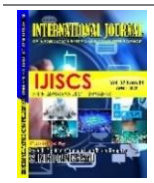

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EMPLOYEE PERFORMANCE ASSESSMENT SYSTEM OF PT BPRS TANGGAMUS USING SAW AND VIKOR METHODS BASED ON MOBILE SYSTEM

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Abstract
Effective and accurate employee performance assessment is an important aspect in human resource management in companies, including at PT BPRS Tanggamus. However, the manual assessment system used so far is considered inefficient, time-consuming, and often less objective, causing problems in determining employee performance fairly and transparently. This study aims to develop a mobile-based Employee Performance Assessment System using the Simple Additive Weighting (SAW) and VIšekriterijumsko KOmpromisno Rangiranje (VIKOR) methods. The SAW method is used to calculate performance rankings based on several assessment criteria, while VIKOR helps in handling conflicts between criteria and producing optimal compromise solutions. This study uses a mobile system development approach integrated with a multi-criteria method, which was tested at PT BPRS Tanggamus. The results of the study show that the SAW and VIKOR-based system is able to improve accuracy, objectivity, and speed in performance assessment compared to the manual method. The mobile system also provides flexibility to management and employees in accessing assessment results anytime and anywhere, as well as increasing the transparency of the assessment process. This study recommends further development to add more complex performance analytics features, as well as improving the user interface to make the system easier to use in the future.

1.0 INTRODUCTION

Managing an institution is certainly inseparable from the management of Human Resources (HR). One of them is a Financial Institution, namely Banking. Based on data from the Financial Services Authority (OJK) as of October 2022, in Indonesia there are 4 Limited Liability Commercial Banks, 68 National Private Commercial Banks, 27 Regional Development Banks (BPD), and 8 Bank Branch Offices Domiciled Abroad [1] . In addition, as of December 2022, there were 1.441 People 's Credit Banks and 16.7 Sharia People's Financing Banks. [2] . Managing Human Resources is certainly inseparable from employee performance assessments in order to control and supervise employee performance. Focusing on employee performance evaluation is important for several crucial reasons. First, there is a need to optimize employee productivity and individual performance. By understanding the contribution of each team member, companies can allocate human resources more efficiently to achieve their business goals. Second, a good performance appraisal system can provide a foundation for career development, motivate employees, and increase their satisfaction. Clarity about individual performance can give employees a clearer picture of their career development and ladder.

Third, performance appraisal results play an important role in strategic decision making, including in terms of human resource development, promotion, and allocation of organizational resources. Fourth, performance appraisals also support the company's efforts to improve service quality, operational efficiency, and employee retention management. Fifth, by identifying employee performance strengths and weaknesses, companies can plan appropriate training and competency development. Sixth, performance appraisals create a basis for managing fairness and transparency in the workplace, building employee trust in management, and creating a positive work culture. Performance appraisals impact employee engagement, provide a clear understanding of expectations, and provide an opportunity for employees to actively participate in the development process.

There are several studies that have been conducted on employee performance appraisal applications built to avoid data input errors so that leaders will be facilitated in the assessment process. Not only that, employee performance can be known by leaders [3] . Employee performance assessments are carried out manually, resulting in delays in processing employee performance and poor data administration. SDLC Method and *Matching Profile* appropriate to be implemented in employee performance assessment. This system helps BPR Agung Sejahtera in conducting employee performance assessments more efficiently and quickly. [4] . Furthermore, research conducted by Haryani (2019) determined the best employees by using the Profile Matching method as an alternative. Determining the standard value of each criterion has an influence on the process of determining the best employees. [5] . Other research has also been conducted in determining rewards and *punishments* can be simplified and performance assessments can be accelerated with accurate results through the *Simple Additive Weighting* (SAW) method so that the Management of PT Bank Negara Indonesia Cirebon Branch is greatly assisted [6] . Research conducted previously implemented two methods, namely the SMART and MAUT methods, the results of the study showed that the SMART and MAUT methods can be implemented well for employee selection at Merapi Online Corporation and can minimize the same preference values, so that alternative rankings can be done well [7] . In addition, other research has also been conducted with Online Presence Using the Global Positioning System for Employee Performance Assessment Based on the Simple Additive Weighting Method, the results of the study showed that the SPPK Application can run online, Android mobile and website can be integrated to conduct employee performance assessments, and can facilitate the process of recording employee attendance and return [8] . Furthermore, research conducted by applying the *Analytic Network Process* (ANP) method that was developed can make it easier to provide objective assessments of lecturer performance at Unklab based on the weights and criteria that have been determined [9] .

State of the art and novelty with the analysis of the results of each institution has different criteria. Differences in the focus of criteria with high value weights. In this study will use two methods, namely the *Simple Additive Weighting* (SAW) method and *Vise Kriterijumska Optimizacija I Kompromisno Resenje* (VIKOR) will be presented with *an interface* that is easier to implement by *end-users* so that it will be more *user friendly* in its operation. The system will be made based on a website, the computerized assessment process will be connected to *a database server* that is integrated in the HRD section. The Decision Support System for employee assessment at PT BPR Syariah Tanggamus is expected to increase time efficiency in providing assessments of employee performance. The system to be built can print assessment results.

2 .0 METHODOLOGY

This study uses a comparison of two methods, namely *the Simple Additive Weighting* (SAW) method and *Vise Kriterijumska Optimizacija I Kompromisno Resenje* (VIKOR) in conducting employee performance assessments at PT BPR Syariah Tanggamus Pringsewu Branch Office. The SAW method was chosen because it is commonly used in a calculation [10] [11] [12] . In addition, the SAW method has an algorithm that is quite easy to understand because it has a simple formula. The basic concept of the SAW method is to find a quality sum of the performance values in each alternative on all attributes Fishburn (1967) and MacCrimmon (1968) [13] . While the VIKOR method was chosen for the purpose when in a condition where

the ability is not possessed by the decision maker in determining the choice when starting the design of a system so as to obtain the closest ideal solution results based on the proposed compromise solution [14] . Through the calculation of these two methods, we can compare the results of employee performance assessments at PT BPRS Tanggamus in one Decision Support System (DSS). Comparison of *the Simple Additive Weighting* (SAW) Method and *Vise Kriterijumska Optimizacija I Compromise Resenje* (VIKOR) is carried out by using alternative data, alternative values, and the same criteria weights to assess the performance of BPRS employees.

2.1 Simple Additive Weighting Method

It is the process of finding the sum of weights based on the performance ranking based on every other way in the attribute as a whole. [15] [16] . This method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative *ratings* . [13] . In other words, the *Simple Additive Weighting Method* is a weight addition process that requires a decision matrix normalization process with existing alternatives [17] .

The normalization formula uses equation (1) .

$$rij = \begin{cases} \frac{x_{ij}}{max_{xij}} Jika\ J\ adalah\ atribut\ benefit \\ \frac{min_{xij}}{x_{ij}} jika\ J\ adalah\ atribut\ cost \end{cases}$$

Equation 1

Where r_{ij} is the normalized performance rating of alternative P_i on attribute C_j ; *i* = 1, 2, ..., m and *j* = 1, 2, ..., n.

The preference value for each alternative (V_i) is in accordance with equation (2)

$$V_i = \sum_{j=1}^{n} W_j\, r_{ij}$$

Equation 2

With the provision that the final result has a larger vi value, it can be identified that the Pi alternative has a better assessment.

2.2 Vikor Method

The VIKOR method is a ranking method with a multi-criteria ranking index according to a certain measure that is closest to the ideal solution. [18] [19] . The application of the VIKOR method aims to obtain alternative ranking results that are close to the ideal solution by proposing a compromise solution. [14] [20] . In other words, the VIKOR method is used to obtain the closest ideal solution by ranking alternatives through compromise solutions.

The following are the calculation stages of the VIKOR method [14] [21] :

1. The first step is to prepare the X Matrix

$$X = \begin{bmatrix} X_{11} X_{12} \cdots \cdot X_{1n} \\ X_{21} \ldots \cdot \cdots \cdot \ldots \cdot \\ \ldots \cdot \ldots \cdot \cdots \cdot \ldots \cdot \\ X_{m1} \ldots \cdot \cdots \cdot X_{mn} \end{bmatrix}$$

   With the description X_{ij} as the i-th measure of alternatives on attribute j, m indicates the number of alternatives and n indicates the number of attributes.

2. Perform normalization of the X matrix using the formula according to equation (3) as follows:

$$r_{ij} = \left(\frac{X_j^+ - X_{ij}}{X_j^+ - X_j^-} \right)$$

3. Calculate the values of X_j and R_j using the following equations (4) and (5):

$$S_j = \sum_{j=1}^{n} wj \left(\frac{X_j^+ - X_{ij}}{X_j^+ - X_j^-} \right)$$

$R_j = \max_j \left[wj \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-} \right) \right]$

4. Calculating the VIKOR Index
   The VIKOR index value can be calculated using the following equation (7):
   $Q = \left[\frac{S_i - S^-}{S^+ - S^-} \right] v + \left[\frac{R_i - R^-}{R^+ - R^-} \right] (1\text{-}v)$
   The VIKOR Q value is a value used as a reference in the ranking process for each alternative. The smaller the Q value, the closer the alternative is to the optimal solution [18] [20] .

2.3 Criteria and Weighting

The criteria and weighting applied in this study are based on the Employee Assessment Guidelines of PT BPR Syariah Tanggamus. There are 20 criteria and each criterion as a benefit can be seen in the following table 2:

Table 1. Criteria Preference Weights

Criteria	Criteria Code	W	Attribute
Work ability	C1	0.058	Benefits
Working speed	C2	0.058	Benefits
Capturing power	C3	0.058	Benefits
Work efficiency and effectiveness	C4	0.058	Benefits
Job mastery	C5	0.058	Benefits
Quality of work	C6	0.058	Benefits
Honesty	C7	0.017	Benefits
Discipline	C8	0.017	Benefits
Physical condition	C9	0.017	Benefits
Craft	C10	0.017	Benefits
Accuracy / precision	C11	0.017	Benefits
Performance and Punctuality of work	C12	0.017	Benefits
Self-Motivation	C13	0.017	Benefits
Responsibility	C14	0.017	Benefits
Creativity	C15	0.017	Benefits
Relationship with superiors	C16	0.033	Benefits
Relationship with co-workers	C17	0.033	Benefits
Social relations	C18	0.033	Benefits
Presence	C19	0.300	Benefits
Sanctions	C20	0.100	Benefits

Based on the Employee Performance Assessment Guidelines owned by PT BPR Syariah Branch Office. Each criterion has a value range which can be seen in the following table 2 [22] [23] :

Table 2. Range of criteria values

Value Range	Mention
91 – 100	Special
81 – 90	Very good
71 – 80	Good
61 – 70	Enough
51 – 60	Currently
50	Not enough

2.4 Waterfall Method

In the waterfall system development method or waterfall model is one of the models in the Software Development Life Cycle (SDLC) which is a sequential and linear approach. In the waterfall model, system development is carried out in several phases that are interdependent with each other, with each phase must be completed before entering the next phase. The

waterfall model has several advantages, including a clear structure, comprehensive documentation, and the ability to control change. However, this model also has disadvantages, such as the lack of flexibility in addressing changes in needs that may arise during the development process [19].

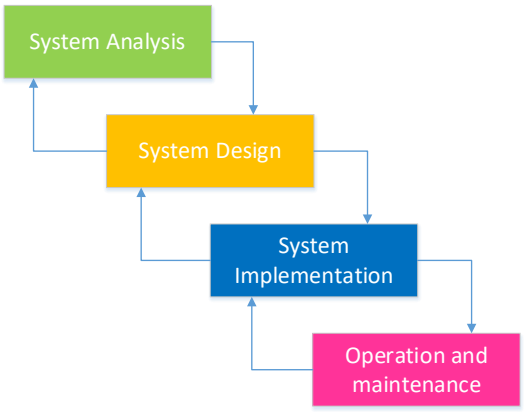

Figure 1. *Waterfall*

a) System Analysis is the stage where the running system is studied and a new system is proposed, System analysis includes feasibility study activities and needs analysis. Based on the system analysis conducted, PT BPRS really needs a web-based mobile employee performance assessment application system, this is necessary because the assessment process carried out at PT BPRS Tanggamus uses manual calculations so that it is less effective and transparent.
b) System Design is the process of planning and developing a framework or system to be developed using UML Diagrams: Use Case Diagrams, Activity Diagrams, and sequence diagrams. Where the stages change the needs that are still in the form of concepts into real system specifications.
c) System Implementation is the stage of translating the system design into a programming language. In addition, at the implementation stage, system testing is also carried out before it is used by stakeholders.
d) Operation and Maintenance phase involves operating the implemented system and performing routine maintenance to ensure its performance remains optimal.

2.5 Research Flow Framework

There is a need for an explanation regarding the research flow framework carried out in this research with the following description:

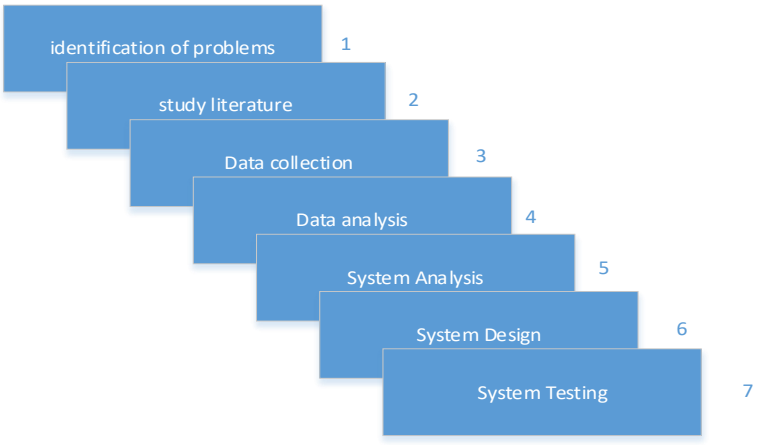

Figure 2. *Research* Flow

a. **Identification of problems** The first stage is to identify the problems that occur at PT BPRS Tanggamus which then become the problem formulation to be studied in this research.
b. **Literature Study** is the process of studying and understanding theories related to this research in order to understand more deeply and use the results of previous studies that have similarities in case studies as basic material in compiling this research.
c. **Data collection** is done by several methods, namely by interview, literature study, observation, and questionnaire. The results of data collection in determining variables will be tested with variable validity and reliability.
d. **Data Analysis** After the supporting research data is obtained, the next step is to analyze the data obtained.
e. **System Analysis** This stage is the process of compiling a Mobile-based System Design Analysis that will be built by integrating the website with an integrated database in the HRD system.
f. **System Design** Creating a Decision Support System using variables that have been tested with the SAW and VIKOR methods . Furthermore, it is built using PHP and MySQL with Bootstrap.
g. **System Testing** After the system is created, it will be tested using the *black box method* to determine the functional value of the resulting system.

3 .0 RESULTS

The data used in the study is data obtained through direct observation at PT BPRS Tanggamus, through the process of observation, interviews and literature studies conducted, variables used to determine the best employees were obtained as many as 20 variables, in addition, interviews were also conducted for the system design process that is in accordance with the needs of PT. BPRS.

3.1 Data Testing

a. Simple Additive Weighting (SAW) method

Employee performance assessment at PT. BPRS Tanggamus was conducted using 8 employees as an alternative assessment. The alternative employee values tested can be seen in table 3.

Table 3. Alternative values

Alternative	Assessment criteria																			
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
A1	80	75	85	75	80	75	80	70	85	85	80	70	90	75	80	85	80	70	100	100
A2	80	70	80	85	85	75	80	70	80	70	75	85	80	85	80	85	75	70	100	100
A3	85	85	70	85	70	75	85	80	70	80	85	90	80	70	80	85	80	70	95	100
A4	70	80	75	80	70	80	80	85	80	75	80	85	80	90	70	85	85	80	100	100
A5	85	85	75	80	80	85	75	85	80	70	70	80	75	85	85	85	90	85	100	100
A6	75	75	80	75	85	85	75	80	75	75	85	85	70	85	80	85	90	80	90	80
A7	80	80	80	80	80	75	85	80	80	75	70	90	85	85	75	75	85	80	100	100
A8	70	85	80	85	85	80	90	70	75	90	85	80	75	75	70	75	85	85	95	100
Min Value	70	70	70	75	70	75	75	70	70	70	70	70	70	70	70	75	75	70	90	80
Max Value	85	85	85	85	85	85	90	85	85	90	85	90	90	90	85	85	90	85	100	100

Based on the alternative data in table 4, the X matrix is formed as follows:

$$X = \begin{bmatrix} 80 & 75 & 85 & 75 & 80 & 75 & 80 & 70 & 85 & 85 & 80 & 70 & 90 & 75 & 80 & 85 & 80 & 70 & 100 & 100 \\ 80 & 70 & 80 & 85 & 85 & 75 & 80 & 70 & 80 & 70 & 75 & 85 & 80 & 85 & 80 & 85 & 75 & 70 & 100 & 100 \\ 85 & 85 & 70 & 85 & 70 & 75 & 85 & 80 & 70 & 80 & 85 & 90 & 80 & 70 & 80 & 85 & 80 & 70 & 95 & 100 \\ 70 & 80 & 75 & 80 & 70 & 80 & 80 & 85 & 80 & 75 & 80 & 85 & 80 & 90 & 75 & 85 & 85 & 80 & 100 & 100 \\ 85 & 85 & 75 & 80 & 80 & 85 & 75 & 85 & 80 & 70 & 70 & 80 & 75 & 85 & 85 & 85 & 90 & 85 & 100 & 100 \\ 75 & 75 & 80 & 75 & 85 & 85 & 75 & 80 & 75 & 75 & 85 & 85 & 70 & 85 & 80 & 85 & 90 & 80 & 90 & 80 \\ 80 & 80 & 80 & 80 & 80 & 75 & 85 & 80 & 80 & 75 & 70 & 90 & 85 & 85 & 75 & 75 & 85 & 80 & 100 & 100 \\ 70 & 85 & 80 & 85 & 85 & 80 & 90 & 70 & 75 & 90 & 85 & 80 & 70 & 75 & 70 & 75 & 85 & 85 & 95 & 100 \end{bmatrix}$$

From the X matrix, data normalization is then carried out using equation 1 with the following calculation:

$r_{11} = \frac{80}{\max(80,80,85,70,85,75,80,70)} = \frac{80}{85} = 0.941$

$r_{21} = \frac{80}{\max(80,80,85,70,85,75,80,70)} = \frac{80}{85} = 0.941$

After calculating using equation 1, the normalization matrix will be obtained as follows:

$$X = \begin{bmatrix} 0,941 & 0,882 & 1 & 0,882 & 0,941 & 0,882 & 0,889 & 0,824 & 1 & 0,994 & 0,941 & 0,778 & 1 & 0,833 & 0,941 & 1 & 0,889 & 0,824 & 1 & 1 \\ 0,941 & 0,824 & 0,941 & 1 & 1 & 0,882 & 0,889 & 0,824 & 0,941 & 0,778 & 0,882 & 0,944 & 0,889 & 0,944 & 0,941 & 1 & 0,833 & 0,824 & 1 & 1 \\ 1 & 1 & 0,824 & 1 & 0,824 & 0,882 & 0,944 & 0,941 & 0,824 & 0,889 & 1 & 1 & 0,889 & 0,778 & 0,941 & 1 & 0,889 & 0,824 & 0,95 & 1 \\ 0,824 & 9,41 & 0,82 & 0,941 & 0,824 & 0,941 & 0,889 & 1 & 0,941 & 0,883 & 0,941 & 0,994 & 0,889 & 1 & 0,824 & 1 & 0,944 & 0,941 & 1 & 1 \\ 1 & 1 & 0,882 & 0,941 & 0,941 & 1 & 0,833 & 1 & 0,941 & 0,778 & 0,824 & 0,889 & 0,883 & 0,994 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0,882 & 0,882 & 0,941 & 0,882 & 1 & 1 & 0,833 & 0,941 & 0,882 & 0,883 & 1 & 0,994 & 0,778 & 0,994 & 0,941 & 1 & 1 & 0,941 & 0,9 & 0,8 \\ 0,941 & 0,941 & 0,941 & 0,941 & 0,941 & 0,882 & 0,944 & 0,941 & 0,941 & 0,883 & 0,824 & 1 & 0,944 & 0,994 & 0,882 & 0,882 & 0,944 & 0,941 & 1 & 1 \\ 0,824 & 1 & 0,941 & 1 & 1 & 0,941 & 1 & 0,824 & 0,882 & 1 & 1 & 0,899 & 0,833 & 0,833 & 0,824 & 0,882 & 0,944 & 1 & 0,95 & 1 \end{bmatrix}$$

After obtaining the normalization value, the next step is to search for the preference value using equation 2:

V 1 = (0.941x0.058) + (0.882x0.058) + (1x0.058) + (0.882x0.058) + (0.941x0.058) + (0.882x0.058) + (0.889x0.017) + (0.824x0.017) + (1x0.017) + (0.994x0.017) + (0.941x0.017) + (0.778x0.017) + (1x0.017) + (0.833x0.017) + (0.941x0.017) + (1x0, 033) + (0.889x0.033) + (0.824x0.033) + (1x0.3) + (1x0.1)

= 0.0546 + 0.0512 + 0.0580 + 0.0512 + 0.0546 + 0.0512 + 0.0151 + 0.0140 + 0.0170 + 0.0161 + 0.0160 + 0.0132 + 0 , 0170 + 0.0142 + 0.0160 + 0.0330 + 0.0293 + 0.272 + 0.3 + 0.1

= 0.9487

V 2 = (0.941x 0.058) + (0.824 x 0.058) + (0.941 x 0.058) + (1 x 0.058) + (1 x 0.058) + (0.882 x 0.058) + (0.889 x 0.017) + (0.824 x 0.017) + (0.941 x 0.017) + (0.778 x 0.017) + (0.882 x 0.017) + (0.944 x 0.017) + (0.889 x 0.017) + (0.944 x 0.017) + (0.941 x 0.017) + (1 x 0.33) + (0.833 x 0.033) + (0.824 x 0.033) + (1 x 0.3) + (1 x 0.1)

= 0.0546 + 0.0478 + 0.0546 + 0.058 + 0.058 + 0.0512 + 0.0151 + 0.0140 + 0.0160 + 0.0132 + 0.0150 + 0.0161 + 0.0151 + 0 .0161+ 0.0160 + 0.0330 + 0.0274 + 0.0271 + 0.3000 + 0.1000

= 0.9483

Based on the search for preference values using equation 2, the preference values of 8 (eight) alternatives are obtained in table 4 below.

Table 4. Preference Values

Alternative	MARK	RANK
A1	0.9487	3
A2	0.9483	4
A3	0.9348	7
A4	0.9461	6
A5	0.9700	1
A6	0.9087	8
A7	0.9557	2
A8	0.9467	5

From table 4 above, it can be seen that the alternative with the best performance is alternative 5 with a value of 0.9700 and the lowest value is alternative 6 with a value of 0.9461.

b. Vikor Method

Employee performance assessment at PT BPRS using the VIKOR method is carried out using the same employee data as the data used for employee assessment at PT. BPRS using the SAW method.

Based on the X matrix that has been obtained, the following positive and negative values are determined:

Positive value (+)

f_1^+ = max {80,80,85,70,85,75,80,70} = 85

f_2^+ = max {75,70,85,80,85,75,80,85} = 85

Negative value (-)

f_1^- = min{80,80,85,70,85,75,80,70} = 70

f_2^- = min {75,70,85,80,85,75,80,85} = 70

After obtaining positive and negative values, the next step is to carry out normalization calculations using equation 4 as follows:

$r_{11} = \left(\frac{85-80}{85-70}\right) = 0.333$

$r_{21} = \left(\frac{85-80}{85-70}\right) = 0.333$

After normalization, the following matrix will be obtained:

$$X = \begin{bmatrix} 0,019 & 0,039 & 0 & 0,058 & 0,019 & 0,058 & 0,011 & 0,017 & 0 & 0,004 & 0,006 & 0,017 & 0 & 0,013 & 0,006 & 0 & 0,022 & 0,033 & 0 & 0 \\ 0,019 & 0,058 & 0,019 & 0 & 0 & 0,058 & 0,011 & 0,017 & 0,006 & 0,017 & 0,011 & 0,004 & 0,009 & 0,004 & 0,006 & 0 & 0,033 & 0,033 & 0 & 0 \\ 0 & 0 & 0,058 & 0 & 0,058 & 0,058 & 0,006 & 0,006 & 0,017 & 0,009 & 0 & 0 & 0,009 & 0,017 & 0,006 & 0 & 0,022 & 0,033 & 0,15 & 0 \\ 0,058 & 0,019 & 0,039 & 0,029 & 0,058 & 0,029 & 0,011 & 0 & 0,006 & 0,013 & 0,006 & 0,004 & 0,009 & 0 & 0,017 & 0 & 0,011 & 0,011 & 0 & 0 \\ 0 & 0 & 0,029 & 0,029 & 0,019 & 0 & 0,017 & 0 & 0,006 & 0,017 & 0,017 & 0,009 & 0,013 & 0,004 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0,039 & 0,039 & 0,019 & 0,058 & 0 & 0 & 0,017 & 0,006 & 0,011 & 0,013 & 0 & 0,004 & 0,017 & 0,004 & 0,006 & 0 & 0 & 0,011 & 0.3 & 0,1 \\ 0,019 & 0,019 & 0,019 & 0,029 & 0,019 & 0,058 & 0,006 & 0,006 & 0,006 & 0,013 & 0,017 & 0 & 0,004 & 0,004 & 0,011 & 0,033 & 0,011 & 0,011 & 0 & 0 \\ 0,058 & 0 & 0,019 & 0 & 0 & 0,029 & 0 & 0,017 & 0,011 & 0 & 0 & 0,009 & 0,013 & 0,013 & 0,017 & 0,033 & 0,011 & 0 & 0,15 & 0 \end{bmatrix}$$

The next step is to find the value of S using equation 5 as follows:

S_1 = 0.019 + 0.039 + 0 + 0.058 + 0.019 + 0.058 + 0.011 +
0.017 + 0 + 0.004 + 0.006 + 0.017 + 0 + 0.013 + 0.006 +
0 + 0.022 + 0.033 + 0 + 0
= 0.322

S_2 = 0.019 + 0.058 + 0.019 + 0 + 0 + 0.058 + 0.011 + 0.017 +
0.006 + 0.017 + 0.011 + 0.004 + 0.009 + 0.004 + 0.006 +
0 + 0.033 + 0.033 + 0 + 0
= 0.305

The next step is to find the R value using equation 6 with the following results:

Table 5. S and R values

Alternative	S_i	R_i
A1	0.322	0.058
A2	0.305	0.058
A3	0.449	0.150
A4	0.320	0.058
A5	0.170	0.039
A6	0.644	0.300
A7	0.285	0.058
A8	0.380	0.150
min	0.170	0.039
max	0.644	0.300

After obtaining the S and R values, the final step is to calculate the Vikor index using equation 7 as follows:

$Q_{A1} = \left[\frac{0,322-0,169}{0,644-0,169}\right]0.5 + \left[\frac{0,058-0,039}{0,3-0,039}\right](1-0.5)$
= 0.1967

$Q_{A2} = \left[\frac{0,305-0,169}{0,644-0,169}\right]0.5 + \left[\frac{0,058-0,039}{0,3-0,039}\right](1-0.5)$
= 0.1788

Based on the calculation of the index value, the index value of each alternative is obtained as follows:

Table 6. Index Values

Alternative	MARK	RANK
A1	0.1967	5
A2	0.1788	3
A3	0.5069	7
A4	0.1946	4
A5	0	1
A6	1	8
A7	0.1577	2
A8	0.4342	6

Based on table 6, it can be seen that the best index value is in alternative 5 with a value of 0 and the lowest index value is in alternative 6 with a value of 1.

A comparison of the results of data testing that has been carried out using the SAW and VIKOR methods can be seen in table 7.

Table 7. Differences in SAW and VIKOR Test Results

Alternative	SAW	VICTOR
A1	3	5
A2	4	3
A3	7	7
A4	6	4
A5	1	1
A6	8	8
A7	2	2
A8	5	6

Based on table 7, it can be seen that the results of data testing using the SAW and VIKOR methods to support the decision to assess the best employees obtained the same results, namely the highest value was in alternative 5 as the selected alternative.

3.2 System Design

a. Use Case Diagram

Use case diagram is a general description of the system to be built. Through the use case diagram, the activity process of the system being built can be seen. In addition, the use case diagram also shows the actors involved in the system process and the existing system limitations. The system process built to assist the employee assessment process at PT. BPRS in general can be seen in Figure 1. Below.

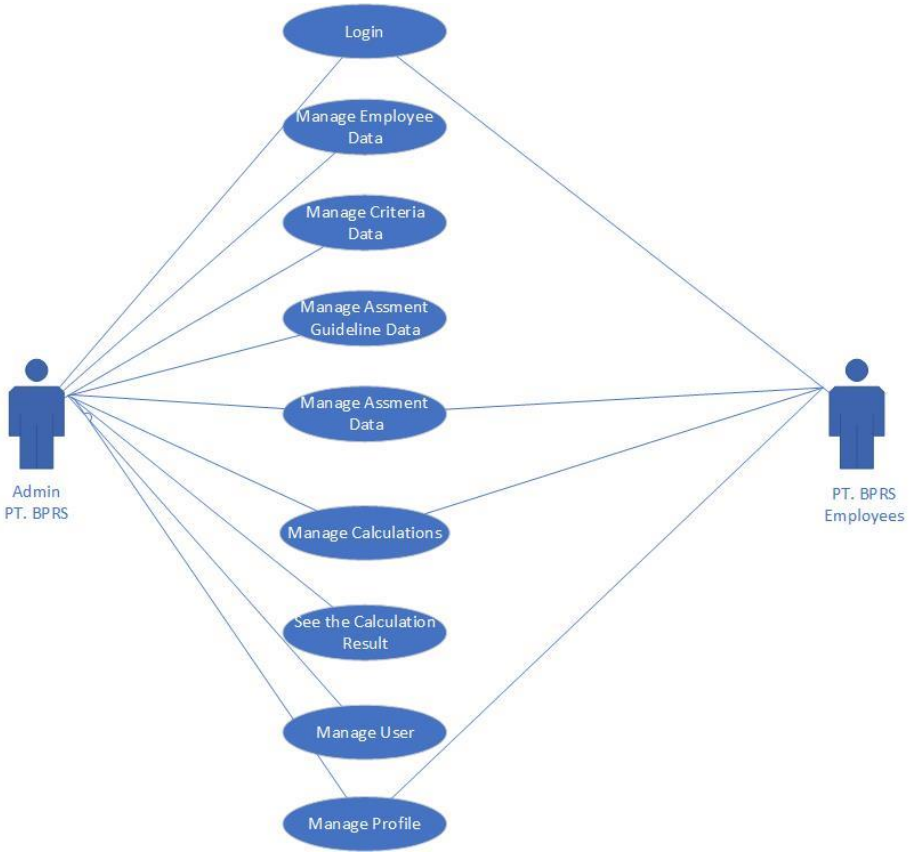

Figure 3. Use Case Diagram of PT's Employee Assessment System. BPRS

Based on Figure 1 above, it can be seen that there are 2 (two) actors directly involved in the system, namely the admin at PT BPRS who acts as the system control and the party who can manipulate data in the system and the employee as the party who can see the assessment process transparently.

b. Activity Diagram

Activity diagram is a visual form of workflow that contains activities and actions, which can also contain choices, repetitions, and concurrency. The activity diagram created illustrates three important processes in the employee assessment application at PT. BPRS, namely the process of inputting employee assessment guidelines that can only be done by the admin of PT. BPRS, the process of inputting employee values at PT. BPRS that can only be done by the admin of PT. BPRS, and the process of calculating values to determine the best employees that can be done by the admin and employees at PT. BPRS. The activity diagram of the process of inputting assessment guidelines, inputting employee values, and the calculation process can be seen in figures 4, 5, and 6 below.

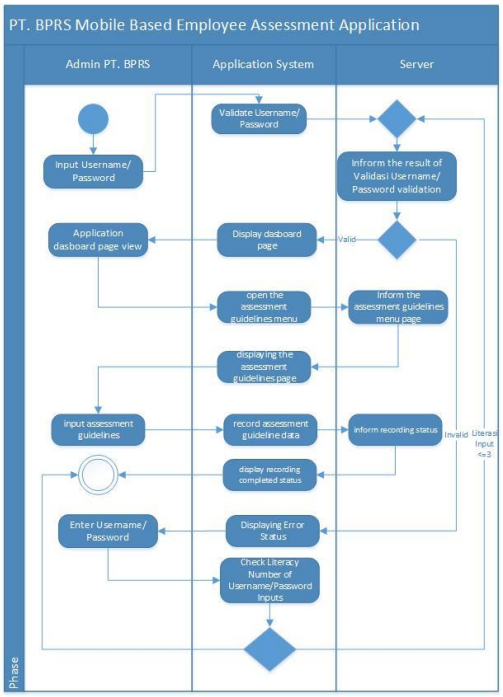

Figure 4. Activity Diagram of the Assessment Guidelines Input Process

Figure 4 shows the process of the assessment guideline input system carried out by the PT. BPRS admin.

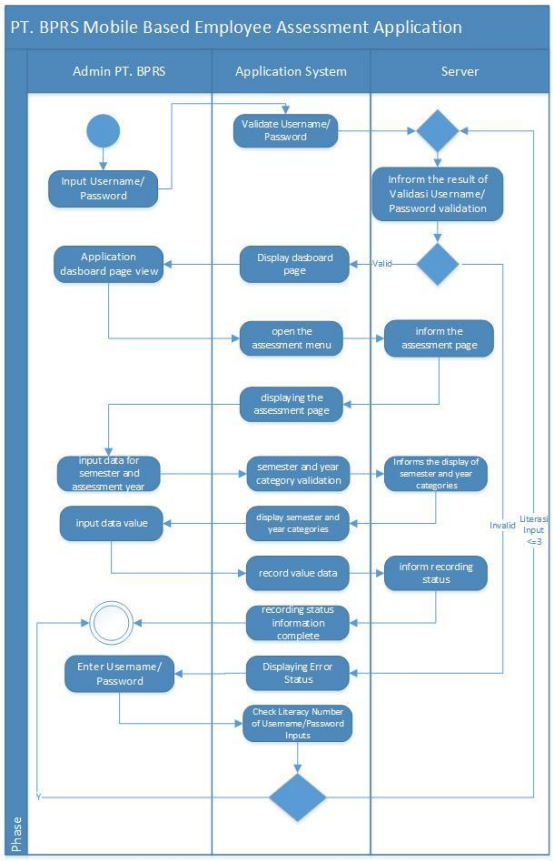

Figure 5. Activity Diagram of the Assessment Data Input Process

Figure 5 shows the assessment input system process carried out by the PT. BPRS admin.

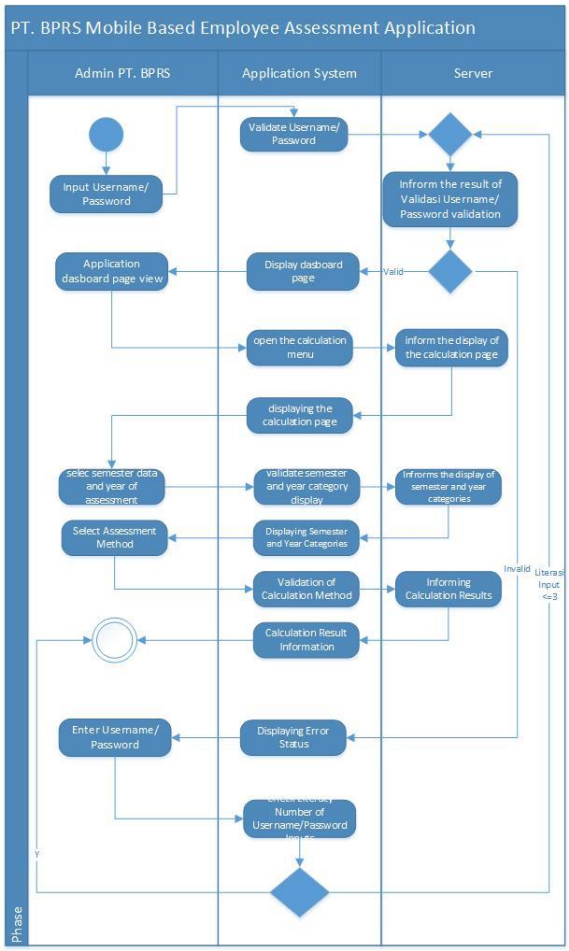

Figure 6. Activity Diagram of the Calculation Process

Figure 6 shows the calculation system process carried out by the PT. BPRS admin.

c. Squance Diagram

Sequence Diagrams depict the processes and objects involved and the sequence of messages exchanged as needed to perform the functionality.

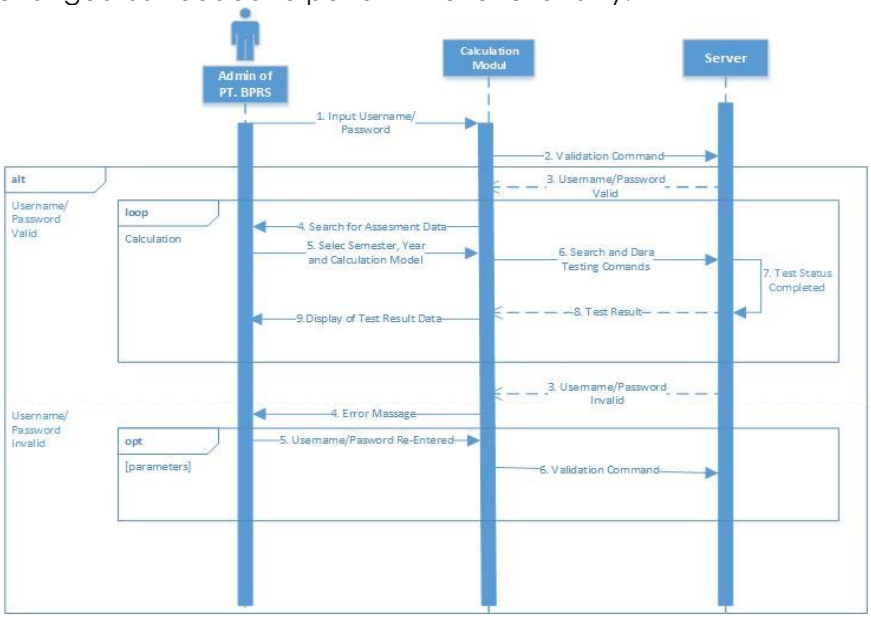

Figure 7. Squance Diagram of the Calculation Process

Based on Figure 7 above, it can be seen that the ongoing process is the process of calculating employee assessments carried out by the PT. BPRS admin.

3.3 Analysis of Research Results

Based on the research that has been done, the SAW and VIKOR methods show consistent ranking results, in addition, by implementing the SAW and VIKOR methods in making the best employee assessment decisions, it provides an optimal solution. The mobile-based decision-making system is designed so that the system can be easily accessed and provides flexibility and convenience for PT. BPRS management to monitor and assess employee performance, in addition, by using a mobile-based decision support system, the employee assessment process at PT. BPRS can be carried out objectively and transparently.

4.0 CONCLUSION

Based on the research that has been done, this study has succeeded in developing a mobile-based employee performance assessment system for PT BPRS Tanggamus using the SAW and VIKOR methods, which increase accuracy, transparency, and efficiency in the assessment process. The SAW method provides a more objective ranking based on measurable criteria, while VIKOR resolves conflicts between criteria, resulting in more optimal decisions. The implementation of the mobile system facilitates flexible access and performance monitoring, anytime and anywhere. As well as a more objective and transparent assessment process. Users welcome this system because it increases fairness and speeds up the assessment process. This study suggests further development of analytical features and interface improvements to make it easier to use.

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