

A DECISION SUPPORT SYSTEM FOR DETERMINING THE BEST EMPLOYEE PERFORMANCE EVALUATION USING THE ANALYTICAL HIERARCHY PROCESS (AHP) METHOD

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Abstract

Employee performance appraisal plays a critical role in organizational decision-making, particularly in determining promotions, bonuses, and competency development. Conventional manual evaluation methods are often subjective, inconsistent, and lack systematic validation. While prior studies have applied multi-criteria decision-making methods in decision support systems (DSS) for employee evaluation, a critical gap remains: most existing systems omit consistency testing, use incomplete weighting procedures, or lack end-to-end system implementation—undermining the reliability of their outputs. To address this gap, this study proposes a novel DSS that integrates a complete Analytical Hierarchy Process (AHP) procedure, including pairwise comparison, normalization, priority weight calculation, and consistency validation, within a fully operational web-based system developed using the SDLC Waterfall model at PT Sam Sam Jaya Garments. Data were collected through observation and interviews to define evaluation criteria and system requirements. The results reveal that Discipline holds the highest weight (0.4391), followed by Target Achievement (0.2661) and Honesty (0.1507), with a Consistency Ratio (CR) of 0.029, confirming reliable judgments. The system successfully ranked ten employees, identifying Cahya Annisyiah as the top performer with a final score of 0.39116. The key contribution of this study lies in its end-to-end integration of AHP with consistency validation into a deployable DSS, directly addressing the methodological shortcomings identified in previous research and enhancing objectivity, accuracy, and transparency in employee performance evaluation.

Keywords: Decision Support System, Analytical Hierarchy Process, Employee Performance Evaluation, AHP, SDLC Waterfall

I. INTRODUCTION

Employee performance appraisal is a critical aspect of organizational efforts to enhance productivity and improve the quality of human resources. A well-designed evaluation system should be objective, measurable, and consistent, as it serves as the basis for strategic decision-making such as promotions, bonuses, and employee development. However, in practice, many organizations still rely on manual and subjective evaluation methods, which often lead to bias, inconsistency, and reduced decision accuracy.

To address these challenges, Decision Support Systems (DSS) have been widely adopted to assist organizations in making structured and data-driven decisions. Employee performance evaluation typically involves multiple criteria with varying levels of importance, making it necessary to apply a Multi-Criteria Decision-Making (MCDM) approach. One of the most widely used methods is the Analytical Hierarchy

Process (AHP), which can decompose complex problems into hierarchical structures, perform pairwise comparisons, and generate priority weights with consistency validation.

The Analytical Hierarchy Process (AHP) is one of the most widely used methods in DSS-related studies due to its ability to decompose complex problems into a hierarchical structure, perform pairwise comparisons among criteria, and provide consistency testing to ensure that the resulting weights are objective and accurate. Numerous studies have demonstrated the flexibility and reliability of AHP across various domains, including the determination of community welfare weights [1], evaluation of toddlers' nutritional status [2], and supplier selection based on the QQCD model [3]. Despite the differences in problem contexts, these studies consistently indicate that AHP is capable of producing rational and consistent priority weights.

Previous research on DSS also indicates that multi-criteria methods such as Simple Additive Weighting (SAW), Fuzzy SAW, and AHP can enhance the objectivity of evaluations and support decision-makers in various scenarios, including employee performance assessment [4], [19]. In the context of performance evaluation, AHP has been shown to generate accurate recommendations that can be used as a basis for reward allocation to improve employee motivation [5]. Similar findings have also been reported in other organizational settings, such as village governance, where DSS implementation resulted in more measurable and efficient assessments compared to manual methods [6].

Several previous studies have applied AHP and other MCDM methods in employee evaluation contexts, yet each presents notable limitations that this study aims to address. Fu'adi and Diana (2022) demonstrated that AHP can effectively support employee selection decisions by producing structured priority rankings [16] however, their work lacks system implementation detail and comprehensive validation, making it difficult to replicate or deploy in real organizational settings. Wijaya and Farisi (2024) applied the Fuzzy SAW method to improve decision objectivity, but their study does not incorporate consistency testing, which is essential to ensure the reliability of the generated weights [17]. Meanwhile, Husnaini (2025) combined AHP and TOPSIS in a DSS framework to enhance decision accuracy [18]. Although these studies confirm the effectiveness of DSS and AHP-based approaches, most of them focus primarily on method application without fully addressing important aspects such as consistency ratio (CR) validation, comprehensive system implementation, and integration with real organizational needs.

In addition, recent international studies also highlight the growing importance of DSS and AHP in decision-making. According to [20], consistency improvement in AHP is essential to ensure reliable decision outcomes [20]. Other studies in high-impact journals emphasize the integration of DSS with robust validation mechanisms and real-world implementation to enhance decision transparency and accountability. However, many existing systems still lack end-to-end implementation, validation of consistency, or use simplified weighting approaches that reduce the reliability of results.

Based on these observations, a clear research gap can be identified: (1) the lack of DSS implementations that fully integrate the complete AHP procedure, including consistency testing; (2) limited studies that combine methodological rigor with real-world system development; and (3) insufficient emphasis on transparency and validation in employee performance evaluation systems.

A systematic review of these studies, as summarized in Table 1, reveals three consistent research gaps. First, no existing study fully integrates the complete AHP procedure including pairwise comparison, normalization, priority weighting, and Consistency Ratio (CR) validation within a functional DSS for employee performance evaluation. Second,

studies that do incorporate AHP either remain theoretical or lack end-to-end system development, while those that include system development rely on simpler methods with reduced accuracy. Third, none of the reviewed studies simultaneously satisfies three critical requirements: methodological rigor (CR validation), comprehensive system implementation (SDLC-based development), and real organizational applicability. This threefold gap directly motivates the present study.

Table 1. Literature Review of Previous Studies

No	Author & Year	Method	Contribution	Limitations
1	Fu'adi & Diana (2022)	AHP	Employee selection using AHP	No system implementation detail, limited validation
2	Wijaya & Farisi (2024)	Fuzzy SAW	Improved objectivity in evaluation	No consistency testing
3	Husnaini (2025)	AHP-TOPSIS	Hybrid DSS approach	Complexity, limited practical implementation
4	Bancin (2022)	SAW	Simple ranking system	Equal weighting, low accuracy
5	Salomon & Gomes (2024)	AHP (theoretical)	Consistency improvement model	Not applied in employee DSS

Based on the limitations identified in previous studies, this research proposes a Decision Support System using the Analytical Hierarchy Process (AHP) with several key improvements. The novelty of this study lies in: (1) the implementation of a complete AHP procedure, including pairwise comparison, normalization, priority weighting, and consistency ratio (CR) validation; (2) the development of a fully functional DSS using the SDLC Waterfall model; and (3) the application of the system in a real organizational context with criteria tailored to company needs.

Therefore, this study aims to develop and implement a DSS based on AHP to determine the best employee in a more objective, consistent, and transparent manner. The results of this study are expected to contribute both theoretically, by strengthening the application of AHP in DSS research, and practically, by providing an effective tool for employee performance evaluation in organizations.

II. METHODS

Operational environment related to the employee performance appraisal process. This observation technique was employed to examine work systems, discipline, attendance patterns, work behavior, and the evaluation mechanisms currently implemented by the company. Through direct observation, the researcher was able to gain an in-depth

understanding of the actual conditions in the field and to identify the criteria used by the company in assessing employee performance.

Interviews were conducted to collect more comprehensive information from company stakeholders, such as managers, supervisors, or human resource personnel who are authorized in the performance evaluation process. A semi-structured interview approach was adopted to allow the researcher to pose core questions while maintaining flexibility to further explore respondents' answers. The collected information included company policies, evaluation criteria, the relative importance (weights) of each criterion, the existing performance appraisal procedures, and the challenges faced by the company in conducting performance evaluations.

These two techniques were selected because they are complementary. Observation provides empirical data regarding the company's actual conditions, whereas interviews offer in-depth insights from individuals directly involved in performance appraisal activities. The combination of these methods ensures that the data used in the AHP processing are valid, accurate, and aligned with the company's requirements [7], [8], [9].

A. Research design

The research design integrates quantitative analysis with system development. The AHP method is used to determine criteria weights and rank employees, while the system is developed using the Software Development Life Cycle (SDLC) with the Waterfall model. This approach ensures that both decision-making and system implementation are carried out systematically and in a structured manner.

B. Data collection

Data were collected through two primary techniques: observation and semi-structured interviews. Observation was conducted directly within the company's operational environment to examine the existing employee appraisal process, encompassing attendance records, work discipline, behavioral indicators, and current evaluation mechanisms.

Interviews were conducted using a semi-structured approach involving 5 key informants, consisting of 1 HR manager, 2 supervisors, and 2 senior staff members who are directly involved in the employee evaluation process. These informants were selected because they have the authority and experience in determining performance criteria and evaluation standards. The interviews aimed to gather information on evaluation criteria, the level of importance of each criterion, and the challenges faced in the current evaluation system.

In addition to interview data, employee performance data were obtained directly from the Human Resources (HR) department of the company. The dataset comprised 60 employee records, covering performance indicators such as attendance, discipline, work quality, teamwork, and initiative. From this dataset, the 10 employees with the highest composite scores were selected as the final decision

alternatives to be ranked using the AHP method. The combination of observation, interviews, and archival HR data ensures that the information used is valid, reliable, and aligned with organizational needs.

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[7], [8], [9]

C. Determination of Pairwise Comparison Values

The pairwise comparison values in the AHP method were determined based on expert judgment obtained from the interview process. The HR manager and supervisors acted as decision-makers (experts) who provided assessments of the relative importance between criteria using the Saaty scale (1–9). The procedure was as follows:

1. Each informant was given a pairwise comparison questionnaire instrument structured according to the defined performance criteria.
2. Informants provided individual judgments for each criterion pair.
3. The individual responses were then aggregated using the Geometric Mean method to produce a single consolidated comparison matrix representing the collective judgment of all respondents.
4. The aggregated matrix was then subjected to a Consistency Ratio (CR) test, with a threshold of $CR \leq 0.1$, to confirm the logical consistency of the expert judgments.

To ensure reliability, the pairwise comparison values were discussed and agreed upon collectively by the informants. The results were then aggregated and used to construct the comparison matrix. This approach ensures that the weighting process reflects actual organizational priorities and reduces subjectivity bias.

D. AHP Procedure

The Analytical Hierarchy Process (AHP) method is a multi-criteria decision-making method developed by Thomas L. Saaty in the 1970s. This method breaks down complex, unstructured problems into a step-by-step hierarchy. In this study, the hierarchy was defined as follows:

1. Goal: Selecting the best-performing employee.
2. Criteria: Derived from HR policies and confirmed through interviews (e.g., attendance, discipline, work quality, teamwork, initiative).
3. Alternatives: 10 employees with the highest scores selected from a pool of 60 employee records obtained from the HR department.

It then compares each element to determine priorities and weights. It is used to determine criteria weights and rank employees [10]. The following are the stages of AHP according to [11].

- 1) Problem Decomposition: Defining the objective (selecting the best employee), criteria, and alternatives.

- 2) Pairwise Comparison: Comparing criteria using the Saaty scale based on expert judgment.
- 3) Matrix Normalization: Normalizing the comparison matrix to obtain relative values.
- 4) Priority Weight Calculation: Determining the weight of each criterion.
- 5) Consistency Testing: Calculating the Consistency Index (CI) and Consistency Ratio (CR) to ensure logical consistency ($CR \leq 0.1$).
- 6) Alternative Ranking: Calculating the final score of each employee based on weighted criteria and determining the ranking.

E. Consistency Testing

Consistency testing is conducted to ensure that pairwise comparisons in the AHP method are consistent and reasonable. According to [12] the importance of consistency testing lies in the following aspects: identifying and preventing unreasonable decisions by detecting errors in thinking that may be overlooked manually, then the consistency limit ($CR \leq 0.10$) ensures that decision-making performs systematic corrections before making a final decision.

F. Flowchart Research

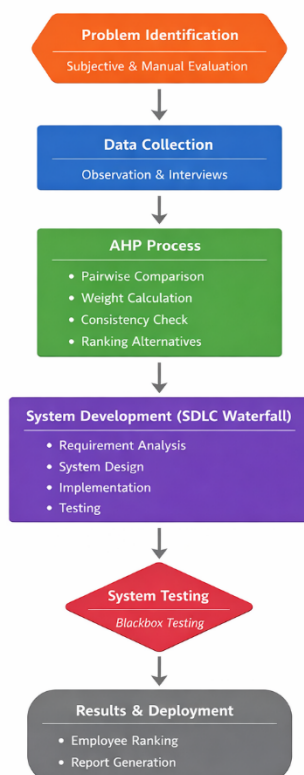


Figure 1. Research Flowchart

The research process is illustrated in a systematic flowchart consisting of several stages. First, the study begins with problem identification, focusing on the subjectivity and inefficiency of manual employee

evaluation. Second, data collection is conducted through observation and interviews with relevant stakeholders. Third, the collected data are processed using the AHP method, including pairwise comparison, weighting, and consistency testing.

Next, the system is developed using the Waterfall model, which includes requirement analysis, system design, implementation, and testing. After the system is successfully tested using Blackbox Testing, the final stage is system deployment and result generation, where the system produces a ranking of employees based on their performance scores. This structured flow ensures that the research process is logical, sequential, and easy to replicate.

G. System Development (Waterfall)

In this study, application development used the Waterfall model Software Development Life Cycle (SDLC) method. The Waterfall model was chosen because of its systematic, sequential flow, which is suitable for projects with clear and stable requirements. Each stage must be completed before proceeding to the next stage, thereby facilitating project management, documentation, and the evaluation process [13]. Here are the stages of the waterfall method.

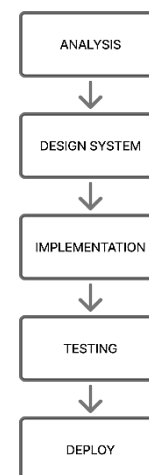


Figure 2. Stages of The Waterfall Method

1) Analysis

At this stage, system requirements are collected through observation and interviews with company representatives. The information collected includes employee assessment procedures, assessment criteria, weightings, and functional and non-functional system requirements. This data is used as the basis for designing an AHP-based decision support system.

2) Design System

The design stage is carried out by creating a system architecture design, database design, and process modeling such as Use Case Diagrams, Activity Diagrams, and AHP Flow Diagrams. This stage aims to

develop the system structure before the implementation process is carried out.

3) Implementation

At this stage, software development is carried out according to the design that has been created. The system is built using the programming language as needed, and integrates the Analytical Hierarchy Process (AHP) method as a calculation engine for employee weighting and ranking.

4) Testing

Testing was conducted using the Blackbox Testing method to ensure that every feature could run as required, including input criteria, AHP weight processing, priority calculations, and the determination of the best employees. Blackbox testing was chosen because it allows for a focus on the functions or features within the system without testing the code, as well as testing efficiency by simplifying the testing conditions to avoid repetitive and unnecessary testing [14], [15].

5) Deploy

After successful testing, the system was implemented in the user environment so that it could be accessed online.

consistent and suitable for use in the subsequent calculation process. 1) CI: 0.036. 2) CR: 0.029

B. Alternatives and Final Value Weighting

Each employee is evaluated using three assessment levels ("Very Good," "Good," and "Poor"), which are subsequently converted into numerical values according to the AHP-derived criterion weights. Furthermore, based on the normalization and weighting results, the total score for each employee is obtained, as presented in the following ranking table.

Table 2. Normalization and Weighting Results

Ranking	NIK	Employee Name	Total Nilai
1	0601231061	Cahya Annisyiah	0.39116
2	0602122278	Lilis Setiari	0.34261
3	0611231423	Sugiyati	0.33255
4	0601252006	Arjuna Putra	0.27841
5	0611156413	Fitri Yuliana	0.27841
6	0603155675	Juwarni	0.27167
7	0606220567	Derita	0.25569
8	0601231046	Ismonah	0.2198
9	0603220454	Dewi Lahagu	0.20975
10	0604252096	Dwi Puttri L	0.16881

III. RESULTS AND DISCUSSION

RESULTS

This study develops a Decision Support System (DSS) designed to determine the best employee by implementing the Analytical Hierarchy Process (AHP) method. The evaluation process is conducted based on six main criteria, namely Attendance (AB), Discipline (DP), Skills (ET), Honesty (HJ), Teamwork (TW), and Target Achievement (TG).

A. Determination of AHP Criteria and Weights

The first stage involves determining the priority of criteria using a pairwise comparison matrix. The results are presented as follows:

Table 1. Priority of Criteria

Priority	Weight Criteria
Discipline (DP)	0.4391
Target (TG)	0.2661
Honesty (KJ)	0.1507
Skills (ET)	0.0754
Cooperation (KM)	0.0415
Absenteeism (AB)	0.0272

Based on the weights obtained above, Discipline emerges as the most important criterion in employee performance evaluation, followed by Target achievement and Honesty. This finding is consistent with company regulations, which emphasize discipline and target attainment as the primary indicators of performance. Furthermore, to ensure the consistency of the assessment, the Consistency Index (CI) and Consistency Ratio (CR) were calculated. The results indicate that the CR value is less than 0.1, confirming that the comparison matrix is

The results of employee rankings generated by the system have several important managerial implications. First, this system can be used as an objective tool to determine the best employees, whether for purposes such as job promotions, bonus awards, or performance evaluations.

The employee with the highest score, Cahya Annisyiah, demonstrated consistent performance at the highest level, particularly in terms of discipline and target achievement. This shows that this employee is worthy of being an example for other employees. Employees with the lowest scores should be given special attention for performance evaluation and improvement.

Subsequently, users input the pairwise comparison values of the criteria to determine the relative importance of each criterion. These values serve as the basis for calculating the criterion weights. The system then performs the AHP computation process, which includes constructing the comparison matrix, normalizing the matrix, calculating priority weights, and conducting a consistency test using the Consistency Ratio (CR). If the CR value exceeds 0.1, users are required to repeat the input process to ensure that the resulting weights are more accurate and consistent.

Once the criterion weights are confirmed to be consistent, users input the alternative scores for each criterion, namely the performance scores of each employee based on the predefined criteria. The system subsequently processes all values by calculating the priority weights of the alternatives, integrating them with the criterion weights, and generating a final score for each employee.

The final stage involves displaying the ranking results. The system presents an ordered list of employees from the

highest to the lowest priority value, thereby enabling the organization to identify the best employee in an objective and measurable manner. Accordingly, this flowchart demonstrates a systematic and integrated workflow in the implementation of the AHP method to support the decision-making process.

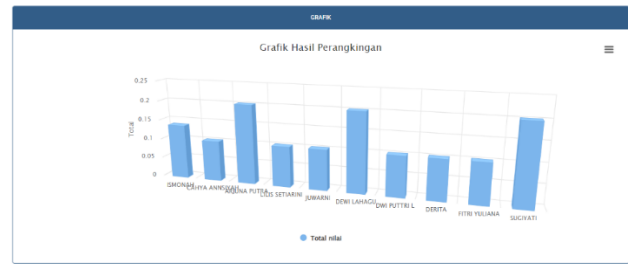


Figure 3. Graph of Ranking Results

C. Testing

Table 3. Testing

NO	Tested Menu	Tested Conditions	Expected Results	Description
1	Login to dashboard	Username and password are correct	Successfully logged into the dashboard	valid
		Incorrect username and password	Failed to log in to the dashboard and an error message appears	valid
2	Logout	Logging out of the dashboard	Successfully logged out	valid
3	Input criteria	Add new criteria	Successfully added criteria data	valid
4	Subcriteria input	Adding new subcriteria	Successfully added new subcriteria	valid
5	Input alternative data	Add new alternative data	Successfully added alternative data	valid
6	Assigning weighted criteria	Assigning weighted criteria	Successfully assigning weighted criteria	valid
7	Assigning alternative weight values	Assigning weight values to alternative data	Successfully assigning weight values to alternative data	valid
8	Calculation	Open the calculation page	The system will automatically display the	Valid

analysis
results,
weighting
results, and
ranking

Based on the research findings, the developed decision support system is capable of providing objective recommendations for identifying the best employee. Cahya Annisya was selected as the best alternative, achieving the highest score of 0.39116. This result is influenced by the employee’s high level of performance consistency across criteria with substantial weights, particularly in the aspects of Discipline and Target achievement.

Conversely, the employee with the lowest score (Dwi Putri L) demonstrates deficiencies in critical aspects that carry high priority weights within the system. The application of the AHP method is proven to be effective in minimizing subjectivity in the evaluation process, as all decisions are based on criterion weights that have been validated through consistency testing (CR = 0.029).

D. Example of Manual AHP Calculation

1) Pairwise comparison matrix

Table 4. Pairwise comparison matrix

Kode	Nama	AB
AB	Absensi	1
DP	Disiplin	9
ET	Keterampilan	4
KJ	Kejujuran	8
KM	Kerjasama	2
TG	Target	9
	Total	33

The first step is to construct a pairwise comparison matrix based on the Saaty scale (1–9), followed by calculating the sum of each column.

Total Column_j = $\sum_{i=1}^n a_{ij}$

Example in the absence column (AB): 1 + 9 + 4 + 8 + 2 + 9 = 33

2) Data Normalization

Each value in the matrix is divided by the total of the corresponding column.

Normalization Value_{ij} = $\frac{a_{ij}}{\text{Total Column}_j}$

Example of normalization on discipline row with absence column.

a) Original Value (\$a_{\{DP, AB\}}\$) = 9

b) Total Column AB = 33

Normalization = $\frac{9}{33} = 0.2727 \dots \approx 0.273$

3) Calculate Priority Weight

Table 5. Calculate Priority Weight

Kode	AB	DP	ET	KJ	KM	TG	Prioritas	CM (Total/Prioritas)
AB	0.03	0.053	0.016	0.016	0.02	0.028	0.0272	6.026
DP	0.273	0.477	0.508	0.508	0.367	0.502	0.4391	6.367
ET	0.121	0.06	0.063	0.063	0.082	0.063	0.0754	6.158
KJ	0.242	0.119	0.127	0.127	0.168	0.125	0.1507	6.158
KM	0.061	0.053	0.032	0.032	0.041	0.031	0.0415	6.099
TG	0.273	0.238	0.254	0.254	0.327	0.251	0.2661	6.261

The priority weight is obtained from the average of the rows in the normalized matrix.

$$W_i = \frac{\sum_{j=1}^n \text{Normalization Value}_{ij}}{n}$$

Where n represents the number of criteria; therefore, in this study, the value of n is 6. An example of calculating the priority weight for the Discipline (DP) criterion is presented as follows:

Based on the DP row data from the normalized matrix table: $(0.273 + 0.477 + 0.508 + 0.508 + 0.367 + 0.502) = 2.635$

Priority (W) = $2.635/6 = 0.4391$ = As illustrated in the figure.

4) Consistency Test

Consistency Index: 0.036
Ratio Index: 1.24
Consistency Ratio: 0.029 (Konsisten)

Figure 3. Consistency Test

a) Calculating the Consistency Index (CI)

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{6.178 - 6}{6 - 1} = \frac{0.178}{5} = 0.0356$$

b) Calculating the Consistency Ratio (CR)

For an $n=6$ matrix order, the Random Index (RI) value of the Saaty table is 1.24, as shown in the figure.

$$CR = \frac{0.0356}{1.24} = 0.0287 \dots \approx 0.029 \text{ Since } CR < 0.1, \text{ the matrix is declared consistent.}$$

DISCUSSION

The results of this study indicate that Discipline holds the highest weight (0.4391), followed by Target Achievement (0.2661) and Honesty (0.1507), with a Consistency Ratio (CR) of 0.029, confirming the reliability of the pairwise comparisons. This weighting pattern is partially consistent with previous studies, yet also reveals important contextual differences that warrant analytical discussion.

From an analytical perspective, the dominance of the Discipline criterion (0.4391) reflects not only the organizational priority of the studied company but also a structural characteristic of labor-intensive or operationally-driven organizations, where employee behavioral consistency directly determines service delivery and output quality. This contrasts with knowledge-intensive or output-driven sectors, where target achievement tends to dominate as evidenced by a

hybrid AHP-WSM study that assigned the highest weight to "achievement of work targets" (0.26), with discipline ranked fourth. The key analytical distinction lies in the nature of work itself: in organizations where operational processes depend on collective employee behavior (attendance, timeliness, procedural compliance), any individual lapse in discipline creates a cascading disruption that cannot be compensated by individual performance outputs alone. This explains why expert respondents in this study consistently rated Discipline above Target Achievement and Honesty in pairwise comparisons, a pattern also confirmed by [21], [22] in similarly operationally-focused environments. Compared to purely output-centric evaluation models, this finding reinforces that behavioral criteria are not subordinate to performance outcomes — they are, in fact, a prerequisite for them.

When compared to prior studies, the variation in criterion weights across AHP-based employee evaluation systems is not an inconsistency it is an expected and theoretically grounded outcome of the AHP methodology itself. Because AHP relies on pairwise comparisons derived from expert judgment, the resulting weights inherently reflect the value system, organizational culture, and strategic priorities of the institution in which the study is conducted. For instance, a study on employee reward evaluation in a technology-driven company found Productivity (0.32) as the highest-weighted criterion and Discipline (0.10) as the lowest, a direct inversion of this study's findings. This divergence is analytically significant: it suggests that organizations with higher task automation and output measurability tend to shift evaluative emphasis toward quantifiable performance outcomes, whereas organizations with high human-operational dependency weight behavioral attributes more heavily. Similarly, [23] reported target achievement as the dominant criterion in a combined AHP-TOPSIS model, likely because their study context involved sales or project-based roles where individual output is directly traceable. These cross-study differences, therefore, are not methodological weaknesses they demonstrate AHP's core strength as a context-sensitive, organization-specific decision support tool that avoids one-size-fits-all evaluation frameworks.

The consistency ratio (CR = 0.029) achieved in this study is notably low, indicating a high degree of logical coherence in expert judgments significantly below the acceptable threshold of 0.1 established by Saaty. To contextualize this analytically, comparative studies show that achieving low CR values in practice can be challenging: one AHP-based performance evaluation study reported an initial CR of 14.9%, which only became acceptable after replacing the questionnaire method with structured interviews. Another study using AHP for employee reward determination reported a CR of 0.08 still acceptable, but nearly three times higher than this study's value. Notably, a recent study by [24] applying AHP for continuous performance evaluation of employees reported CR values ranging from 0.023 to 0.043, indicating that well-structured AHP instruments can achieve low CR values comparable to

those obtained in the current study. The low CR in this study can be attributed to two factors: first, the use of a structured, guided pairwise comparison instrument that reduced cognitive inconsistency among respondents; and second, the relatively focused set of criteria, which reduces the cognitive load on experts and thereby improves judgment consistency. This has a direct methodological implication: a lower CR not only validates the weight distribution but also means that the AHP model produces rankings that more faithfully represent expert priorities, thereby strengthening the reliability of the resulting employee rankings as a basis for managerial decisions.

From a managerial perspective, the findings of this study have several important implications. First, management can use the results to prioritize discipline-related policies, such as attendance monitoring, enforcement of work rules, and employee accountability systems. Second, the DSS developed in this study can support objective and transparent decision-making, reducing subjectivity in employee appraisal processes. Third, the ranking results can be used as a basis for strategic decisions, including promotions, rewards, and training programs.

Second, the DSS developed in this study can support objective and transparent decision-making, reducing subjectivity in employee appraisal processes — a benefit widely recognized in the AHP-HRM literature. A systematic review by Salehzadeh and Ziaecian (2024), covering 180 empirical studies, confirmed that AHP-based approaches consistently improve fairness and objectivity across various HRM domains including performance appraisal, reward management, and employee selection [25]

Furthermore, the high weight of discipline suggests that management should not only focus on performance outcomes but also strengthen behavioral and cultural aspects within the organization. This can be achieved through internal policies, performance incentives, and continuous evaluation systems. By integrating the DSS into routine HR processes, organizations can ensure a more consistent and data-driven evaluation approach.

Overall, this study not only confirms the effectiveness of the AHP method in employee performance evaluation but also highlights the importance of aligning evaluation criteria with organizational priorities. The combination of structured decision-making, consistency validation, and system implementation provides a comprehensive solution that enhances accuracy, fairness, and transparency in employee assessment.

IV. CONCLUSION

This study demonstrates that a Decision Support System (DSS) using the Analytical Hierarchy Process (AHP) provides a structured, objective, and consistent approach to employee performance evaluation. The findings reveal that behavioral factors particularly discipline carry significant weight in the assessment process, reflecting organizational priorities in sustaining productivity and operational stability.

The primary scientific contribution of this study lies in the empirical validation of consistency-ratio-based judgment verification as a mandatory step in DSS-AHP implementation for human resource management. Unlike prior studies that treat consistency checks as optional, this research establishes that omitting this step undermines the logical soundness of decision outcomes, thereby proposing a more rigorous methodological standard for AHP-based DSS development. This contribution advances both the theoretical foundation of multi-criteria decision-making (MCDM) and its practical application in HR evaluation systems.

In terms of practical implications, the system enables management to make transparent, data-driven decisions on promotions, rewards, and development programs while minimizing subjectivity and bias. Organizations are also encouraged to formally embed discipline and behavioral metrics into their performance evaluation frameworks.

This study is constrained by a single organizational context, a limited criterion set, and a small respondent pool, which restricts generalizability. Future research should therefore (1) expand the criterion set to include competency-based indicators, (2) develop hybrid MCDM models specifically AHP-TOPSIS or fuzzy-AHP to handle uncertainty in subjective judgments, (3) validate the model across multiple organizational sectors such as manufacturing and healthcare, and (4) integrate real-time data pipelines and machine learning modules to enable adaptive, AI-assisted performance evaluation at scale.

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