Designing and Implementing COPRAS Decision Support System for Employee Performance Assessment

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Abstract
Employee performance evaluation remains a critical yet challenging process in organizations, particularly due to the persistence of subjectivity and inconsistent judgment across evaluators. In software house environments, where performance is influenced by both technical output and behavioral factors such as collaboration, communication, and initiative, the need for a structured and data-driven approach becomes increasingly important. This research aims to address these challenges by applying a multi-criteria decision-making approach to support employee performance assessment in a more systematic and transparent manner. The research adopts the Rapid Application Development (RAD) method to design and implement a decision support system, enabling iterative development and active user involvement. A case study was conducted in a software house company with approximately 80 employees across Sales, HRD, and IT departments. Performance evaluation was structured using five criteria, and the COPRAS method was applied to process the data, including normalization, weighting, and ranking of employees. Sensitivity to criteria weights was also considered to understand the robustness of the decision outcomes. The results show that the system successfully generates consistent and interpretable rankings, with clear differentiation between employees based on weighted performance indicators. The selected criteria were found to align well with the characteristics of software development work, supporting both technical and collaborative aspects of performance. Moreover, although the input data contains subjective elements, the use of a structured model allows the results to be objectively justified and transparently explained. Overall, the research demonstrates that integrating COPRAS into an information system can enhance fairness, consistency, and decision quality in employee performance evaluation, while bridging the gap between theoretical models and practical organizational needs

1. Introduction

Employee performance evaluation has been widely acknowledged as a fundamental process in organizational management, yet its implementation has often been influenced by subjective judgment. In many organizational settings, performance appraisal has been conducted through managerial perceptions, informal observations, and partially structured criteria, which may introduce cognitive bias, halo effects, and inconsistency across evaluators. Such subjectivity has been reported to reduce the accuracy and fairness of evaluation outcomes, thereby affecting employee trust, motivation, and organizational effectiveness. It has also been observed that even formally designed appraisal systems may still be interpreted differently by evaluators, resulting in variability that weakens decision reliability [1], [2], [3]. Consequently, the need for more structured and objective evaluation approaches has been increasingly emphasized in management research.

The complexity of employee performance itself has further intensified this challenge. Performance has not only been defined in terms of measurable outputs but has also been associated with behavioral dimensions such as teamwork, communication, initiative, and responsibility [4], [5] . These multidimensional attributes have required organizations to adopt evaluation frameworks that can integrate diverse criteria simultaneously. However, without systematic modeling, such multidimensionality has often led to disproportionate emphasis on certain criteria while others remain underrepresented. As a result, performance assessments may fail to capture the holistic contribution of employees. It has been suggested that comprehensive evaluation models are necessary to ensure that all relevant dimensions are adequately considered in decision-making processes [6], [7].

In response to these limitations, multi-criteria decision-making (MCDM) approaches have been increasingly introduced as a methodological solution to support performance evaluation. These approaches have been designed to structure complex decision problems by incorporating multiple criteria, each associated with a specific weight, into a unified analytical framework [8], [9]. Through mathematical modeling and systematic comparison, MCDM methods have enabled decision-makers to reduce reliance on intuition and enhance transparency and consistency in evaluation processes. In the context of employee performance assessment, such methods have been considered particularly relevant because they allow qualitative and quantitative indicators to be transformed into comparable scales, thereby facilitating more rational and data-driven decisions [10], [11], [12].

Despite these advantages, a critical issue has remained in the determination and stability of criterion weights within MCDM models. The assignment of weights has often been influenced by managerial preferences, organizational priorities, or contextual factors, which may vary over time. It has been indicated that even minor variations in weight distribution can lead to significant changes in ranking outcomes, raising concerns regarding the robustness and reliability of the evaluation system [13]. Therefore, sensitivity analysis has been regarded as an essential step to examine how variations in weights affect decision results. In employee performance evaluation, where decisions may influence promotions, compensation, and career trajectories, ensuring the stability and defensibility of outcomes becomes crucial. Understanding the sensitivity of MCDM-based evaluations is thus necessary to support more consistent, fair, and accountable decision-making processes in organizations [14], [15].

The novelty of the present research is positioned in the use of a fully implemented employee performance appraisal application as an empirical testbed for examining how ranking outcomes shift when criterion weights are varied. COPRAS is particularly relevant here because it has been described as a utility-based ranking approach that works through weighted proportional calculations while considering the nature of each criterion, and its simplicity and interpretability have been repeatedly emphasized in recent studies [16], [17]. In a performance evaluation context, this is important because the appraisal process can be moved away from impression-based judgment toward a more structured and data-driven ranking logic, so that managerial decisions can be observed, explained, and defended more clearly. In addition, comparative evidence has shown that COPRAS can produce rankings that are competitive with other established MCDM methods [18], which

strengthens its suitability for employee assessment settings where transparency and practical usability are required.

The research gap is formed by the fact that subjective performance evaluation has remained an active topic in the literature, yet most studies have concentrated on describing appraisal bias, reviewing the topic broadly, or comparing ranking methods, rather than testing the robustness of the final ranking inside an operational decision support system [19]. Sensitivity research in MCDM has shown that ranking outcomes may change when matrix values, normalization procedures, or weighting schemes are altered, and TOPSIS has also been reported to be sensitive to normalization and weight choices. However, far fewer studies have connected that robustness problem directly to employee performance appraisal, where the consequences are managerial and strategic at the same time [19]. This opens a clear space for a COPRAS-based study that does not stop at producing a rank order, but also tests whether the rank order remains stable, interpretable, and decision-ready under realistic weight variations

Among the available MCDM techniques, COPRAS is especially appropriate for employee performance appraisal because alternatives are evaluated proportionally through both benefit and cost criteria, and the final utility score is produced in a form that is easy to interpret for managerial ranking decisions [20]. The method has been described as a utility-based ranking approach, and its computation has been considered relatively direct compared with models that depend heavily on pairwise comparisons or distance calculations [18]. By contrast, AHP has been criticized because its reliance on pairwise comparisons can introduce subjectivity and inconsistency as the number of criteria grows, while TOPSIS has been shown to be sensitive to weighting and normalization choices [18] . In comparative studies, COPRAS has also been found to produce rankings that are closer to benchmark results in some practical cases, which strengthens its relevance for employee appraisal contexts where ranking stability, transparency, and the reduction of subjective bias are required .

This research focuses on a common problem in organizations, namely the use of subjective judgment in employee performance evaluation. For this reason, the research is carried out in a real company (a software house based on Malang, East Java, Indonesia), where the current appraisal process will be observed and analyzed to understand how decisions are made. The criteria used, the assessment flow, and the way results are determined will be examined carefully. After that, the performance data will be arranged into a structured multi-criteria model so that the evaluation process becomes more consistent and systematic. In this way, the research is not only theoretical, but also directly addresses a real problem faced by organizations, especially related to fairness and accuracy in decision-making.

In addition, this research aims to provide a practical solution by developing a prototype information system based on the COPRAS method. The system will support the entire evaluation process, including data input, weighting of criteria, calculation, and ranking results. With this system, performance evaluation can be carried out more transparently and consistently. By combining real case analysis, sensitivity testing, and system development, this study is expected to offer both academic and practical contributions. It not only explains the problem, but also provides a solution that can be directly used in organizational decision-making.

2. Research Methods

Employee performance evaluation has been widely treated as one of the most important decision processes in human resource management, because it affects performance management, employee selection, rewards, and development decisions. In the HRM literature, decision-making has been shown to play a central role in organizational effectiveness, and multi-criteria approaches have been frequently applied in domains such as performance appraisal and human resource selection [9], [20] . At the same time, performance evaluation has often been affected by subjectivity, and subjective judgments have been found to weaken perceptions of interactional, procedural, and distributive justice among employees [1], [21]. For this reason, the appraisal process has increasingly required a more structured and transparent decision model, especially when several criteria must be considered at once. Within this context, COPRAS is relevant because it has been presented as a systematic and effective MCDM method for evaluating alternatives, and its use has been extended to real

decision problems in business and management settings [22], [23], [24]. Its proportional utility logic is especially suitable for employee appraisal, where alternatives must be ranked based on several criteria that may not all move in the same direction.

COPRAS has also been connected to personnel decision problems through empirical studies in which employee or candidate selection was treated as a multi-criteria problem [25]. In a personnel selection case in Iran, AHP was used for weighting and COPRAS-G was used for ranking, showing that the method can be operationalized in HR-related decisions where multiple competencies must be balanced [26]. Similar work has shown that COPRAS can be combined with AHP to handle uncertain and vague information, while still producing a clear final ranking that can be understood by managers [27]. Compared with AHP, which is widely used in HRM but depends on pairwise comparisons for weight derivation, COPRAS is often positioned as the ranking stage that turns weighted criteria into an interpretable utility score for decision support [28]. This makes COPRAS particularly relevant for employee performance evaluation, because it can reduce reliance on purely subjective judgment while still remaining practical for organizational use.

In a performance evaluation process such as the one reflected in the application interface, employee assessment can be carried out by first defining several criteria that represent the company's expectations, such as work target achievement, responsibility, teamwork, communication, initiative, discipline, or punctuality [29]. After the criteria are set, each employee can be given a score for every criterion using a uniform scale, so that the data can be compared in a structured way. This kind of scoring design has been used in employee performance studies to transform qualitative judgment into measurable values, and it has been shown that multi-criteria models can support the creation of clearer scoring guidelines and performance categories. In practice, the assessment is then no longer dependent on a single supervisor's impression, because the rating results are arranged into a more systematic matrix that can be processed objectively in the decision support system.

After the scores are entered, the weights of each criterion can be assigned based on organizational priorities, and the weighted results can be processed to generate a final ranking of employees. In studies that applied COPRAS-based systems, the appraisal process was described as more transparent, more consistent, and more suitable for managerial decisions such as rewards, contract extension, and employee development. The same logic can be reflected where the system can calculate, rank, and display results in a way that is easy for managers to read and explain. Because subjective manual appraisal has been repeatedly associated with unfairness and inconsistent judgment, the use of a structured scoring interface supported by MCDM offers a practical way to reduce bias while still keeping the evaluation aligned with real organizational needs.

In this research, the development of the employee performance evaluation system is conducted using the Rapid Application Development (RAD) method. RAD has been widely recognized as a software development approach that emphasizes speed, user involvement, and iterative prototyping, making it particularly suitable for systems that require quick adaptation to user needs [30]. Instead of following a rigid and sequential process, RAD allows system components to be developed and refined through continuous interaction between developers and users. This approach is considered effective in reducing development time while ensuring that the resulting system aligns closely with organizational requirements. In the context of this research, RAD is appropriate because the system must accommodate dynamic criteria, flexible weighting, and user-friendly interfaces for decision-making processes in human resource management [31], [32]

The RAD method generally consists of several key components or phases, namely requirements planning, user design, construction, and cutover. In the requirements planning phase, system objectives, user needs, and evaluation criteria are identified through direct interaction with stakeholders. This is followed by the user design phase, where prototypes are created and continuously refined based on user feedback, allowing the system interface and functionality to evolve iteratively. The construction phase focuses on the actual development of the system, including coding, integration of decision-making models, and testing. Finally, the cutover phase involves system implementation, user training, and deployment in the organizational

environment. These components enable a flexible yet structured development process, ensuring that the system can be delivered efficiently while maintaining quality and usability [30]

In the **requirements planning phase**, the research was conducted in a software house company with approximately 80 employees, consisting of three main departments: Sales, HRD, and IT. At this stage, data were collected through discussions and observations involving key stakeholders from each department to understand how employee performance evaluation was currently carried out. It was identified that each department had slightly different expectations and performance indicators, for example, Sales focused on target achievement, HRD emphasized discipline and compliance, while IT highlighted problem-solving and technical contribution. These differences required a unified evaluation framework that could accommodate multiple criteria while still reflecting organizational priorities. As a result, system requirements were formulated to include flexible criteria management, weighting mechanisms, and structured performance input.

In the **user design phase**, prototypes of the system interface were developed and iteratively refined based on feedback from users across the three departments. The involvement of employees and managers from Sales, HRD, and IT ensured that the system design remained aligned with actual user needs. For instance, the input forms were adjusted to simplify the scoring process, while the criteria and weighting interface was designed to be easily configurable by HRD. During this phase, several iterations were carried out, where users interacted directly with the prototype and provided feedback regarding usability, clarity of information, and relevance of features. This iterative approach allowed the system to evolve gradually, reducing the gap between technical design and practical usability.

The **construction phase** involved the development of the full system based on the validated design. The application was built to handle employee data, criteria management, weighting, and performance calculation processes within an integrated environment. Data from approximately 80 employees across Sales, HRD, and IT departments were used to test the system functionality. At this stage, the decision-making model was embedded into the system to process the evaluation data and generate ranking results automatically. System testing was also conducted to ensure that calculations were accurate, features were functioning properly, and the system could handle real-world data scenarios without errors.

Finally, in the **cutover phase**, the system was implemented in the company environment and prepared for actual use. Users from Sales, HRD, and IT departments were introduced to the system through basic training sessions, focusing on how to input data, adjust criteria weights, and interpret ranking results. The transition from manual or semi-structured evaluation to a system-based approach was carefully managed to ensure user acceptance. Feedback was also collected after implementation to identify any necessary improvements. Through this phase, the system was not only deployed as a prototype but also positioned as a practical tool that could support more consistent and transparent employee performance evaluation within the organization.

The determination of evaluation criteria in this research was carried out through a structured identification process involving managerial representatives from the Sales, HRD, and IT departments. Based on this process, five main criteria were established, namely collaboration and teamwork (C1), task completion activity (C2), work communication (C3), responsibility and role-taking (C4), and initiative and creativity (C5). These criteria were selected because they reflect both behavioral and performance aspects that are considered essential in a modern organizational environment. It was observed that all selected criteria were categorized as benefit criteria, meaning that higher values indicate better performance. This classification simplifies the evaluation process and ensures consistency in the interpretation of scores across different departments. The use of clearly defined and measurable criteria allows employee performance to be assessed more objectively compared to traditional appraisal methods that often rely on subjective judgment.

Furthermore, the weighting process demonstrated how organizational priorities are translated into measurable importance levels for each criterion. As shown in the system, initiative and creativity (C5) received the highest normalized weight (29.63%), followed by collaboration and teamwork (25.93%), task completion activity (18.52%), communication (14.81%), and responsibility (11.11%). This distribution indicates that the company places strong emphasis on proactive behavior and innovation, while still maintaining the importance

of teamwork and task execution. The normalization process ensures that the total weight equals 100%, allowing proportional comparison across criteria. From an analytical perspective, this weighting structure plays a crucial role in shaping the final ranking results, as criteria with higher weights exert greater influence on decision outcomes. Therefore, the selection and weighting of criteria are not merely technical steps, but strategic decisions that reflect organizational values and directly impact the fairness and effectiveness of employee performance evaluation.

Table1. Criteria and Weight

Code	Criteria	Type	Raw Weight	Normalized Weight (%)
C1	Collaboration & Teamwork	Benefit	7.0	25.93%
C2	Task Completion Activity	Benefit	5.0	18.52%
C3	Work Communication	Benefit	4.0	14.81%
C4	Responsibility & Role Taking	Benefit	3.0	11.11%
C5	Initiative & Creativity	Benefit	8.0	29.63%
Total	—	—	**27.0**	**100.00%**

3. Result and Discussion

The COPRAS calculation process begins by forming a decision matrix based on the employee performance scores shown in the system. Each employee is treated as an alternative, while the five criteria (C1–C5) represent the evaluation dimensions, all categorized as benefit criteria. The first step involves normalizing the decision matrix by dividing each value by the total value of its respective criterion column. After normalization, each value is multiplied by its corresponding normalized weight, resulting in a weighted normalized matrix. For example, for the first employee (Andi Pratama), each score such as 9.8 (C1), 10.0 (C2), 5.2 (C3), 6.5 (C4), and 8.8 (C5) is first normalized against the total of each column, then multiplied by the weights (25.93%, 18.52%, 14.81%, 11.11%, and 29.63%). This process ensures that all criteria contribute proportionally according to their importance.

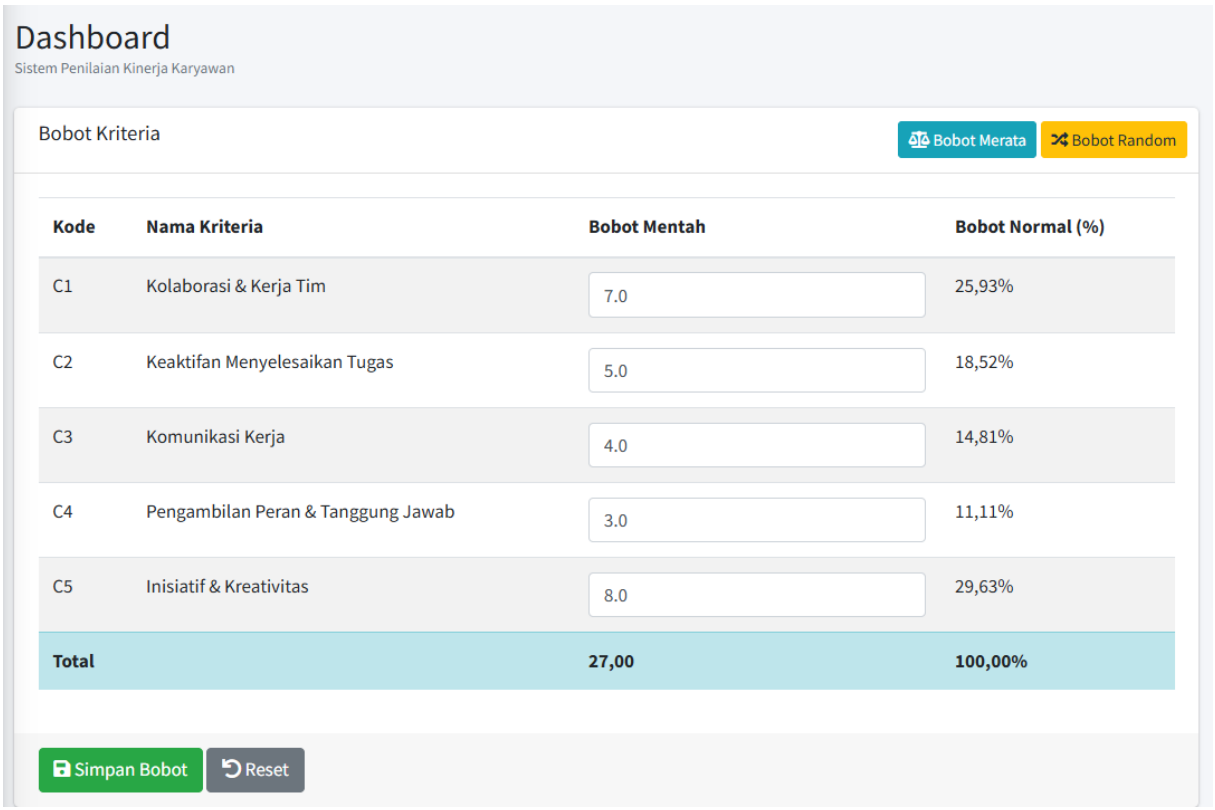

Fig 1. Weight and Criteria Form

Since all criteria are classified as benefit, the COPRAS method simplifies the next step by summing all weighted normalized values for each employee to obtain the utility score. There is no need to separate cost and benefit components in this case. The employee with the highest total score is considered the best-performing alternative. Based on the simulation, employees who consistently achieve high scores in dominant criteria such as initiative and teamwork will obtain higher final values, significantly influencing their ranking position. This demonstrates how COPRAS not only aggregates multi-criteria data but also reflects organizational priorities embedded in the weighting structure, resulting in a transparent and systematic ranking of employee performance.

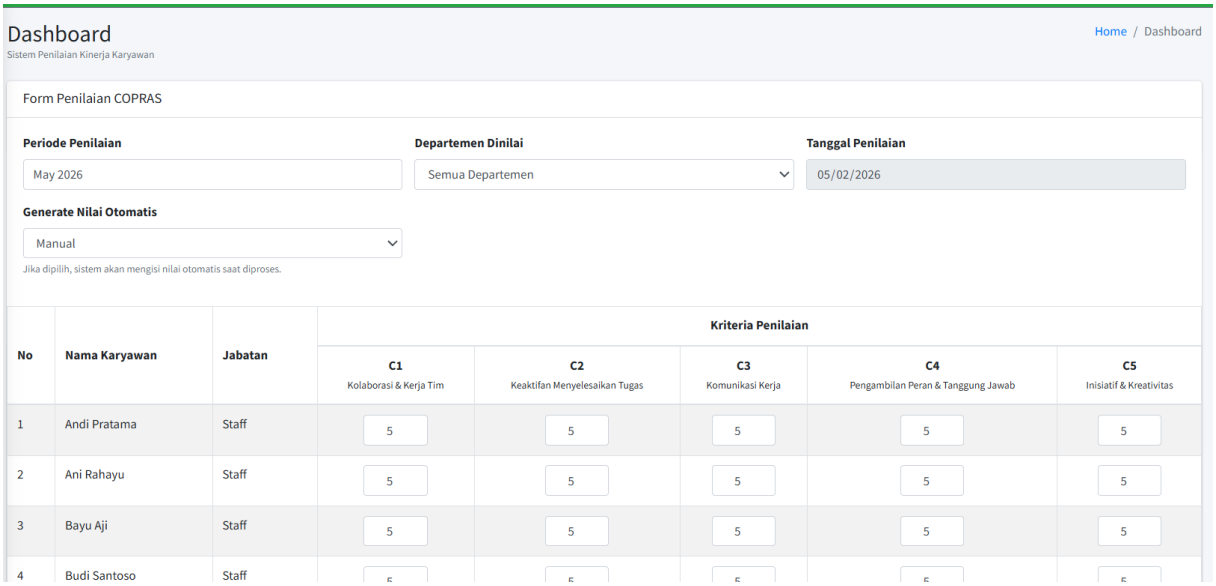

Fig 2. Criteria Scoring Form

The COPRAS output shows that the employee performance ranking was successfully generated based on the five benefit criteria used in the system. The highest-ranked employee in the displayed result is **Iwan Setiawan** with a **Summary (%) of 100.00%**, followed by **Ani Rahayu** at **96.01%** and **Siti Aisyah** at **95.58%**. These results indicate that the system does not only calculate scores, but also converts them into a clear ranking order that can be used directly by the HR administrator. Since all criteria were treated as benefit criteria, employees with stronger and more balanced scores across the weighted indicators obtained better final positions.

From a managerial point of view, the output is useful because the differences between employees are shown in a structured and transparent way. The results also show that employees from different departments can be compared using the same standard, which helps reduce subjectivity in appraisal. The category column, which shows **Sangat Baik (Very Good)**, gives an additional interpretation layer that makes the ranking easier to read for decision-makers. Overall, the COPRAS result supports performance evaluation by turning raw assessment data into an ordered decision output that can be used for reward, promotion, or further development planning.

Table 2. Ranking Summary Table Sangat Baik (Very Good)

Rank	Employee Name	Position	Department	Summary (Qi)	Summary (%)
1	Iwan Setiawan	Staff	Sales	0.06	100.00%
2	Ani Rahayu	Staff	Sales	0.06	96.01%
3	Siti Aisyah	Staff	Sales	0.06	95.58%
4	Fitriani	Manager	HRD	0.06	94.36%
5	Lia Kusuma	Staff	IT	0.05	92.43%
6	Rizki Ramadhan	Staff	IT	0.05	92.21%
7	Dewi Kusuma	Staff	IT	0.05	91.91%
8	Andi Pratama	Staff	HRD	0.05	91.64%
9	Budi Santoso	Staff	Sales	0.05	90.83%
10	Dedi Kurniawan	Staff	HRD	0.05	90.23%
11	Ratih Kusumawati	Staff	Sales	0.05	88.54%
12	Irfan Maulana	Supervisor	IT	0.05	87.97%
13	Bayu Aji	Staff	Sales	0.05	87.52%

Rank	Employee Name	Position	Department	Summary (Qi)	Summary (%)
14	Eko Susilo	Staff	Sales	0.05	87.34%
15	Dedi Jayadi	Supervisor	IT	0.05	86.29%

The calculation process using the COPRAS method begins with the normalization of criterion weights. The raw weights assigned to each criterion are first summed to obtain the total weight, expressed as $\sum w_j = 27$. Each individual weight is then normalized using the formula:

$$w_j' = \frac{w_j}{\sum w_j}$$

As a result, the normalized weights are obtained as 0.2593 (C1), 0.1852 (C2), 0.1481 (C3), 0.1111 (C4), and 0.2963 (C5). These normalized weights indicate the relative importance of each criterion in the evaluation process, where higher values imply greater influence on the final decision. In this case, initiative and creativity (C5) contribute the most, followed by collaboration and teamwork (C1). The next step involves normalizing the decision matrix, where each employee's score is divided by the total score of the corresponding criterion. This process is carried out using the formula:

$$r_{ij} = \frac{x_{ij}}{\sum x_j}$$

For example, for Andi Pratama, the normalized values are calculated as 0.0880 (C1), 0.0727 (C2), 0.0463 (C3), 0.0637 (C4), and 0.0669 (C5). These normalized values are then multiplied by the normalized weights to obtain the weighted normalized matrix using:

$$q_{ij} = r_{ij} \times w_j'$$

The results of this multiplication are 0.0228, 0.0135, 0.0069, 0.0071, and 0.0198 for C1 to C5, respectively. Since all criteria are categorized as benefit criteria, the total performance score is calculated by summing all weighted values using:

$$S_i = \sum q_{ij}$$

Thus, the final score for Andi Pratama is:

$$S_i = 0.0700$$

The final stage of the COPRAS method is the calculation of the utility degree, which reflects the relative performance of each alternative compared to the best-performing one. This is calculated using the formula:

$$U_i = \frac{S_i}{S_{max}} \times 100\%$$

Assuming that the highest score in the dataset is $S_{max} = 0.0703$, the utility value for Andi Pratama is:

$$U_i = \frac{0.0700}{0.0703} \times 100\% = 99.64\%$$

This result indicates that the employee's performance is very close to the optimal alternative. Overall, the COPRAS method is able to systematically transform multi-criteria evaluation data into a proportional ranking, providing a transparent and reliable basis for decision-making in employee performance assessment.

Discussion

The appraisal results can have a practical impact because they convert employee performance into a structured ranking that is easier for managers to read, compare, and act on. In a software house, this is especially relevant because work is usually cross-functional and depends heavily on teamwork, communication, mutual trust, shared leadership, and adaptability; these are the very elements identified as central to effective agile software teamwork. Research has also shown that teamwork quality has a positive effect on team performance and work satisfaction in software development, while requirements uncertainty and conflict can weaken team effectiveness [33]. In that sense, criteria such as collaboration, communication, responsibility, and initiative are not random choices, but a close fit to the way software teams actually operate. A more structured appraisal also helps reduce subjectivity, which is important because subjective judgment can weaken employees' perceptions of fairness in performance appraisal.

From a managerial angle, the impact becomes even clearer because the ranking can be used as a basis for reward allocation, promotion, coaching, and workload adjustment in a more transparent way. Employees who score higher are not only recognized as stronger performers, but the system also makes it easier to see which criteria contribute to that result, so the assessment can be explained rather than simply announced [34]. For the software house case, this matters because high performance is often built on how well someone works with others, responds to change, communicates progress, and takes initiative when technical problems appear [35]. The selected criteria therefore support both fairness and organizational fit, since they reflect the social and technical demands of software work while also giving management a more defensible basis for decision-making [33].

Building on the established criteria and the implemented system, performance appraisal can still involve subjective judgment while remaining objectively justifiable. In practice, managers continue to provide scores based on their observations and experience, which cannot be fully eliminated from human-centered evaluation processes. However, once these judgments are translated into structured criteria and processed through a formal decision model, the subjectivity becomes bounded and traceable. Research has shown that structured performance appraisal systems improve clarity and consistency because evaluation standards are explicitly defined and applied across individuals [6]. As a result, even though the initial input may contain subjective elements, the final decision is supported by a transparent and replicable computational process.

Furthermore, the use of clearly defined criteria aligned with organizational roles helps ensure that subjective assessments remain relevant and grounded in actual job requirements. In a software house environment, where performance often involves intangible aspects such as collaboration, adaptability, and initiative, fully objective measurement is difficult to achieve. Therefore, combining subjective ratings with structured evaluation models becomes a practical solution. It has been emphasized that performance management systems should integrate both judgment and measurement, as over-reliance on purely objective metrics may overlook important behavioral contributions [1]. By embedding these criteria into a system that standardizes scoring and weighting, the organization is able to maintain contextual relevance while improving fairness.

In addition, the presence of a system-based calculation mechanism allows decision outcomes to be justified through data rather than personal opinion alone. Each ranking result can be traced back to specific criteria values and weights, making the evaluation process more defensible when questioned by employees or management. Studies in decision support systems have indicated that transparency and traceability are key factors in increasing user trust and acceptance of automated decisions [36]. Therefore, even though the evaluation originates from subjective inputs, the integration of structured criteria and computational methods

ensures that the final results can be explained logically and consistently. This balance between subjective judgment and objective justification represents a practical advancement in employee performance evaluation within data-driven organizational environments

4. Conclusions

The findings of this research suggest that the real value of a data-driven performance appraisal system does not lie merely in producing rankings, but in reshaping how managerial judgment is structured and justified. By embedding multi-criteria evaluation into a computational framework, subjective assessments are not eliminated but transformed into inputs that can be systematically processed, compared, and explained. This creates a middle ground where human insight and analytical rigor coexist, allowing organizations to retain contextual understanding while improving consistency. In this sense, the contribution of the approach extends beyond technical calculation, as it redefines performance evaluation as a transparent decision process rather than a purely intuitive one.

At a broader level, the integration of COPRAS within an operational information system demonstrates how data science methods can be translated into practical management tools that directly support organizational decision-making. The alignment between selected criteria and the nature of work in a software house further reinforces the importance of contextual relevance in model design. Rather than imposing rigid quantitative metrics, the system adapts to the behavioral and collaborative dimensions of modern work environments. This indicates that effective performance evaluation is not solely about accuracy, but about balancing fairness, interpretability, and applicability. Ultimately, the research highlights that when methodological rigor is combined with organizational context, decision support systems can evolve from passive tools into active instruments that shape more accountable and data-informed management practices

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