

Decision Support System Using the SMART Method in Determining the Status of Contract Employees from Permanent Employees

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Abstract

Employee performance assessment is a way to determine the abilities of each employee. The assessment is carried out to obtain materials for developing the company's human resources. The process of appointing contract employees to permanent positions is still not effective, this results in doubt in decision making which allows errors to occur. In this research, a system for decision making will be built, where this research uses the Multi Attribute Rating Technique (SMART) method. The SMART method is a multi-criteria decision making technique that compares one criterion with another. The data used in this research uses 3 factors and 12 employee data to be selected. For assessment using the SMART method based on criteria and weights, a score above 80 is declared a pass to become a permanent employee. Research using the Simple SMART method can help the Ibnu Sina Islamic Hospital in West Pasaman in managing the data or criteria used in determining the status of contract employees, so that they can determine employees who are in accordance with the quality and quantity of human resources needed and as a basis for making decisions. become a permanent employee.

Keywords: Decision Making System, SMART, Employees, Factors, Criteria.

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1. Introduction

Human resources in a company organization are very important to support the company's progress and quality in achieving its goals. Determining permanent employees is a very important factor for contract employees in a company. Employee performance appraisal is a way to knowing the abilities of each employee, an assessment is carried out to obtain materials for developing the company's human resources. Employee job appraisal is a formal, structured system that measures, assesses, and influences work-related traits, behavior, and results, including absenteeism. The focus is to find out how productive an employee is and whether he or she can perform equally or more effectively in the future. Performance appraisals must be carried out fairly, validly and relevant to the work being done[1] [2]

The process of appointing contract employees to permanent positions is still not effective, this results in doubt in decision making which allows errors to occur. The employees selected are sometimes far from what is expected because the employees do not have the appropriate criteria. The criteria set by the company include: Length of work, Education, Experience, Attendance, Appearance, Communication, Manners, Quick thinking, Self-confidence[3]

The concept of a Decision Support System (DSS) was first expressed in the early 1970s by Michael S. Scott Morton with the term Management Decision System. The term SPK refers to a system that utilizes computer support in the decision making process [4][5][6]. A Decision Support System is a system intended to support managerial decision makers in semi-structured decision situations. The DSS is intended to be a tool for decision makers to expand their capabilities, but not to replace their judgment[7]

Decision Support Systems are designed to assist decision makers in solving semi-structured or unstructured problems by adding human wisdom and computerized information. In the processing process, the decision support system combines the use of analytical models with conventional data entry techniques and information search/interrogation functions. Decision Support Systems are designed in such a way that they can be used or operated easily. Decision Support Systems are designed with emphasis on aspects of flexibility and high adaptability [8][9]

One method that can be used in decision making, namely the SMART (*Simple Multi Attribute Rating Technique*) method, is based on the concept that a good selected alternative not only has the shortest distance from the positive ideal solution but also has the longest distance from the negative ideal solution

[10][11]. The concept is simple and easy to understand, computationally efficient, and has the ability to measure the relative performance of decision alternatives in a simple mathematical form [12][13]. *Simple Multi Attribute Rating Technique* (SMART) is a multi-criteria decision making technique that compares one criterion with another [14][15]. SMART is a decision making system that has many criteria. The SMART method uses many criteria to make decisions based on each alternative. Each criterion has a value. Each criterion has a weight that is described by other criteria[16].

By building a decision support information system application using the *Simple Multi Attribute Rating Technique* (SMART) method, it is hoped that it will be able to help the Ibnu Sina Islamic Hospital, West Pasaman, in managing the data or criteria used in determining the status of contract employees, so that they can determine employees who are in accordance with the quality. and the quantity of human resources needed and as a basis for making decisions on whether to become a permanent employee. From the explanation of the information above, the author raises the research title: "Implementation of a Decision Support System Using the SMART Method in Determining the Status of Contract Employees to Permanent Employees at Ibnu Sina Islamic Hospital, West Pasaman

Implementing employee recruitment is very important in finding and obtaining quality and professional human resources. Currently the level of competition in every company is very tight, this also encourages competition in managing human resources, especially in employee recruitment and selection

2. Research methodology

So that the steps taken by the author in this research do not deviate from the main discussion and are easier to understand, the sequence of steps will be made systematically so that they can be used as clear and easy guidelines for solving existing problems. The sequence of steps that will be carried out in this research can be seen in Figure 3.1 below:

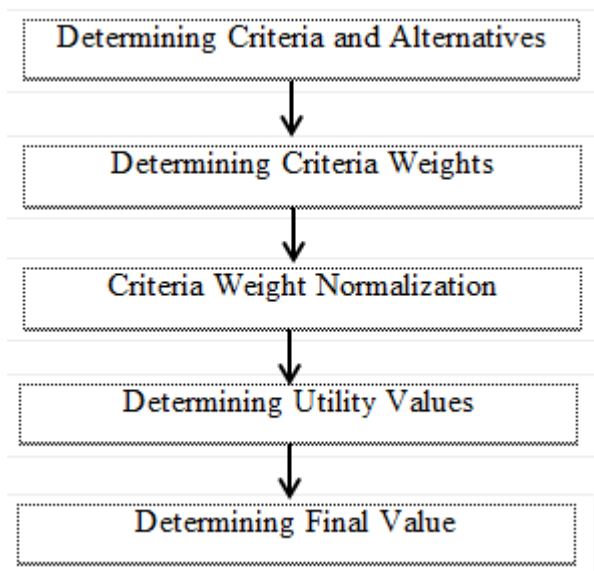


Figure 1. Research Framework

SMART Method Calculation Steps The steps taken in formulating the SMART method in general are as follows[17]:

1. Determine the criteria for alternatives. Determine the criteria used in solving decision-making problems. Data from decision makers is needed in determining the criteria to be used.
2. Determine the weight of the criteria. Give weight to each criterion with an interval of 0-100 for each criterion depending on the priority of the criterion.
3. Normalization of criteria weights Calculate the normalization of weights for each criterion by comparing the weight values of the criteria with the criteria using equation (1)

$$w_i = \frac{w_i}{\sum_{j=1}^m w_j} \quad (1)$$

Where w_i = normalized criteria weight for the i th criterion w ' i = weight of the i th criterion w_j = weight of the j th criterion $j = 1, 2, 3, \dots, m$ number of criteria

4. Determine the utility value. Determine the utility value by converting the criterion value for each criterion into a standard data criterion value . The utility value depends on the nature of the criteria

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

Where $u_i(a_i)$: utility value of the 1st criterion for the 1st criterion , C_{max} : maximum criteria value , C_{min} : minimum criteria value , and $C_{out\ i}$: i -th criterion value

5. Determine the final value by multiplying the value obtained from the normalization of the standard data criteria values by the normalized value of the

criteria weights. Then, add up the values of the multipliers.

$$u(a_i) = \sum_{j=1}^m w_j \cdot u_j(a_i) \quad (3)$$

Where : (a_i)=total value for the i th alternative w_j = normalized weight value of the j th criterion $u_j(a_i)$ = utility value of the j th criterion for the i th alternative

3. Results and Discussion

Data analysis

Table 1. Criteria Factor Data

Factor Name	Factor Weights	Information
Loyalty	20	Factors based on progress or what employees have given to the company
Discipline	30	Factors based on employee compliance and absenteeism
Performance	50	Factors based on the suitability of the employee's work to the work procedures provided

The table above explains the factors assessed in the employee assessment process along with the relative weight or weight of each factor. First, the loyalty factor has a weight of 20. Loyalty is measured based on employee contributions to the company's progress and contributions made in the context of their work. The second factor is discipline, which has a weight of 30. This factor evaluates the level of compliance and punctuality as well as employee absenteeism in carrying out their duties. Finally, the performance factor has the highest weight, namely 50. Performance is assessed based on how well employees adapt their work to established work procedures and the extent to which they achieve or exceed expected standards. This assessment helps in determining the contribution of each factor to the employee's overall evaluation and decision making regarding promotions, awards, or employment status such as permanent or contract employees. Determine the factors used as a reference in decision making and their weights.

Table 2. Criteria Factor Weights

No	Criterion Factor Name	Weight (w_j)	Normalization ($w_i = \frac{w_j}{\sum w_j}$)
1	C1 Loyalty	20	0.2
2	C2 Discipline	30	0.3
3	C3 Performance	50	0.5

The table provided is a table that describes the employee assessment factors along with the criteria used, the relative weight of each factor, and the normalized value of the weight. There are three factors assessed in employee appraisal, each of which has a different relative weight. First, factor C1, which is

loyalty, has a weight of 20. This factor describes how much contribution and loyalty employees have to the company, as well as the positive impact they have on the company's progress. The normalized weight for the loyalty factor is 0.2, which is calculated as the result of the factor's weight (20) divided by the total weight of all factors (100).

Then, factor C2 is discipline, with a weight of 30. This factor emphasizes employee compliance with regulations, punctual attendance, and discipline in carrying out duties. The normalized weight for discipline is 0.3, which is also calculated by dividing the discipline factor weight (30) by the total weight (100).

Finally, factor C3 is performance, which has the highest weight, namely 50. This factor measures the extent to which employees have succeeded in achieving or exceeding the performance targets set by the company, as well as how well they adapt their work to existing work procedures. The normalized weight for the performance factor is 0.5, which is calculated by dividing the performance factor weight (50) by the total weight (100).

After weighting, each employee who will be selected will be given a recommendation score as follows :

Table 3. Recommendation Results

No	Information	Mark
1	Still	≥ 80
2	Contract	≤ 79

After weighting and giving values for each criterion, alternative data is obtained for each employee who will be selected and will be evaluated as below :

Table 4. Initial Data

Factor	Loyalty	Discipline	Performance
Employee 1	Not enough	Enough	No
Employee 2	Enough	Reasonable	Enough
Employee 3	Not enough	Enough	No
Employee 4	No	No	Reasonable
Employee 5	No	Not enough	Very
Employee 6	No	Enough	Very
Employee 7	Enough	Reasonable	No
Employee 8	No	Enough	Not enough
Employee 9	No	Not enough	Not enough
Employee 10	Reasonable	No	Very
Employee 11	Reasonable	Not enough	Enough
Employee 12	Reasonable	Reasonable	Not enough

Utility value $u_i(a_i)$ is the result of calculating the weights of factors (C1, C2, and C3) on employee values. This score provides a composite picture of how well an employee is performing based on the factors measured. Employees with high utility scores tend to be good candidates for promotions or recognition for their good performance, while employees with lower utility scores may require further coaching or development to improve performance. The utility value is needed when

ranking each alternative, so that it can be seen which alternative is worthy or not worthy of being chosen.

Tabel 5 Utility Value Results for Each Alternative

A	C1	C2	C3	$u_i(a_i)$ C1	$u_i(a_i)$ C2	$u_i(a_i)$ C3
A1	70	80	60	30	20	40
A2	80	90	80	20	10	20
A3	70	80	60	30	20	40
A4	60	60	90	40	40	10
A5	60	70	100	40	30	0
A6	60	80	100	40	20	0
A7	80	90	60	20	10	40
A8	60	80	70	40	20	30
A9	60	70	70	40	30	30
A10	90	60	100	10	40	0
A11	90	70	80	10	30	20
A12	90	90	70	10	10	30

For final calculation of utility value $u_i(a_i)$ From each alternative, the overall utility value obtained is as follows:

$A1 = 32$
 $A2 = 17$
 $A3 = 32$
 $A4 = 25$
 $A5 = 17$
 $A6 = 14$
 $A7 = 27$
 $A8 = 29$
 $A9 = 32$
 $A10 = 14$
 $A11 = 21$
 $A12 = 20$

Final determination of Max – U (ai) assessment results:

$A1 = 100 - 32 = 68$
 $A2 = 100 - 17 = 83$
 $A3 = 100 - 32 = 68$
 $A4 = 100 - 25 = 75$
 $A5 = 100 - 17 = 83$
 $A6 = 100 - 14 = 86$
 $A7 = 100 - 27 = 73$
 $A8 = 100 - 29 = 71$
 $A9 = 100 - 32 = 68$
 $A10 = 100 - 14 = 86$
 $A11 = 100 - 21 = 79$
 $A12 = 100 - 20 = 80$

Candidates for permanent employees who are declared eligible are candidates who have the highest to lowest final scores. In accordance with the case above, the highest value is given priority by determining the eligibility limit value ≥ 80 . In determining eligibility for the selection of permanent employees at the Ibnu Sina Islamic Hospital, West Pasaman, the author has determined at the beginning the weight for the loyalty criteria factor of 20 percent, the factor Discipline criteria are 30 percent and performance criteria factors are 50 percent.

The performance criteria factor is superior because this factor is more influential, because this factor has many considerations compared to other factors. Starting from whether the performance is in accordance with the job desk, skills in solving problems, speed in completing work, to whether the employee is able to maintain the good name of the company. Based on the final scores above, the following are the results:

Table 6. Decision Results

Code	Alternative	Final score	Decision
A6	Employee 6	86	Still
A10	Employees10	86	Still
A2	Employee 2	83	Still
A5	Employee 5	83	Still
A12	Employees 12	80	Still
A11	Employees 11	79	Contract
A4	Employee 4	75	Contract
A7	Employees 7	73	Contract
A8	Employee 8	71	Contract
A1	Employee 1	68	Contract
A3	Employee 3	68	Contract
A9	Employee 9	68	Contract

The table above explains a number of employees along with their final grades and the status of decisions regarding their appointment as permanent or contract employees. Registered employees have a unique identification code ranging from A1 to A12, with a final grade reflecting the results of their performance appraisal. Employees with the highest final score, namely 86, including Employee 6 and Employee 10, as well as Employee 2 and Employee 5, were all appointed as permanent employees. Meanwhile, employees with final scores below, such as Employee 11 with a score of 79, and Employees 4 to Employee 9 with scores between 68 and 75, their status is still under contract. The decision to assign employee status is based on performance evaluation criteria established by the company, which may involve factors such as goal achievement, competency, and individual performance assessment.

System Testing

System testing aims to run and describe the system that has been tested until completion. Testing of the system is carried out to determine the extent to which the system that has been designed can overcome existing problems, and to determine the relationship between system components. By testing this application, it can provide information in making a decision support system that is not perfect, with this testing it can explain the usefulness of application performance in a decision support system.



Figure 2 . System Home Page

On this page the admin can see the home display of the Decision Support System Application for Determining Employee Status at the Ibnu Sina Islamic Hospital, West Pasaman. Next, design the criteria input page as in Figure 3 .

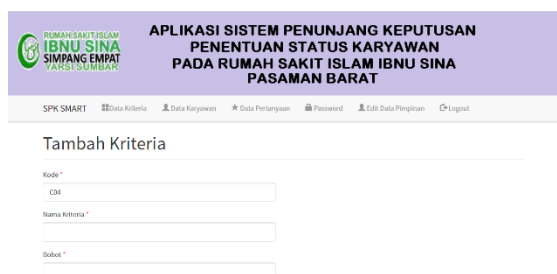


Figure 3 . Criteria Input Page

Admin adds data on employees who will be selected to become permanent employees, as shown in Figure 4 .

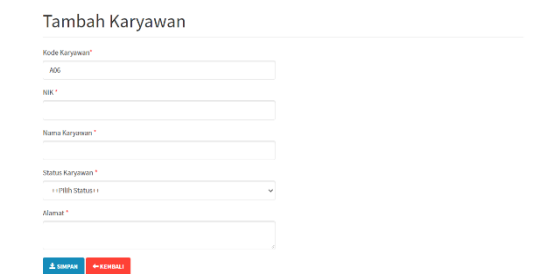


Figure 4 . Employee Input Page

Admin adds questions that will be used as a reference for assessment by the leadership which will later be shaped like a questionnaire.



Figure 5 . Question Input Page

The leader will complete the assessment on the questionnaire page that has been designed.

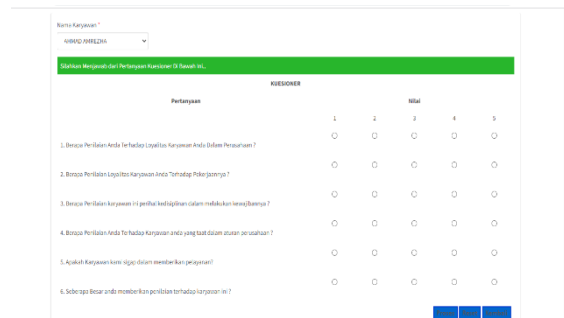


Figure 6 . Employee Assessment Questionnaire

After providing criteria and assessments for all employees, the final results of the decision support system are calculated as in Figure 7 .

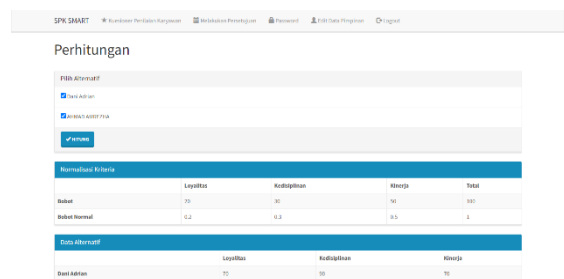


Figure 7 . Results of the Decision on the Eligibility of Recruiting Permanent Employees

4. Conclusion

This application has proven to be able to make it easier for related parties to carry out the process of determining the status of contract employees to permanent employees using the Simple Multi Attribute Rating Technique method. With supporting factors in the form of position, loyalty, discipline, performance, utility and status. The decision support system application has proven capable of determining the status of contract employees as permanent employees at Ibnu Sina Islamic Hospital, West Pasaman quickly and in real time. By using the Simple Multi Attribute Rating Technique method, the final result of the calculation is in the form of employee status which determines the status of contract employees from becoming permanent employees.

References

- [1] Septiana, S., Wicaksono, R. N., Saputri, A. W., Fawwazillah, N. A., & Anshori, M. I. (2023). Meningkatkan kompetensi sumber daya manusia untuk masa yang mendatang. Student Research Journal, 1(5), 446-466. <https://doi.org/10.55606/srjyappi.v1i5.705>
- [2] Lumunon, R. R., Sendow, G. M., & Uhing, Y. (2019).

- Pengaruh work life balance, kesehatan kerja dan beban kerja terhadap kepuasan kerja karyawan PT. Tirta Investama (Danone) Aqua Airmadidi. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, 7(4). <https://doi.org/10.35794/emba.7.4.2019.25410>
- [3] Sambani, E.B., & Nugraha, F. (2018). Sistem Pendukung Keputusan Untuk Menentukan Status Karyawan Kontrak Menjadi Karyawan Tetap Menggunakan Metode SMART, 2(7), 116–123
- [4] Damanik, S., & Utomo, D. P. (2020). Implementasi Metode ROC (Rank Order Centroid) Dan Waspas Dalam Sistem Pendukung Keputusan Pemilihan Kerjasama Vendor. *KOMIK (Konferensi Nasional Teknologi Informasi dan Komputer)*, 4(1). <http://dx.doi.org/10.30865/komik.v4i1.2690>
- [5] Djamain, Y. (2015). Sistem pendukung keputusan penerimaan pegawai baru pt. pln (persero) kantor pusat dengan menggunakan metode simple additive weighting (saw). *Jurnal Teknik Informatika*, 8(1). <https://doi.org/10.15408/jti.v8i1.1935>
- [6] Permana, S. D. H. (2015). Sistem penunjang keputusan pemilihan sekolah menengah kejuruan teknik komputer dan jaringan yang terfavorit dengan menggunakan multi-criteria decision making. *Jurnal Teknologi Informasi dan Ilmu Komputer*, 2(1), 11-19. <https://doi.org/10.25126/jtiik.201521123>
- [7] Ulama, E. K., Priandika, A. T., & Ariany, F. (2022). Sistem Pendukung Keputusan Pemilihan Sapi Siap Jual (Ternak Sapi Lembu Jaya Lestari Lampung Tengah) Menggunakan Metode Saw. *Jurnal Informatika dan Rekayasa Perangkat Lunak*, 3(2), 138-144. <https://doi.org/10.33365/jatika.v3i2.2022>
- [8] Asnal, H., Fitri, T. A., & Anam, M. K. (2020). Sistem Pendukung Keputusan Penunjukan Supplier Pengadaan Perangkat Kesehatan Pada Instalasi Farmasi RSUD Arifin Achmad Pekanbaru Dengan Metode Multifactor Evaluation Process. *SATIN-Sains Dan Teknologi Informasi*, 6(1), 98-105. <https://doi.org/10.33372/stn.v6i1.618>
- [9] Nagara, E. S., & Nurhayati, R. (2021). Sistem Pendukung Keputusan Penentuan Hama Padi Menggunakan PHP. *Jurnal TAM (Technology Acceptance Model)*, 4, 1-12. <https://doi.org/10.56327/jurnaltam.v4i0.31>
- [10] Sabir, F. M., Mashud, M., Halid, A., Asrul, A., & Rumallang, R. (2024). Penerapan Metode Multi Criteria Decision Making Sebagai Sistem Penunjang Keputusan Promosi Jabatan Karyawan Di PT. Fastfood Indonesia Tbk. *Jurnal Minfo Polgan*, 13(1), 150-163. <https://doi.org/10.33395/jmp.v13i1.13500>
- [11] Sofyan, H. S. H., Sany, Y. N., & Yudha, H. S. (2023). Pemilihan Supplier Material Baja untuk Proyek Tower Menggunakan Metode Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) di PT. XSF. *Jurnal Teknologika*, 13(2), 170-178. <https://doi.org/10.51132/teknologika.v13i2.278>
- [12] Sianturi, F. A., & Hasugian, P. M. (2017). Sistem Pendukung Keputusan Penentuan Kelayakan Perkreditan Anggota Koperasi (Studi Kasus Pada Koperasi Kozero). *Jurnal Teknik Informatika UNIKA Santo Thomas*, 88-100. <https://doi.org/10.17605/jti.v2i1.47>
- [13] Iriane, G. R., Ernawati, E., & Wisnubhadra, I. (2015, July). Analisis penggabungan metode saw dan metode topsi untuk mendukung keputusan seleksi penerimaan dosen. In *Seminar Nasional Informatika (SEMNASIF) (Vol. 1, No. 4)*.
- [14] Saputra, A. Y., & Mawartika, Y. E. (2019). Sistem Pendukung Keputusan Dalam Memilih Perumahan Dengan Metode Simple Multi Attribute Rating Technique. *Cogito Smart Journal*, 5(1), 35-44.
- [15] Maulana, R., Suryani, N., & Buani, D. C. P. (2021). Sistem Pendukung Keputusan Pemilihan Alat Kontrasepsi Terbaik Metode SMART (Simple Multi Attribute Rating Technique) Bagi Keluarga Berencana. *EVOLUSI: Jurnal Sains dan Manajemen*, 9(1). <https://doi.org/10.31294/evolusi.v9i1.9940>
- [16] Tanti, W. O., Lokapitasari, P. L., & Hayati, L. N. (2022). Sistem Pendukung Keputusan Penentuan Program Studi Perguruan Tinggi Menggunakan Metode SMART Berbasis Web. *Buletin Sistem Informasi dan Teknologi Islam (BUSITI)*, 3(2), 106-112.
- [17] Putranto, I. D., & Maulina, D. (2023). Sistem Pendukung Keputusan Dengan Metode SMART Untuk Menentukan Guru Terbaik. *Journal Automation Computer Information System*, 3(2), 92-102. <https://doi.org/10.47134/jacis.v3i2.61>