weights calculated using the ROC approach. The final decision-making outcome shows that Candidate A1 is the most suitable for selection based on the determined weights, even though they are not superior in all aspects.

**Keywords:** Decision Support System, Employee Recruitment, SMARTER, MCDM, Employee Selection

## 1. INTRODUCTION

The employee recruitment process is an important initial stage in building a high-quality human resource base within an organization. Mistakes in selecting candidates can have a negative impact on company performance. In practice, the selection process often relies on the intuition or subjective judgment of interviewers. Therefore, a systematic and objective approach is needed in the decision-making process.

Decision Support Systems (DSS) can help managers select the best candidates based on predetermined criteria [1]. One DSS method that can be applied is SMARTER, which is an extension of the SMART (Simple Multi-Attribute Rating Technique) method [2]. SMARTER assigns weights based on the ROC formula for each criterion while considering preference rankings, thereby reducing bias in the decision-making process [3].

SMARTER has been widely used in previous studies to solve multi-criteria decision-making problems. In study [4], SMARTER was used to assess the performance of educational personnel. The results of this study concluded that SMARTER can facilitate the objective determination of the performance value of each alternative to determine which alternative is entitled to a reward. In study [5], SMARTER was used for the selection of the student council president. The results of this study concluded that SMARTER can produce a mathematical ranking of alternatives. In study [6], SMARTER was used for rice field mapping. The results of this study showed that SMARTER has an accuracy of 76% in solving the problem studied by the author.

## 2. METHODOLOGY

### 2.1 Decision Support System

A Decision Support System is a computer-based system that supports decision-making in semi-structured or unstructured situations [7]. Decision Support Systems do not replace decision-makers, but rather improve the effectiveness of the decision-making process through alternative analysis and simulation [8].

### 2.2 SMARTER

SMARTER (Simple Multi-Attribute Rating Technique Exploiting Ranks) is a decision-making approach used to solve multi-criteria problems [9]. The decision-making process in this method involves a weighting system for criteria and sub-criteria, which is calculated using the Rank Order Centroid (ROC) method [10]. The resulting



weights reflect the relative importance of each criterion and subcriterion in determining the final value of each alternative [11]. The total weight assigned to all criteria or subcriteria in the SMARTER method must sum to 1, ensuring proportionality in the evaluation [12]. The complete steps in the decision-making process using the SMARTER method can be explained as follows [13]:

- a. Identification of problems
- b. Determine criteria and sub-criteria
- c. Determine the ranking order of all criteria and sub-criteria subjectively
- d. Determine the weight of criteria and sub-criteria using the ROC formula

$$w = \left(\frac{1}{k}\right) \sum_{i=k}^k \left(\frac{1}{i}\right) \dots\dots\dots (1)$$

Explanation:

- 1)  $w$  = criterion weight value
- 2)  $k$  = number of criteria used
- 3)  $i$  = alternative value

- e. Determine the utility value of all criteria using the following formula:

$$u_i(a) = 100\% \times \left(\frac{c_i - c_{\min}}{c_{\max} - c_{\min}}\right) \dots\dots\dots (2)$$

Explanation:

- 1)  $u_i(a)$  = utility value of criterion  $i$
- 2)  $c_i$  = value of criterion  $i$
- 3)  $c_{\min}$  = smallest criterion value
- 4)  $c_{\max}$  = largest criterion value

- f. Determine the final value of all criteria using the following formula:

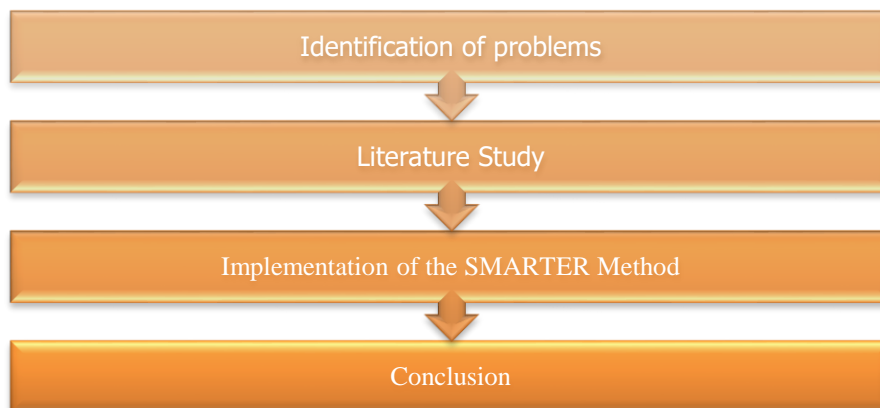
$$u_n = \sum_{k=1}^K w_k u_n(x_n) \dots\dots\dots (3)$$

Explanation:

- 1)  $u_n$  = total value of each criterion
- 2)  $w_k$  = weight value of criterion  $k$
- 3)  $u_n(x_n)$  = utility value of criterion  $k$  for alternative  $i$

### 2.3 Research Stages

The solution to the employee recruitment problem in this study was carried out using four stages, as shown in Figure 1 below:



**Figure 1.** Research Stages

### 2.4 Research Data

In this study, the author used four main criteria to assess potential employees to be recruited, as shown in the following table:



**Table 1.** Employee Recruitment Criteria

Criteria	Description	Criteria Ranking	Sub Criteria	Sub Criteria Ranking
C1	Latest Education	1	Bachelor's	1
			Dipolma 3	2
			Vocational High School	3
C2	Work experience	2	5 - 6 years	1
			3 - 4 years	2
			0 - 2 years	3
C3	Technical skills	3	Good	1
			Enough	2
			Bad	3
C4	Communication skills	4	Good	1
			Enough	2
			Bad	3

The alternative data used in this study consisted of four candidates, each of which was evaluated based on a number of predetermined criteria to determine the best candidate objectively and measurably.

**Table 2.** Alternative Employee Recruitment Data

Alternative	Criteria Value			
	C1	C2	C3	C4
A1	Bachelor's	1 years	Good	Bad
A2	Dipolma 3	5 years	Enough	Enough
A3	Vocational High School	3 years	Good	Enough
A4	S1	2 years	Bad	Good

### 3. RESULTS AND DISCUSSION

The results of applying the SMARTER method in employee recruitment using research data in Table 1 and Table 2 can be seen in the description below:

a. Weighting of Employee Recruitment Criteria and Sub-Criteria

The results of determining the weighting of employee recruitment criteria and sub-criteria using the ROC formula in this study are as follows:

**Table 3.** Results of Criteria Weighting Using ROC

Criteria	Criteria Ranking	ROC Formula	Criteria Weight
C1	1	$w = \frac{(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4})}{4}$	0,5208
C2	2	$w = \frac{(0 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4})}{4}$	0,2708
C3	3	$w = \frac{(0 + 0 + \frac{1}{3} + \frac{1}{4})}{4}$	0,1458
C4	4	$w = \frac{(0 + 0 + 0 + \frac{1}{4})}{4}$	0,0625

**Table 4.** Weighting Results of Sub-Criteria Using ROC

Criteria	Sub Criteria	Sub Criteria Ranking	ROC Formula	Weight
C1	Bachelor's	1	$w = \frac{(1 + \frac{1}{2} + \frac{1}{3})}{3}$	0,6111
	Dipolma 3	2	$w = \frac{(0 + \frac{1}{2} + \frac{1}{3})}{3}$	0,2778



C2	Vocational High School	3	$w = \frac{(0+0+\frac{1}{3})}{3}$	0,1111
	5 - 6 years	1	$w = \frac{(1+\frac{1}{2}+\frac{1}{3})}{3}$	0,6111
	3 - 4 years	2	$w = \frac{(0+\frac{1}{2}+\frac{1}{3})}{3}$	0,2778
	0 - 2 years	3	$w = \frac{(0+0+\frac{1}{3})}{3}$	0,1111
C3	Good	1	$w = \frac{(1+\frac{1}{2}+\frac{1}{3})}{3}$	0,6111
	Enough	2	$w = \frac{(0+\frac{1}{2}+\frac{1}{3})}{3}$	0,2778
	Bad	3	$w = \frac{(0+0+\frac{1}{3})}{3}$	0,1111
C4	Good	1	$w = \frac{(1+\frac{1}{2}+\frac{1}{3})}{3}$	0,6111
	Enough	2	$w = \frac{(0+\frac{1}{2}+\frac{1}{3})}{3}$	0,2778
	Bad	3	$w = \frac{(0+0+\frac{1}{3})}{3}$	0,1111

Based on the results of the weighting of criteria and sub-criteria using the ROC formula shown in Table 4 above, the alternative values in Table 5 below were obtained:

**Table 5.** Alternative Employee Recruitment Data Based on the ROC Formula

Alternative	Criteria Value			
	C1	C2	C3	C4
A1	0,6111	0,1111	0,6111	0,1111
A2	0,2778	0,6111	0,2778	0,2778
A3	0,1111	0,2778	0,6111	0,2778
A4	0,6111	0,1111	0,1111	0,6111

b. Total Utility Value of All Criteria

The results of determining the utility value for employee recruitment using the SMARTER method in this study are as follows:

C1

$$A1=100\% \times \left( \frac{0,6111-0,1111}{0,6111-0,1111} \right) = 1$$

$$A2=100\% \times \left( \frac{0,2778-0,1111}{0,6111-0,1111} \right) = 0,3334$$

$$A3=100\% \times \left( \frac{0,1111-0,1111}{0,6111-0,1111} \right) = 0$$

$$A4=100\% \times \left( \frac{0,6111-0,1111}{0,6111-0,1111} \right) = 1$$

After the utility value of criterion C1 has been determined, the next step is to determine the utility values of C2 to C4 using the same formula. The results of determining the utility values of all criteria can be seen in Table 6 below:

**Table 6.** Results of Determining the Utility Value of All Criteria

Alternative	Criteria			
	C1	C2	C3	C4
A1	1	0	1	0
A2	0,3334	1	0,3334	0,3334



A3	0	0,3334	1	0,3334
A4	1	0	0	1

c. Determination of Final Scores for All Criteria

The results of determining the final scores for all criteria for the employee recruitment process in this study are as follows:

C1

$$A1 = 0,5208 \times 1 = 0,5208$$

$$A2 = 0,5208 \times 0,3334 = 0,1736$$

$$A3 = 0,5208 \times 0 = 0$$

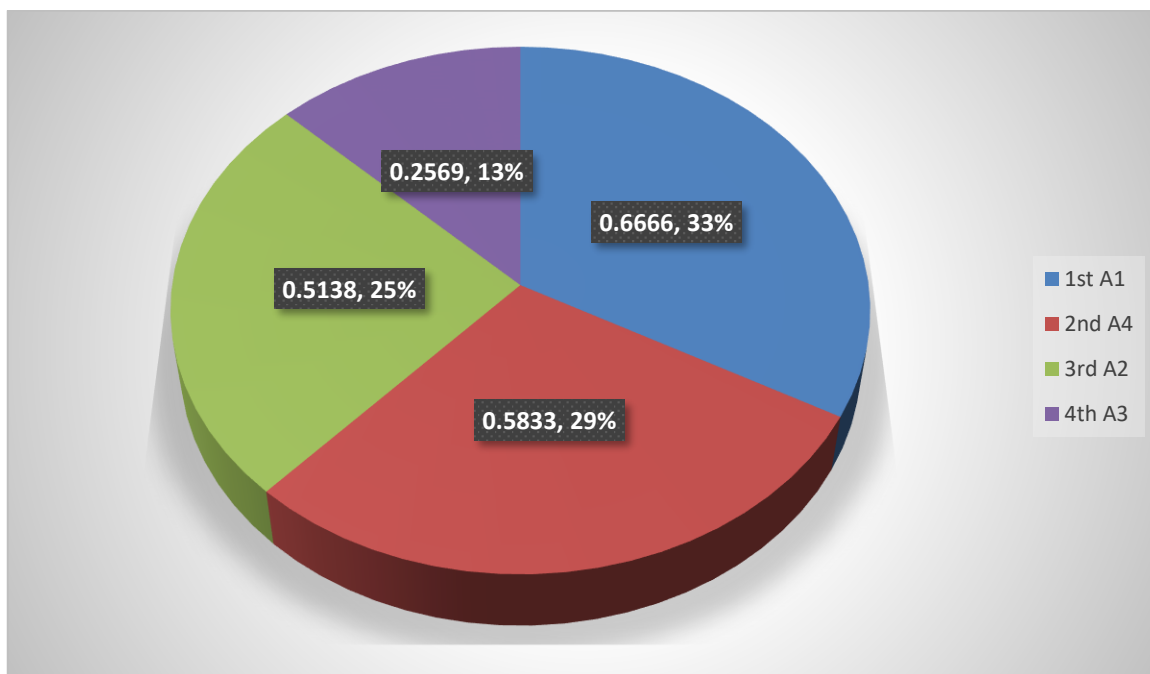
$$A4 = 0,5208 \times 1 = 0,5208$$

After the final value of criterion C1 has been determined, the next step is to determine the final values of criteria C2 to C4 using the same formula. The results of determining the final values of all criteria can be seen in Table 7 below:

**Table 7.** Final Score for All Criteria

Alternative	Criteria				Final Score
	C1	C2	C3	C4	
A1	0,5208	0	0,1458	0	0,6666
A2	0,1736	0,2708	0,0486	0,0208	0,5138
A3	0	0,0903	0,1458	0,0208	0,2569
A4	0,5208	0	0	0,0625	0,5833

Based on the final scores for each alternative shown in Table 7 above, the ranking of alternatives can be seen in the figure below:



**Figure 1.** Alternative Ranking Results

#### 4. CONCLUSION

Based on the results of the analysis using the SMARTER method shown in the previous sub-section, it can be seen that this method utilizes the weights of criteria and sub-criteria calculated using the ROC approach, as well as the utility values for each alternative, to obtain the final result in the form of a ranking of the best



candidates. Overall, the SMARTER method provides a systematic and objective decision-making framework. The final decision-making results indicate that Candidate A1 is the most suitable for recruitment based on the predefined weights, although they are not superior in all aspects.

## References

- [1] V. M. M. Siregar, M. A. Hanafiah, N. F. Siagian, K. Sinaga, and M. Yunus, "Decision Support System For Selecting The Best Practical Work Students Using MOORA Method," *Internet Things Artif. Intell. J.*, vol. 2, no. 4, pp. 270–278, 2022, doi: 10.31763/iota.v2i4.562.
- [2] P. Yudani and L. Wati, "Implementasi Metode SMARTER Pada Sistem Pendukung Keputusan Bantuan Langsung Tunai (BLT)," *J. Fasilkom*, vol. 13, no. 02, pp. 232–243, 2023, doi: 10.37859/jf.v13i02.5504.
- [3] W. P. Lestari, B. W. Sari, and D. Prabowo, "IMPLEMENTATION OF SMARTER METHOD FOR PROSPECTIVE STUDENT COUNCIL SELECTION SYSTEM SMK NEGERI 1 REMBANG," vol. 19, no. 2, 2023, doi: 10.33480/pilar.v19i2.4591.
- [4] D. P. Utomo and B. Purba, "Sistem Pendukung Keputusan Penilaian Kinerja Tenaga Kependidikan (TENDIK) Dengan Menggunakan Metode SMARTER," *J. Komtika (Komputasi dan Inform.)*, vol. 5, no. 2, pp. 140–152, 2021, doi: 10.31603/komtika.v5i2.5619.
- [5] W. S. L. NASUTION and Patriot Nusa, "Decision Support System for Election of OSIS Chair for Muhammadiyah Schools Using the Simple Multi Attribute Rating Technique Exploiting Rank (SMARTER) Method," *Data Sci. J. Comput. Appl. Informatics*, vol. 6, no. 2, pp. 96–110, 2022, doi: 10.32734/jocai.v6.i2-9071.
- [6] P. Agustamam and I. Irmayansyah, "Penerapan Simple Multi Attribute Rating Technique Exploiting Ranks (SMARTER) Untuk Pemetaan Lahan Tanaman Padi," *TeknoIS J. Ilm. Teknol. Inf. dan Sains*, vol. 14, no. 2, pp. 198–213, Jul. 2024, doi: 10.36350/jbs.v14i2.255.
- [7] M. F. Anshary and S. Yakub, "Decision Support System Pemilihan Wilayah Potensial Dalam Pemasaran Produk Menggunakan Metode MOORA," vol. 2, pp. 229–238, 2023.
- [8] M. Siddik, P. Ramadhani, and W. Salistiawaty, "Sistem Pendukung Keputusan Pemilihan Jam Tangan Menggunakan Metode MOORA," *Sist. Pendukung Keputusan dengan Apl.*, vol. 2, no. 1, pp. 12–22, 2023, doi: 10.55537/spk.v2i1.115.
- [9] M. Afdal, W. Ramadhan, and W. Putri, "Implementasi Metode Simple Multi Attribute Rating Technique Exploiting Rank (SMARTER) Untuk Pendukung Keputusan Pemberian Reward," *Indones. J. Inform. Res. Softw. Eng.*, vol. 3, no. 1, pp. 1–10, Mar. 2023, doi: 10.57152/ijirse.v3i1.532.
- [10] R. D. Affandi, H. Pratiwi, Azahari, and M. Ibnu Sa'ad, "Application of the SMARTER Method in Determining the Whitening of Study Permits and Teacher Study Tasks," *Aptisi Trans. Technopreneursh.*, vol. 5, no. 2, pp. 315–325, 2023, doi: 10.34306/att.v5i2.311.
- [11] F. A. Sitompul, F. Helmiah, and R. Rohminatin, "Implementation of the SAW Method in the Decision Support System for Giving Rewards for Honorary Employees," *Build. Informatics, Technol. Sci.*, vol. 4, no. 2, pp. 1–11, 2022, doi: 10.47065/bits.v4i2.2049.
- [12] A. P. kusuma and Trisianto Didik, "Sistem Pendukung Keputusan Untuk Menentukan Tingkat Kesejahteraan Masyarakat Menggunakan Metode Smarter (Simple Multi Attribute Rating Technique Exploiting Ranks)," *J. Sist. Cerdas dan Rekayasa*, vol. 6, no. April, pp. 1–13, 2024.
- [13] N. P. M. Erlina Putri, I. G. I. Sudipa, I. K. A. G. Wiguna, I. B. G. Sarasvananda, and I. W. Sunarya, "Decision Making Model for Temple Revitalization in Bali Using Fuzzy-SMARTER Combination Method," *Sinkron*, vol. 9, no. 1, pp. 61–74, Jan. 2024, doi: 10.33395/sinkron.v9i1.13177.