

Application of the Key Performance Indicator Method in an Employee Information System

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Received:

December 9, 2025

Revised:

January 23, 2026

Accepted:

February 15, 2026

Published:

March 2, 2026

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DOI:

10.63158/journalisi.v8i1.1439

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Abstract. The rapid development of information technology has significantly encouraged the integration of information systems in human resource management to enhance efficiency, effectiveness, and objectivity. However, performance appraisal systems that lack standardized indicators can lead to subjectivity and inconsistency, impacting employee productivity and managerial decision-making. This study proposes a web-based Personnel Management Information System (PMIS) that integrates Key Performance Indicators (KPIs) to provide an objective and measurable performance evaluation system. The system design incorporates KPIs, weights, and targets, supported by a structured, transparent process for performance assessments. The system was implemented at PT Kebon Agung Trangkil, a sugar industry company, to improve employee performance evaluations and managerial decision-making. This research adopts the Waterfall system development method and includes a User Acceptance Test (UAT) with 15 respondents, achieving an 88% acceptance rate. The results indicate that the developed system improves assessment efficiency, reduces subjectivity, and supports more transparent decision-making. The study concludes with recommendations for expanding the system's capabilities and improving KPI validation through formal methods.

Keywords: Information Systems, Key Performance Indicators (KPI), Human Resource Management, Performance Appraisal, Web-based System

1. INTRODUCTION

The development of information technology has significantly encouraged organizations across various sectors to adopt information systems in human resource management, aiming to improve effectiveness, efficiency, and objectivity [1]. Personnel management involves not only the administration of employee data but also the establishment of a consistent, measurable, and continuous performance evaluation process. The results of performance appraisals directly impact employee productivity and the quality of managerial decision-making [2]. However, performance appraisal systems that lack standardized indicators can lead to subjectivity and inconsistency, ultimately diminishing the reliability of the performance information produced [3].

To address these challenges, the Key Performance Indicator (KPI) method is widely implemented. KPIs are a set of measurable, relevant indicators that are specifically designed to align with an organization's strategic goals, ensuring objective performance evaluations through clearly defined targets, weights, and metrics [4][5]. When integrated into web-based personnel information systems, KPIs enhance the performance evaluation process by making it more systematic, transparent, and traceable, which further improves the reliability of the performance information [6].

In industries such as sugar production, which are characterized by large-scale, seasonal workforces, managing human resources efficiently can be particularly challenging. Performance evaluations in this context are often performed manually using paper-based forms, a method that is time-consuming, prone to errors, and difficult to track over time. This highlights the urgent need for a more structured and computerized personnel management system that can streamline employee performance evaluations. While numerous studies have developed performance evaluation systems using different approaches, significant gaps remain. For example, Sholikha and Eko Pujianto [7] developed a decision support system for selecting the best employees using the Profile Matching method, which helps reduce subjectivity but primarily focuses on employee selection. Irmawan et al. [8] applied the IT Balanced Scorecard to evaluate attendance, but found that the system's effectiveness still needed improvement. Shrimp [9] developed a web-based personnel information system, but without integrating performance appraisal methods. Research by Setyodewi et al. [10] and Wijaya et al. [6] applied the KPI method in

performance evaluation, but their systems remained partial, operating as separate evaluation modules and lacking full integration within Personnel Management Information Systems (HRIS).

These gaps in the existing research can be summarized in three main aspects: Conceptually, previous implementations of KPIs have generally focused on stand-alone performance appraisal systems rather than fully integrating them into HRIS [11]. Systemically, there has been little integration of KPI calculation processes with broader personnel data management in a web-based platform. Evaluatively, most studies have not included a User Acceptance Test (UAT) to ensure that these systems meet the operational needs of large-scale, complex organizations.

This research aims to address these gaps by designing and implementing a web-based HRIS that comprehensively integrates KPI-based performance appraisals. In contrast to previous studies, which often focused solely on performance score calculations or stand-alone evaluation modules, this research develops an integrated HRIS that combines employee data management with KPI-based performance appraisals, along with validation through a User Acceptance Test. The contribution of this research lies in providing a comprehensive, objective, and measurable performance evaluation system that is functionally integrated and validated, making it more applicable to support managerial decision-making in large-scale industrial organizations. This system will be implemented at PT Kebon Agung Trangkil, a sugar industry company, to demonstrate its practical application in a real-world context.

2. METHODS

This study uses a descriptive approach as the main data collection strategy with the aim of describing and analyzing the actual conditions of the employee performance appraisal process and the needs for information system development at PT Kebon Agung Industri Sugar Factory [12]. The descriptive method was chosen because the research problem focuses on mapping the real condition of the running system, identifying weaknesses in manual processes, and formulating KPI-based system needs, rather than hypothesis testing. Thus, this approach is best suited to support the purpose of designing an information system that departs from field facts [13].

2.1. Research object

The object of the research is PT Kebon Agung Industri Sugar Factory, a manufacturing company in the field of processing sugarcane into sugar. Employee performance assessments are carried out periodically by the personnel and leadership departments as a basis for evaluation and decision-making. However, the assessment process that is still manual has the potential to cause subjectivity, reporting delays, and difficulties in tracing historical data, so a more objective, measurable, and structured web-based personnel information system is needed.

2.2. Data Collection Methods

Data collection is carried out to obtain accurate information related to personnel processes, performance assessments, and system needs based on Key Performance Indicators (KPIs). All data used is institutional, does not contain sensitive personal identities, and is obtained with the consent of the company. Data is used only for research purposes and is kept confidential in accordance with research ethics principles [14]. Primary data sources were obtained through observation and interviews [15]. Observation is carried out by directly observing the process of recording employee data, attendance, filling out assessment forms, and evaluation flows by superiors. Structured interviews were conducted with personnel staff and unit leaders to explore assessment procedures, indicators used, manual system constraints, and the need for a more objective and efficient web-based assessment system. Secondary data sources were obtained through documentation studies and literature studies [16]. The documentation study includes the collection of assessment forms, attendance data, organizational structure, and company policies related to performance evaluation. Literature studies are used to strengthen theoretical foundations regarding KPIs, personnel information systems, and system development methods.

2.3. System Development Methods

This study applies the Waterfall system development method in building a Personnel Management Information System. The Waterfall method was chosen because it has systematic, structured, and sequential stages, so it is suitable for the development of systems with functional needs that have been clearly defined from the beginning and require complete documentation [17]. In contrast to the Agile method, which emphasizes iterative development, intensive collaboration with users, and the ability to adapt to

rapidly changing needs [18]. The Waterfall method is more appropriately applied to an organizational environment with relatively stable business processes and a development scope that has been established from the beginning. Waterfall's limitations in dealing with changing needs are overcome through an in-depth needs analysis in the early stages. The stages of this method include system needs analysis, design, implementation, testing, and maintenance.

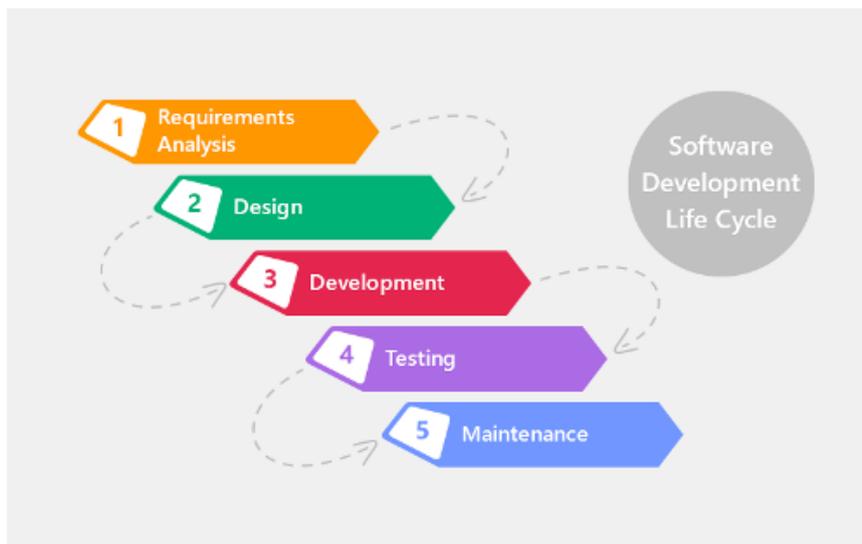


Figure 1. Waterfall Method

At the needs analysis stage, the researcher identifies the performance appraisal process, the actors involved, the approval flow, and the KPI indicators used. The system design stage is carried out using Unified Modeling Language (UML) modeling in the form of Flow of Document and Use Case Diagram to describe user interaction with the system and data flow. The implementation stage is carried out by building a web-based application using the PHP programming language and MySQL database. The testing stage is carried out using Black Box Testing to ensure that all functions run according to specifications, as well as User Acceptance Test (UAT) by involving end users to assess the suitability of the system for operational needs and ease of use. The maintenance stage is carried out to maintain system stability and make repairs and improvements based on user feedback.

2.4. Employee Performance Appraisal Method (KPI)

Employee performance assessment in this system uses the Key Performance Indicators (KPI) method. The indicators used include honesty, discipline, skill, responsibility,

cooperation, behavior, thoroughness, and leadership [3]. The selection of these indicators refers to the standard of human resource performance assessment that is commonly used in the organization and is adjusted to the Company's operational needs [10].

The weight of each indicator is determined based on expert judgment from the management and human resources department, taking into account the level of importance of each indicator to the overall performance of employees. The weighting process is carried out through structured discussions to ensure that indicators that are considered more critical, such as discipline and responsibility, have a greater contribution of value in the final calculation. Indicator validation is carried out conceptually by comparing it to the company's internal literature and policies to ensure the relevance and measurability of each KPI. The calculation of KPI values is carried out using the following formula, as show in Equation 1 and 2.

$$\text{Actual Reach (\%)} = \frac{\text{Oveall Score}}{\text{Maximum Score}} \times 100 \quad (1)$$

$$\text{Percentage of Achievement} = \frac{\text{Actual Percentage}}{\text{Target Percentage}} \times 100 \quad (2)$$

The results of the assessment are then classified into the following categories as follow 85–95%: Excellent, 70–84%: Good, 60–69%: Sufficient, and <60%: Needs to be improved.

3. RESULTS AND DISCUSSION

3.1. System Planning

This research produces a web-based Personnel Management Information System that integrates the Key Performance Indicator (KPI) method to support the performance appraisal process in an objective and structured manner. The system design is modeled using Unified Modeling Language (UML) to describe the process flow and interaction between actors [19]. Each actor is designed according to his or her roles and responsibilities, so that the system can be used optimally by all parties involved in the performance appraisal process.

The Flow of Document shown in figure 2 illustrates the digitization of the performance appraisal flow starting from the preparation of indicators, filling in the scores by the superiors, to verification and determination of final results by management [20]. This digitization eliminates the reliance on physical documents, speeds up approval flows, and improves the traceability of assessment data.

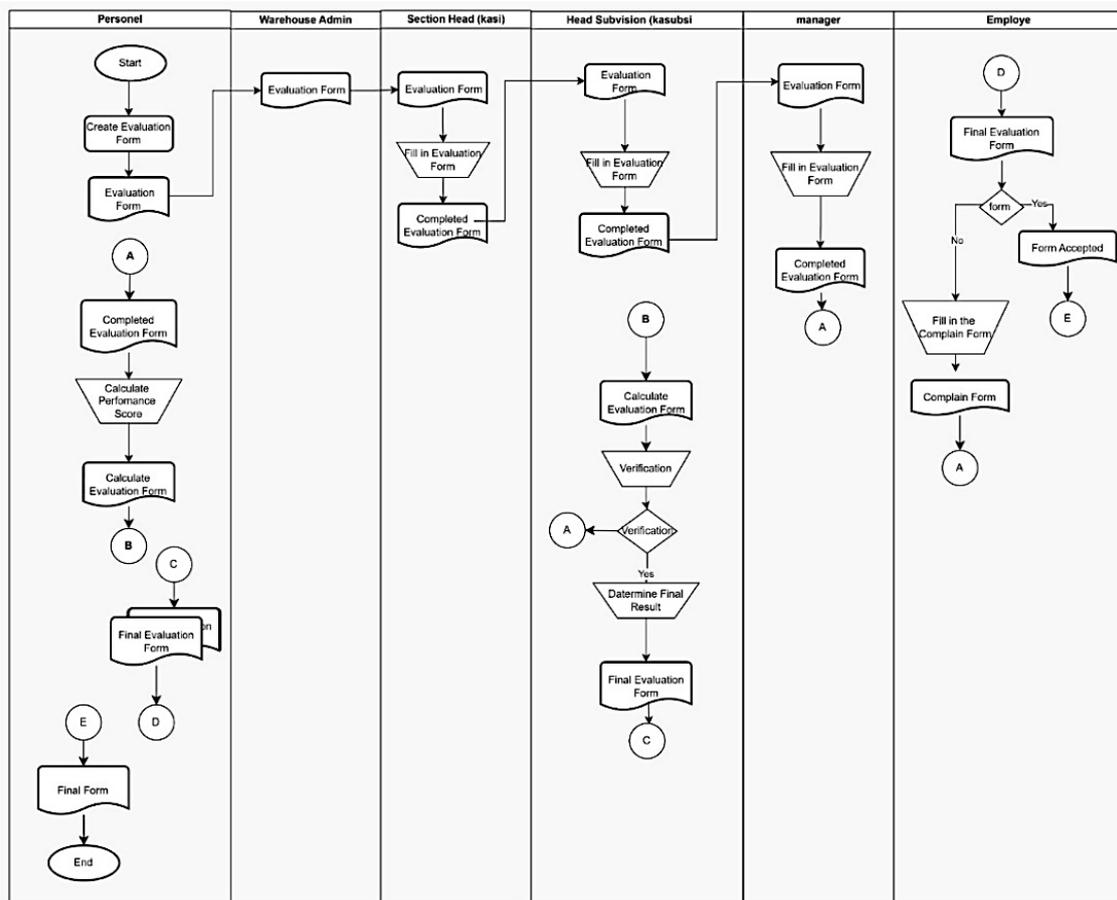


Figure 2. Flow of Document for Employee Performance Assessment System

The Use Case Diagram in Figure 3 shows that the system supports a multi-level assessment process involving personnel, section heads, subdivision heads, managers, and employees [21]. All major processes, from form creation, filling out scores, calculating KPIs, to serving final results, are integrated in one platform. Table 1 summarizes the functions of each actor and shows that there is no process redundancy as each role has different access rights and responsibilities.

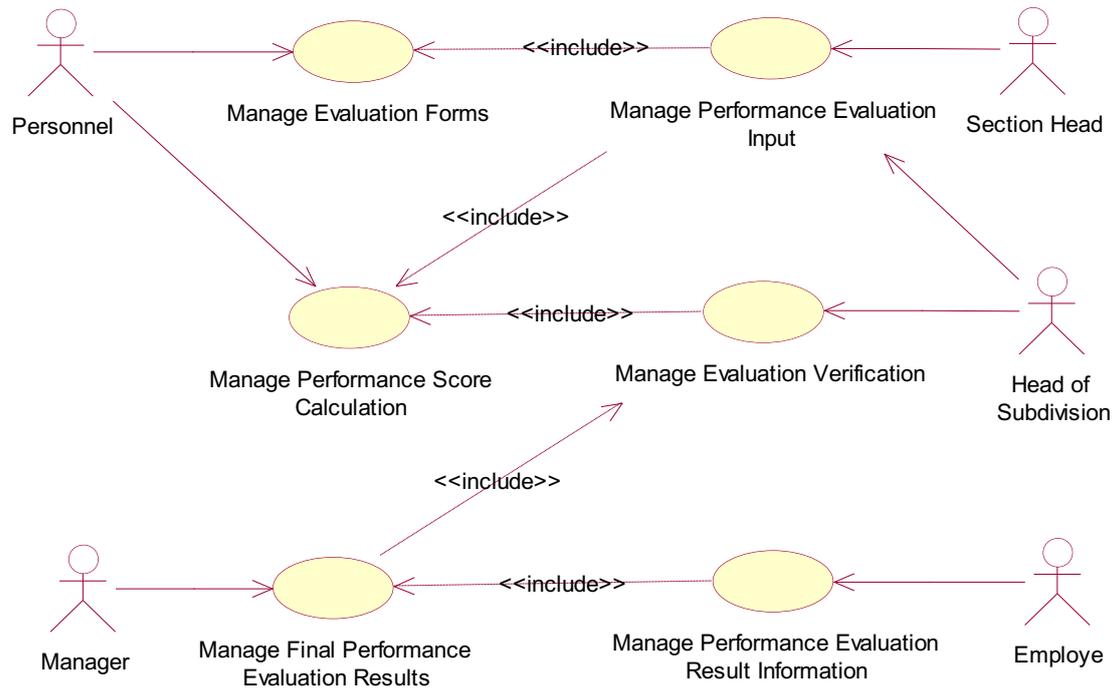


Figure 3. Use Case Diagram for Employee Performance Assessment System

Table 1. Description of Use Case for Employee Performance Assessment System

Use Cases	Description	Actors
Create Assessment Form	Creation of KPI-based performance indicators and assessment forms	Personnel
Fill Assessment Form	Filling in performance values based on defined indicators	Kasi, Kasubsi
Verify Assessment	Reviewing and validating the completed assessment forms	Kasubsi
Calculate Performance Score	Calculating employee performance scores using KPI methods	Personnel
Determine Final Result	Determining final performance results and performance status	Manager
View Final Performance Result	Accessing and viewing final performance evaluation results	Employee

3.2. System Implementation

The implementation of the system shows that all the functional requirements formulated at the analysis stage can be realized consistently in web-based applications [22]. The

system is able to integrate the management of KPI indicators, multi-level value filling processes, weight-based automatic calculations, and presentation of final results in one unified platform. This implementation confirms that the system design is not only conceptual, but can be applied operationally to support the performance evaluation process that was previously done manually. The setting of indicators, weights, and performance targets is done through the form shown in Figure 4 [23]. This module ensures that all work units use the same indicator standards, thereby increasing the consistency and objectivity of Key Performance Indicator (KPI)-based assessments.

Figure 4. Assessment Form After

Figure 5. Assessment Form

Figure 6. Assessment Form (Kasubi)

Figure 7. Manager Assessment Form

The process of filling in grades by the supervisor is directly shown in Figure 5 and Figure 6, which depict the assessment form at the level of Section Head and Sub-Section Head. The system automatically calculates the value based on the weight of the KPI that has been set, thereby reducing manual calculation errors and speeding up the recapitulation process. The final results of the assessment are displayed on the image manager module 7 (Figure 7), which serves to perform final validation and determination of performance decisions. The integration of all these stages shows that the system is able to support the multi-level performance evaluation process in a structured, transparent, and well-documented manner, thus answering the problems of subjectivity and inefficiency that previously occurred in the manual appraisal process.

3.3. Key Performance Indicator (KPI) Calculation Results

Employee performance assessment in this study was carried out using the Key Performance Indicator (KPI) method which consists of eight main indicators, namely honesty, discipline, skills, responsibility, cooperation, behavior, accuracy, and leadership. These indicators were chosen because they have been used as a standard for assessing the company's internal performance and are considered to represent aspects of employee behavior, competence, and overall work responsibilities. The determination of weights on each indicator is not carried out randomly, but is determined based on the company's internal policies through an expert judgment approach involving personnel and management. This process considers the relative importance of each indicator to the achievement of organizational goals. Indicators that have a direct impact on operational success and decision-making, such as responsibility, skills, cooperation, and leadership, are given greater weight than other supporting indicators. All weights are then normalized so that the total weight reaches 100%, so that KPI calculations can be carried out consistently and standardized. The performance appraisal process is carried out by three assessors representing the organizational structure, with the aim of increasing objectivity as well as minimizing individual subjective bias. The recapitulation of the assessment results of each assessor is presented in Table 2.

Table 2. Key Performance Indicator Calculation Results

No	Assessment Factors	Assessor 1	Assessor 2	Assessor 3	Total Values
1	Honesty	85	95	88	268
2	Discipline	90	96	95	281
3	Skills	85	85	80	250
4	Responsibilities	90	85	80	255
5	Cooperation	90	85	80	255
6	Behavior	85	90	90	265
7	Precision	90	90	90	270
8	Leadership	90	90	90	270
Total Value					2114

Based on Table 2, the total performance score obtained from all assessment indicators is 2114. The maximum score that can be achieved is 2400, which is obtained from eight assessment indicators each of which is assessed by three assessors with a maximum

score of 100 on each indicator. The comparison between the actual score and the maximum score resulted in an actual achievement of 88.08%. This value shows that in aggregate employee performance is in the high category and relatively evenly distributed in all assessment indicators. The largest contribution to these achievements came from the indicators with the dominant weight, namely responsibility, skills, cooperation, and leadership, which reflected the company's focus on the competency and strategic work behavior aspects.

The percentage of KPI achievement is calculated by comparing the actual achievement to the company's performance target of 100%, so that the KPI achievement value is 88.08%. Based on the assessment classification criteria used, the score is included in the Excellent category. This shows that employee performance has been at an optimal level and in accordance with the company's expected targets. Conceptually, these results reinforce that the implementation of KPIs in a web-based performance appraisal information system not only simplifies the process of calculating and processing data, but also increases transparency and accountability in performance appraisals. Each indicator, assessment weight, and calculation results can be clearly traced by management and employees, so that the system developed is able to support an objective, measurable, and consistent performance evaluation process.

3.4. System Testing

1) Black Box Testing

System functional testing is carried out using the black box testing method to verify the fit between user needs and system outputs without reviewing the internal structure of the program [24]. The focus of the test includes the main functions, namely the management of assessment forms, input of KPI scores, automatic calculations, and the presentation of assessment results reports. A summary of the scenario and test results is presented in Table 3.

Table 3. Black Box Testing

Test Form	Skenario	Expected Results	Test Results
Personnel Dashboard Testing	Access the main menu	View a summary of assessment data	Successful
Testing Create Assessment Form	Click on the "Create Form" button	KPI assessment form displayed	Successful

Test Form	Skenario	Expected Results	Test Results
Testing Save Assessment Form	Clearing a field	Displays a required field alert	Successful
Testing Save Assessment Form	Fill the entire field	Data stored to the database	Successful
Testing KPI Value Inputs	Filling in the indicator value	Successfully saved values	Successful
KPI Calculation Testing	Click on the calculation process	KPI values are calculated automatically	Successful
Testing Assessment Report	Click print report	Assessment report displayed	Successful

Based on the test scenario, the results are successful, which indicates that each major module of the system is capable of processing inputs and producing outputs according to functional specifications. This means that the system has met basic operational needs in supporting the KPI-based performance appraisal process, especially in the aspects of input validation, calculation consistency, and reliability of data storage and retrieval. Thus, in terms of functionality, the system is considered feasible to be implemented in the work environment of PT Kebon Agung Trangkil.

2) User Acceptance Test (UAT)

User acceptance evaluation is carried out through a User Acceptance Test to assess the suitability of the system with the needs and expectations of end users [25]. The UAT involved 15 respondents who represented key roles in the performance appraisal process, namely personnel, section heads, subdivision heads, and managers. The instrument used was in the form of a questionnaire with nine statements that included aspects of appearance, ease of use, reliability of functions, accuracy of information, and system support for the decision-making process (Table 4).

Table 4. Question List

No	Questions
1	The appearance of the employee performance appraisal system is attractive
2	The menus in the performance appraisal system are easy to understand

No	Questions
3	The performance appraisal system is easy to operate
4	All menus on the system run according to their function
5	The system simplifies the process of assessing employee performance
6	The data or information displayed by the system is accurate
7	The resulting assessment report is in accordance with the needs of the management
8	The system helps in the process of evaluating employee performance
9	The system is in accordance with the needs of the user

The results of the recapitulation of respondents' answers in table 5 show that most respondents give a Strongly Agree and Agree assessment of the entire statement. The weighting of the answers refers to the five-level Likert scale (Table 6), then the total score of each statement is calculated (Table 7) and converted into a percentage of the acceptance rate (Table 8).

Table 5. Questionnaire Results

Questions	Value					Percentage				
	SS	S	CS	KS	TS	SS	S	CS	KS	TS
1	9	4	2	0	0	60%	27%	13%	-	-
2	10	3	2	0	0	67%	20%	13%	-	-
3	7	5	3	0	0	47%	33%	20%	-	-
4	9	4	2	0	0	60%	27%	13%	-	-
5	10	3	2	0	0	67%	20%	13%	-	-
6	7	5	3	0	0	47%	33%	20%	-	-
7	9	4	2	0	0	60%	27%	13%	-	-
8	10	3	2	0	0	67%	20%	13%	-	-
9	7	5	3	0	0	47%	33%	20%	-	-

Table 6. Table of Weights of Answer Values

Code	Remarks	Weight
SS	Strongly agree	5
S	Agree	4
CS	Simply Agree	3
KS	Somewhat Agree	2

Code	Remarks	Weight
TS	Disagree	1

Table 7. UAT Calculation

Questions	Value					Quantity
	SS x 5	S x 4	CS x 3	PC x 2	TS x 1	
1	45	16	6	-	-	67
2	50	12	6	-	-	68
3	35	20	9	-	-	64
4	45	16	6	-	-	67
5	50	12	6	-	-	68
6	35	20	9	-	-	64
7	45	16	6	-	-	67
8	50	12	6	-	-	68
9	35	20	9	-	-	64

Table 8. UAT Percentage

Questions	Value		
	Quantity	Amount/Resp	Percentage
1	67	4,47	89%
2	68	4,53	91%
3	64	4,27	85%
4	67	4,47	89%
5	68	4,53	91%
6	64	4,27	85%
7	67	4,47	89%
8	68	4,53	91%
9	64	4,27	85%
Average Percentage			88%

Based on the results of the User Acceptance Test data processing involving 15 respondents, an average user acceptance rate of 88% was obtained, which is included in the Very Good category. The highest percentage value of 91% was obtained in several

statements related to the ease of menu, completeness of functions, and system support for the performance evaluation process. Meanwhile, the lowest percentage value of 85% is in the aspects of ease of operation and data accuracy. These results show that in general the system has been very well received by users, although there are still opportunities for improvement in terms of usability and data validation mechanisms to improve the convenience and reliability of using the system. However, these UAT results are limited because the number of respondents is limited and only represents specific organizational structures, so generalizations at a broader organizational scale require further testing with a more diverse number of respondents and role variations.

3.5. Discussion

The results of the system test showed that the implementation of Key Performance Indicators (KPIs) as a method of evaluating employee performance provided an actual achievement of 88.08%, which was included in the *very good category*. This value shows that the performance indicators used such as honesty, discipline, skills, responsibility, and leadership have been able to represent employee performance objectively based on multi-assessor assessments. These achievements also indicate that the developed system has functioned in accordance with the needs of the organization in supporting the performance evaluation process in a structured and measurable manner.

From an organizational perspective, the implementation of a KPI-based performance evaluation system not only has an impact on improving the efficiency of the appraisal process, but also contributes to transparency and accountability in human resource management. Before the system was implemented, the performance appraisal process tended to be subjective and poorly documented, potentially causing employee dissatisfaction. With this system, the results of the assessment can be traced back based on the indicators and weights that have been set, which ultimately supports managerial decision-making such as awarding, promotion, and employee coaching.

However, the achievement of high KPI scores does not necessarily reflect the overall success of the system. This result is also influenced by the limited scope of data, both in terms of the number of respondents and the assessment period used. The assessment was carried out by three assessors in one evaluation period, so that the variation in employee performance in the long term has not been fully accommodated. Therefore,

the results of this study are more accurately interpreted as an initial description of the effectiveness of the system, rather than as an absolute representation of the overall performance of the organization.

When compared to the research of Sholikha and Eko Pujianto [7] which focuses on employee selection using the Profile Matching method, this research contributes to sustainable performance evaluation through the implementation of KPIs that are integrated in the Personnel Management Information System. In contrast to the research of Setyodewi et al. [10] and et al. [6] Which generally only focuses on the calculation or presentation of KPI values, this study integrates KPIs as a whole into a web-based personnel system, thereby supporting data consistency, performance history management, and periodic performance evaluation. In addition, compared to the IT Balanced Scorecard approach by Irmawan et al. [8] ANG focuses on system evaluation, this study emphasizes the assessment of individual performance based on operational indicators. However, this study still has limitations in data coverage and the determination of KPI weights that depend on the company's internal policies.

However, this study still has some limitations. The number of respondents in the UAT test involving 15 people is still relatively limited, so the results of the system acceptance rate cannot be fully generalized to all organizational units. In addition, the determination of KPI weights in this study still refers to the company's internal policies and expert considerations, so it has the potential to produce different results if the system is applied to organizations with different characteristics and needs. Therefore, further research is recommended to involve a larger number of respondents and validate the KPI weights more objectively, for example through statistical approaches or the application of formal weighting methods such as the Analytical Hierarchy Process (AHP).

4. CONCLUSION

This research resulted in a web-based personnel management information system that integrates KPI methods to support objective and measurable evaluation of employee performance. The calculation results show a performance achievement of 88.08% which is included in the very good category, while the UAT result of 88% indicates that the system can be well received and in accordance with user needs. The implementation of

this system is able to improve the efficiency of personnel data management, reduce the subjectivity of assessments, and support more transparent and data-based managerial decision-making. However, this study has several limitations, namely the number of UAT respondents who are still limited, the determination of KPI weights that still refer to the company's internal policies without statistical validation, and the scope of the system which is still limited to the performance evaluation function and has not been integrated with other HR modules. Therefore, further research is recommended to involve a wider range of respondents, validate KPI weights using formal methods such as AHP, and integrate the system with attendance, payroll, and career management modules to improve the accuracy, coverage, and generalization of system implementation.

ACKNOWLEDGMENT

The author would like to thank PT Kebon Agung Trangkil for the support and permission given during the research process, especially in providing the necessary data and information. Gratitude was also conveyed to the Information Systems Study Program, Muria Kudus University, as well as the supervisors who have provided direction, input, and academic support so that the research entitled Application of the Key Performance Indicator Method in an Employee Information System can be completed properly.

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