Implementation of the Simple Multi-Attribute Rating Technique (SMART) for Decision Making on the Selection of the Best Prospective Employee

Mihuandayani[1]*, Rida P. Sanggilalung[2] , Supit Mamuaya[3] iD

[1,2,3]Department of Information System, Sekolah Tinggi Manajemen Informatika dan Komputer Multicom Bolaang Mongondow, Kotamobagu, Indonesia
*Corresponding author: mihuandayani20@gmail.com

Abstrak

Manajemen sumber daya manusia merupakan bagian penting dari perusahaan, hal ini dapat mempengaruhi keberhasilan perusahaan. Dalam proses seleksi karyawan baru di perusahaan sering terjadi beberapa permasalahan seperti waktu yang tidak efektif, perusahaan masih memilah berkas calon karyawan secara konvensional kemudian membandingkannya dengan berkas lain untuk penilaian, sehingga membutuhkan waktu yang lama karena banyaknya pelamar yang melamar dengan kualitas yang berbeda. Selain itu, dapat terjadi subjektivitas data dari hasil penilaian calon pegawai karena alasan tertentu seperti memiliki kedekatan emosional dengan pemangku kepentingan. Untuk menangani permasalahan tersebut diperlukan suatu sistem seperti Sistem Pendukung Keputusan (SPK). Penelitian ini mengusulkan pendekatan Simple Multi-Attribute Rating Technique (SMART) dalam mengevaluasi calon karyawan. Ada lima kriteria yang digunakan dalam penelitian ini, yaitu tes tertulis, wawancara, pendidikan, sertifikat penghargaan, dan pengalaman kerja. Sistem pendukung keputusan ini dapat membantu pemangku kepentingan khususnya pimpinan cabang perusahaan untuk menentukan calon karyawan terbaik dengan hasil yang akurat dan objektif. Dalam penelitian ini juga dilakukan perbandingan metode SMART dengan sistem manual yang memperoleh tingkat akurasi 91,33% dengan metode yang diusulkan. Metode SMART dapat menjadi pilihan efektif dan andal untuk memilih calon karyawan, karena dapat meminimalkan kesalahan dan meningkakan efisiensi rekrutmen, sehingga berdampak positif pada produktivitas perusahaan dan kinerja karyawan.

Kata kunci: Seleksi, Sistem pendukung keputusan, SMART, pegawai.

Abstract

Human resource management is the important part of the company, it can affect the success of the company. In the process of selecting new employees at the company, several problems often occur such as ineffective time, the company still sorts out the prospective employee files conventionally and then compared them with other files for assessment, so it took a long time because there are many applicants who apply with different quality. In addition, there can be subjectivity to the data from the assessment results of prospective employees for certain reasons such as having emotional closeness with stakeholders. It needed a system to handle these problems such as Decision Support System (DSS). This study proposed the Simple Multi-Attribute Rating Technique (SMART) approach in evaluating prospective employees. There are five criteria used in this study, namely written tests, interviews, education, award certificates, and work experience. This decision support system can help stakeholders, especially the head of the company's branches, to determine the best candidate for employees with accurate and objective results. In this research, a comparison was also made between the SMART method and a manual system, which obtained an accuracy rate of 91.33% with the proposed method. The SMART method can be an effective and reliable option for selecting job candidates, as it can minimize errors and improve recruitment efficiency, thereby positively impacting company productivity and employee performance.

Keywords: Selection, Decision support system, SMART, employee

1. INTRODUCTION

As businesses strive to achieve their objectives and remain competitive in their respective industries, the integration of human resource management with overall business strategy has become increasingly important. Through a business strategy that is integrated with human resource management, it can assist the company in achieving its goals (Armstrong & Taylor, 2020; Chakraborty & Biswas, 2019). Developing a company needs to notice the importance of the quality of its resources. The recruitment and selection process are the initial stage of human resource management. This process needs to be done properly

to ensure that the job position in the company has quality resources. In terms of hiring, many prospective employees proposed by providing all the required documents, and they were tested in writing and interviewed. Several companies in various regions especially Indonesia often have problems with new employees. In most companies, new employees only last a short time. The reason usually occurs because of a mistake of hiring employees. After working, it turns out that the employee does not have the skills or criteria that match the company's needs. This problem also occurs in companies in the field of consumer financing services in Kotamobagu. This company provides loan financing services, new and used vehicle loan services for credit applicants and takes advantage of credit interest payments. The recruitment and selection process for new employees at the company is determined directly by the Branch Head and is still carried out conventionally by sorting applicant files and then comparing them with other files. It will take a lot of time to assess because many applicants applied with different qualities. In addition, there can also be subjective assessment in terms of manipulating applicant data, due to emotional closeness such as family or close relatives of stakeholders. The reduced quality of the selected employee candidates can be caused by the subjective selection phase.

Making decisions is a critical aspect of any organization, and it requires a systematic approach to ensure that the best possible solution is reached. A model of human reasoning in making decisions can use a Decision Support System (DSS), so the created facts can produce solutions by experts (Assaad & El-adaway, 2020; Mahdi et al., 2022). Usually, there are many criteria in each alternative which are difficult to find a solution in decision making, so an analytical tool is needed (Sun et al., 2020; Tafreshi et al., 2016). In various studies, many companies have used DSS to determine the best prospective employees using various methods such as in previous research which used method of the Multi-Attribute Utility Theory (MAUT) (Setyawan et al., 2017; Umar & Sahara, 2022). Another method that can be used in decision making is the Simple Multi-Attribute Rating Technique (SMART). In this method, the principles of multi-attribute utility theory are applied in a simple way (Gupta et al., 2022; Shi et al., 2015). The basis for making the decision is that each criterion has an important weight that is compared to each other to get the best alternative. This method does not need an assessment of preference or unimportance between hypothetical alternatives, so that in decision making it rejects the elicitation process.

Many studies discuss the use of the SMART method in determining employee performance appraisals at universities so that employee evaluations can be more effective and less subjective. In determining the results, the study used six criteria such as integrity, cooperation, leadership, service orientation, commitment, and discipline. The research can produce employee recommendations to support decision-making by management and university leaders (Hwang et al., 2017; Putra & Ali, 2022). Other study also discusses about decision making system, especially in the evaluation of the best performance of employees who have many criteria with the SMART approach. This is done to make decisions more credible, structured, transparent, and systematic. Assessments are carried out by various parties by implementing a 360-degree feedback system (Tambunan et al., 2021; Tee & Ahmed, 2014).

The SMART method is also used to support decisions in the computer engineering courses of concentration at a university. The SMART is a simple approach and each alternative is independent so it does not affect the weights. The criteria for determining majors include two criteria, namely academic value and student interest (Hasibuan et al., 2022; Jahir et al., 2019). Another study used the SMART method for e-marketplace selection. Seven criteria are used in this research. The results show that the biggest factor in the loyalty of women entrepreneurs in online sales is market service (Suharto et al., 2022; Wirapraja et al., 2021). Other studies also discuss the use of the SMART method to rank efficient satellite

system vendors. This decision-making process involves many stakeholders. There are twelve criteria used in this study. The SMART method can increase the transparency of decisions in complex decision-making processes (Ginting et al., 2023; Troisi et al., 2021). Another research uses the SMART method to determine the level of drug addicts according to their class. The results of this study are 75.37% of the comparison test of real data and SMART application data. There are five criteria used and the most influential criterion is the frequency of drug use (Hasanah & Ramdhan, 2022; Hasin et al., 2013).

Other studies also combine several methods in decision making. For example, a study was conducted to select cocoa bean plantations that have the best quality using the Forward Chaining and SMART method. The research was conducted using two methods and five criteria. This study resulted the possibility to select the correct cocoa beans of good quality for health because chocolate is rich in antioxidants and contains flavonoid phenols which can increase immunity (Fathurrozi et al., 2022; Sihombing et al., 2019). Another study evaluates students' academic performance using the Multi-Objective Optimization by Ratio Analysis and SMART approach with ten criteria resulting from entropy and gain. The results of the application of this method produce an accuracy of 60.9 percent (Castro-Lopez et al., 2022; Naveed et al., 2020). Combination of the Analytical Hierarchy Process (AHP) and SMART approach is used to determine endemic areas of dengue fever. The criteria used are humidity, air temperature, rainfall, population density, and wind speed. The results of this study get an alternative ranking order with the highest weight of 0.572. DBD endemic areas is determined by the humidity criteria as the highest weight (Inayah et al., 2021; Prasetiyowati, 2022). The use of AHP and SMART is used to select the best lecturers at a university with twelve criteria and produces an accuracy of 78.20% (Castelló-Sirvent & Meneses-Eraso, 2022; Inayah et al., 2021).

Making informed decisions is crucial for the success of any organization, and there are various approaches that can be used to support this process. One such approach is the SMART method. The SMART method in decision making is also widely used in various studies such as previous research which states that the SMART method can help decision-makers simply and effectively (Hasibuan et al., 2022; Hwang et al., 2017; Tambunan et al., 2021). Each alternative assessment is independent, so if an alternative is added or subtracted it will not affect the calculated weight. This research help to facilitate the head of branch companies in making decisions using the SMART method. In evaluation, this study compares the manual calculation data that has been carried out by the company with the data calculated using SMART. The evaluation process calculated the level of accuracy of SMART in determining the best alternative from the five criteria accurately and effectively.

2. METHODS

The research design for a study on decision support system using SMART method for selecting employees may use a mixed-methods approach, involving both qualitative and quantitative data collection techniques. The study may involve HR managers or recruiters as participants, and the sample size may vary based on the organization's size and the number of HR managers or recruiters involved in the study. The research question may be: What is the effectiveness of a decision support system that uses the SMART method for selecting job candidates? The study may use hypothesis testing to compare the effectiveness of the decision support system with traditional methods of selecting employees. The study may begin with a review of the existing literature on the SMART method for decision making and its application in employee selection. The research may then proceed to data collection. Sources of data from leasing companies in Kotamobagu obtained through the interview with experts and documentation. Experts in this study are people who have the main task in the

process of selecting new employees at PT. Indomobil Finance Indonesia (IMFI) Kotamobagu. Two methods of data collection were used, namely interviews and documentation. Interviews with the head of the company's branch as a decision-maker to determine the criteria and weights that have been set by the company and to find out how the employee selection process at PT. IMFI Kotamobagu. The instruments used in the study such as interview guides which included open-ended questions on the experiences of the expert or recruiters with the system, challenges encountered, and suggestions for improvement. Meanwhile, in the documentation, data were searched by looking for references from various sources and studying the theory of decision support systems. The study uses 25 data, namely 15 data in the 2019 selection and 10 data in the 2020 selection. Data analysis techniques may include statistical analysis of the accuracy and efficiency of the SMART method compared to traditional methods, as well as qualitative analysis of the feedback and experiences of decision-makers and job candidates who participated in the selection process.

In this research used the system development Waterfall model. This method is carried out with a systematic and sequential approach, each step must be completed one by one (Royce, 1987). The communication phase is used to find out the issues and processes of selection to be able to perform a functional system requirements analysis. Then the planning phase is carried out by the development team to make a schedule and estimate until the activity is completed. The modeling phase is carried out to design data modeling using Entity-Relationship Diagram (ERD), the modeling process with Data Flow Diagram (DFD), and design the interface. The next phase is the system construction based on SMART approach, where we build the program and perform the system testing. Then, if the results have adjusted to the needs, the deployment phase is carried out which consists of a delivery system, support, and feedback. SMART is a multi-criteria decision-making approach where each alternative has many criteria and there is an important weight of each criterion so that the best alternative can be found. There are eight stages of using SMART (Goodwin & Wright, 2004), namely: (a) Determine the alternatives used in making the best decisions; (b) Determine the number of criteria used; (c) Give a weight value for each criterion. In this study, the value interval is 1-100; (d) Calculating the normalization of the criteria weights with equation (1).

$$\frac{w_j}{\sum w_j} \quad (1)$$

W_j is the value of the weight of the criteria and $\sum W_j$ is the total weight of the criteria; (e) Provide criteria parameter values in the form of quantitative data (number) and qualitative data (text); (f) Determine the utility value on each criterion for the category of costs and benefits. The cost category is calculated by the formula (2).

$$u_{i(a_i)} = \frac{(c_{max} - c_{out})}{(c_{max} - c_{min})} \quad (2)$$

While the criteria for the *benefit* category are calculated by Equation (3).

$$u_{i(a_i)} = \frac{(c_{out} - c_{min})}{(c_{max} - c_{min})} \quad (3)$$

Where $ui(ai)$ is the result of the utility value, $Cmax$ and $Cmin$ are the maximum and minimum values of the criteria, while $Cout$ is i value of the criteria; (g) Determine the final value of each criterion by using equation (4).

$$u_{(a_i)} = \sum_{j=1}^{m} w_j u_i(a_i)$$

(4)

Where $u(ai)$ is the total alternative value, Wj is the value of the normalized weight, and $ui(ai)$ is the result of the utility value; (h) Sort the final scores from largest to smallest to get the best alternative.

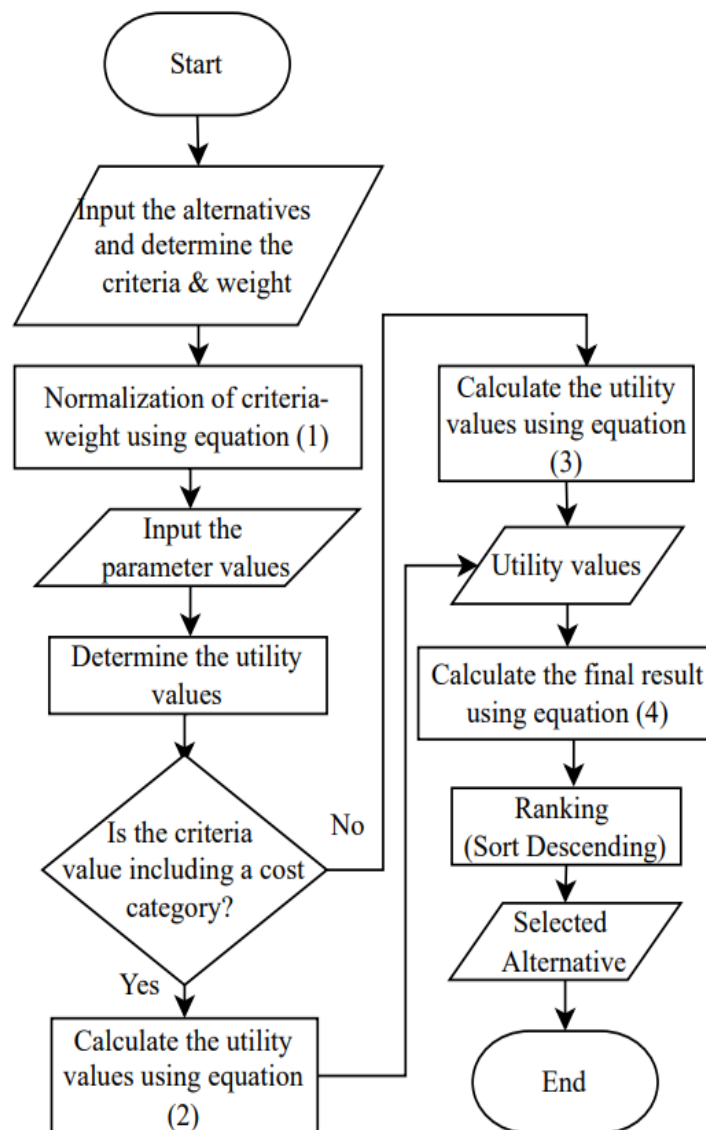The phase of SMART approach can be seen in Figure 1.

Figure 1. The phase of SMART approach.

3. RESULTS AND DISCUSSION

Result

The selection process of the prospective employee in PT. IMFI Kotamobagu has five criteria in Table 1.

Table 1. Criteria with the weight

Code	Criteria	Weight
C01	Writing Test	15%
C02	Interview	40%
C03	Education	20%
C04	Award Certificate	5%
C05	Working Experience	20%
Total		**100%**

In Table 1, there are five criteria obtained from interviews with the head of the company's branch. Each criterion has a different weight value. The criteria and weights are based on company regulations. The writing test is used to see the applicant's analogy ability and knowledge. Interview are used to explore self-potential in work. Education, award certificates, and working experience are included in administrative tests to determine the background of prospective employees.

Table 2. Normalization

Code	Criteria	Weight	Normalization
C01	Writing Test	15%	15/100=0.15
C02	Interview	40%	40/100=0.40
C03	Education	20%	20/100=0.20
C04	Award Certificate	5%	5/100=0.05
C05	Working Experience	20%	20/100=0.20
Total		**100%**	**1.00**

The normalization results in Table 2 are obtained from calculations with equation (1).

Table 3. Parameter values for each criterion & alternatives

Alternative	C01	C02	C03	C04	C05
2019					
AL01	1	2	1	2	1
AL02	3	2	2	3	3
AL03	3	3	3	3	3
AL04	2	2	2	3	1
AL05	3	2	3	2	2
AL06	3	3	2	2	2
AL07	3	2	2	2	1
AL08	3	3	2	3	3
AL09	2	2	3	2	2
AL10	2	2	1	1	1
AL11	2	2	3	3	3
AL12	3	2	2	1	1
AL13	3	3	3	2	3

Alternative	C01	C02	C03	C04	C05
AL14	1	2	1	1	3
AL15	2	2	2	2	2
2020					
AL01	3	2	3	2	3
AL02	2	2	2	1	1
AL03	1	2	3	2	2
AL04	2	3	3	3	3
AL05	1	3	2	2	2
AL06	2	2	3	2	3
AL07	1	1	3	2	2
AL08	1	2	1	1	1
AL09	2	2	3	3	3
AL10	3	2	3	3	3

In Table 3, parameter values are given for each criterion in each alternative. In the 2019 selection there were 15 alternatives and in 2020 there were 10 alternatives. There are five criteria, each of which has a parameter value whose assessment has been determined by the company. C01 has a value range of 1-3, namely answering questions > 90% correct = 3, answering questions > 50% correct = 2, and answering questions < 50% correct = 1. For C02 it is also the same, namely very good = 3, good = 2, and enough = 1. C03 that is S1 = 3, D1-D3 = 2, and SMA/SMK = 1. C04 that is > 2 = 3, 2 = 2, and at least 1 = 1. While C05, another office = 3, had internship = 2, and no working experience = 1.

Table 4. Determination of utility value

Alternative	C01	C02	C03	C04	C05
2019					
AL01	0.0	0.0	0.0	0.5	0.0
AL02	1.0	0.0	0.5	1.0	1.0
AL03	1.0	1.0	1.0	1.0	1.0
AL04	0.5	0.0	0.5	1.0	0.0
AL05	1.0	0.0	1.0	0.5	0.5
AL06	1.0	1.0	0.5	0.5	0.5
AL07	1.0	0.0	0.5	0.5	0.0
AL08	1.0	1.0	0.5	1.0	1.0
AL09	0.5	0.0	1.0	0.5	0.5
AL10	0.5	0.0	0.5	0.5	0.0
AL11	0.5	0.0	1.0	1.0	1.0
AL12	1.0	0.0	0.5	0.0	0.0
AL13	1.0	1.0	1.0	0.5	1.0
AL14	0.0	0.0	0.0	0.5	1.0
AL15	0.5	0.0	0.5	0.5	0.5
2020					
AL01	1.0	0.5	1.0	0.5	1.0
AL02	0.5	0.5	0.5	0.0	0.0
AL03	0.5	0.5	1.0	0.5	0.5
AL04	0.5	1.0	1.0	1.0	1.0
AL05	0.0	1.0	0.5	0.5	0.5
AL06	0.5	0.5	1.0	0.5	1.0

Alternative	C01	C02	C03	C04	C05
AL07	0.0	0.0	1.0	0.5	0.5
AL08	0.0	0.5	0.0	0.0	0.5
AL09	0.5	0.5	1.0	1.0	1.0
AL10	1.0	0.5	1.0	1.0	1.0

In Table 4, the utility value is calculated using equation (3) as a benefit category.

Table 5. Final result calculation

Alternative	Calculation
2019	
AL01	0.03
AL02	0.50
AL03	1.00
AL04	0.23
AL05	0.48
AL06	0.78
AL07	0.28
AL08	0.90
AL09	0.40
AL10	0.08
AL11	0.53
AL12	0.25
AL13	0.98
AL14	0.20
AL15	0.30
2020	
AL01	0.78
AL02	0.38
AL03	0.53
AL04	0.93
AL05	0.63
AL06	0.70
AL07	0.33
AL08	0.20
AL09	0.73
AL10	0.80

In Table 5, the process of calculating the final result is carried out by equation (4).

Table 6. Ranking

Alternative	Value	Status
2019		
AL03	1.00	Succeed
AL13	0.98	Failed
AL08	0.90	Failed
AL06	0.78	Failed
AL11	0.53	Failed
AL02	0.50	Failed
AL05	0.48	Failed

Alternative	Value	Status
AL09	0.40	Failed
AL15	0.30	Failed
AL07	0.28	Failed
AL12	0.25	Failed
AL04	0.23	Failed
AL14	0.20	Failed
AL10	0.08	Failed
AL01	0.03	Failed
2020		
AL04	0.93	Succeed
AL10	0.80	Failed
AL01	0.78	Failed
AL09	0.73	Failed
AL06	0.70	Failed
AL05	0.63	Failed
AL03	0.53	Failed
AL02	0.38	Failed
AL07	0.33	Failed
AL08	0.20	Failed

The ranking results obtained from the final calculation are shown in Table 6. Where there is only one prospective employee with the highest score who is declared to have passed the selection based on interviews obtained from the head of the company's branch. Based on the ranking results, there is an applicant who passed. Alternative AL03 in 2019 with evaluation value is 1.00. Alternative AL04 in 2020 with evaluation value is 0.93.

Evaluation

The results of calculations using the SMART approach are compared with the manual system to be evaluated. The comparison can be seen in Table 7.

Table 7. The comparison of SMART & manual system

Alternative	Manual	SMART	Status
2019			
A03	Suitable	Suitable	Compatible
A13	Unsuitable	Unsuitable	Compatible
A08	Unsuitable	Unsuitable	Compatible
A06	Unsuitable	Unsuitable	Compatible
A11	Unsuitable	Unsuitable	Compatible
A02	Unsuitable	Unsuitable	Compatible
A05	Unsuitable	Unsuitable	Compatible
A09	Unsuitable	Unsuitable	Compatible
A15	Unsuitable	Unsuitable	Compatible
A07	Unsuitable	Unsuitable	Compatible
A12	Unsuitable	Unsuitable	Compatible
A04	Unsuitable	Unsuitable	Compatible
A14	Unsuitable	Unsuitable	Compatible
A10	Unsuitable	Unsuitable	Compatible
A01	Unsuitable	Unsuitable	Compatible

Alternative	Manual	SMART	Status
2020			
A04	Unsuitable	Suitable	Incompatible
A10	Suitable	Unsuitable	Incompatible
A01	Unsuitable	Unsuitable	Compatible
A09	Unsuitable	Unsuitable	Compatible
A06	Unsuitable	Unsuitable	Compatible
A05	Unsuitable	Unsuitable	Compatible
A03	Unsuitable	Unsuitable	Compatible
A02	Unsuitable	Unsuitable	Compatible
A07	Unsuitable	Unsuitable	Compatible
A08	Unsuitable	Unsuitable	Compatible

The value of the final calculation results is sent to the company's central human resource department, and will be given authority to the head of the branch of PT. IMFI Kotamobagu to make decisions for selected employees. By using the SMART method, the branch head will not choose employees arbitrarily because the rankings have used a system that provides ratings quickly so that employee selection becomes more precise. From the results of the comparison of the manual system with the SMART method, two samples' data are not compatible with the 25 employee's data tested. This is because, in the calculation using SMART methods, each alternative and criterion is normalized so that it can provide a more precise and objective assessment in the employee selection process.
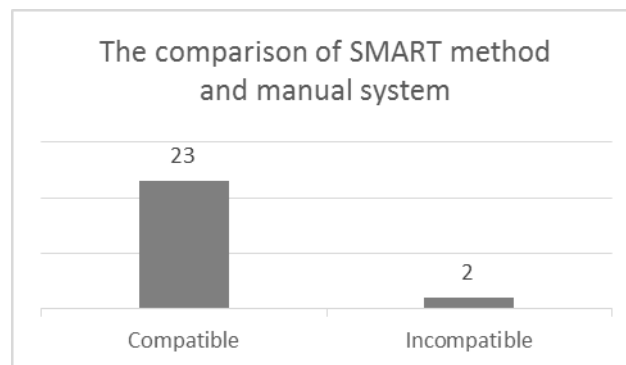

Figure 2. The evaluation of SMART and manual system.

We can see in Table 7 and Figure 2, from the 25 alternatives, it was found two different data. The decision support system based on evaluation produces 23 data which is compatible with the manual result. The results of the accuracy test of this study, namely 91.33%, were obtained using the SMART approach in selecting the best prospective employee.

Discussion

The use of the SMART method in employee selection has been proven to provide a more accurate and objective assessment. This research achieved an accuracy rate of 91.33% in selecting the best employee candidates, which is very important in ensuring that the employee selection process runs efficiently. The calculation results of the SMART method are sent to the central human resources department, ensuring that branch heads do not select employees arbitrarily and rely on carefully processed data. In addition, the SMART method also helps in overcoming the mismatch of sample data with the manual system. In this case, a decision support system based on the SMART method generated 23 compatible data from 25

alternatives, demonstrating its effectiveness in processing data efficiently and reducing errors. Based on the evaluation results obtained, the use of the SMART method in the employee selection decision support system provides several significant benefits (Akhif et al., 2023; Zumarniansyah et al., 2021). This includes improved accuracy and efficiency of the selection process, which in turn results in better hiring decisions. In addition, this approach also increases objectivity and fairness in the selection process by minimizing the influence of subjective bias (Montibeller & Von Winterfeldt, 2015; Yusuf, 2023). In addition to these benefits, the use of the SMART method also helps streamline the selection process, saving the organization time, and resources (Gemawaty & Yuliani, 2023; Wang et al., 2018). Overall, this approach has the potential to contribute to increased company productivity and employee performance. The results of this evaluation also reveal research limitations, such as two sample data that are not compatible with the manual system, which could be the focus of future research. Therefore, the recommendation for future studies is to overcome this limitation and expand the scope of studies with more sample data. Thus, the results of this study provide valuable contributions and a foundation for the development of better and more efficient employee selection methods.

4. CONCLUSION

Based on calculations system in the decision making for the recruitment and selection of prospective employees at a company, the calculations in the 2019 and 2020 selections using the SMART method consist of five criteria, namely written tests, interviews, education, award certificates, and working experience, there is a person who has the highest score in each selection with a value of 1.00 in 2019. Furthermore, one person has the highest score with a value of 0.93 in 2020. The results of this study can also be used as a reference for PT. IMFI especially branch heads and applicants facilitate the decision-making process for the selection of new employees and facilitate applicants in the online registration process so that the recruitment process is more effective and objective. Based on the test results, the level of accuracy is 91.33% achieved. This study resulted in the best prospective employee in the selection process using the SMART approach.

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