ELKOM (Jurnal Elektronika dan Komputer)
p-ISSN : 1907-0012 (print) e-ISSN : 2714-5417 (online)
Vol. 19, No. 1, Juli 2026
https://journal.stekom.ac.id/index.php/elkom

Development of a Digital-Based 360-Degree Performance Appraisal System to Enhance the Objectivity of Employee Evaluation

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Article Info

Article history:

Received May 8, 2026
Revised June 20, 2026
Accepted June 28, 2026
Available: July 1, 2026
Published: July 30, 2026

Keywords:

360-Degree;
Performance;
Appraisal;
Web-Based Systems;
Digital

ABSTRACT

Employee performance appraisal is a strategic instrument in human resource management that directly influences competency development, job promotion, and remuneration policies. However, conventional top-down appraisal systems are often confronted with issues of subjectivity, evaluator bias, and limited transparency in the evaluation process. This study aims to develop a digital-based 360-degree performance appraisal system that integrates multi-source perspectives, including supervisors, peers, subordinates, and self-assessment, within a unified platform. The study employed an Agile-based system development method using an iterative approach, supported by data collection techniques consisting of literature review, business process observation, and in-depth interviews with stakeholders within higher education institutions. The system was designed using a web-based architecture with role-separated modules, a role-based access control (RBAC) authentication mechanism, and score normalization algorithms to ensure assessment consistency. The testing results indicate that the system successfully improves evaluation objectivity through standardized weighting distribution, enhances transparency through audit trail and real-time reporting features, and accelerates the recapitulation process by up to 78% compared to manual methods. Furthermore, the system effectively reduces single-evaluator bias and strengthens accountability in human resource management decision-making. This study concludes that the digitalization of 360-degree performance appraisal functions not merely as an automation tool, but as a strategic instrument for establishing a fair, transparent, and data-driven evaluation culture.

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1. INTRODUCTION

In the contemporary organizational landscape, Human Resource Management (HRM) has evolved from a mere administrative function into a vital strategic partner, central to the realization of institutional goals. At the heart of this ecosystem lies the performance appraisal a critical mechanism designed not only for administrative decision-making but for the profound development of human potential (Abraham et al., 2024). Ideally, these evaluations serve as a foundation for competency development, professional growth, and organizational justice. However, traditional performance assessment systems often remain tethered to conventional, unidirectional, "top-down" approaches where a single supervisor acts as the sole arbiter of merit (Iqbal et al., 2025). This hierarchy is inherently susceptible to subjective biases, such as the halo effect or leniency errors, which ultimately obscure a true understanding of an individual's contribution and stifle employee motivation (Bapar et al., 2024).

The limitations of conventional systems are not merely methodological but also operational. Manual or semi-digital processes characterized by static reporting and spreadsheet-based tracking are frequently time-consuming and prone to human error (Prayoga et al., 2025). Such inefficiencies lead to a lack of real-time data visibility, which can hinder agile decision-making and erode the trust necessary for a healthy organizational climate (Khadim et al., 2023). In an era defined by digital transformation, a reliance on these fragmented processes creates an "information gap" that prevents organizations from accurately analyzing employee competencies or predicting future talent needs (Balakayeva et al., 2023).

The 360-degree assessment, often referred to as multisource feedback (MSF), offers a holistic alternative by gathering performance data from a diverse circle of observers, including supervisors, peers, subordinates, and the employees themselves through self-assessment (Lockyer & Sargeant, 2022). By democratizing the source of evaluation, this method fosters a culture of transparency, accountability, and heightened self-awareness (Abraham et al., 2024). Yet, the human complexity of managing multiple evaluators and varied instruments often results in a significant administrative burden. Without the support of a sophisticated, role-based information system, the transition to 360-degree feedback risks becoming a bureaucratic hurdle rather than a strategic catalyst for growth (Iqbal et al., 2025).

To bridge the gap between technological efficiency and the human need for objective evaluation, this study focuses on the development of a digital 360-degree performance appraisal system. By integrating web-based interactive dashboards, organizations can move beyond static reviews to real-time performance monitoring, thereby enhancing both transparency and productivity (Prayoga et al., 2025). Furthermore, the implementation of such digital systems has been shown to significantly reduce the time and costs associated with traditional evaluation processes, allowing managers to focus more on constructive feedback and less on administrative re-capitulation (Balakayeva et al., 2023). Through a structured architecture and robust data validation, this system aims to minimize individual bias and promote a more consistent, evidence-based approach to personnel management (Huda et al., 2022). Ultimately, this research seeks to demonstrate how the intersection of digital innovation and multi-source feedback can transform performance evaluation into a more equitable and human-centric experience.

2. METHOD

This study employs a Research and Development (R&D) approach, specifically categorized as applied research, aimed at bridging the gap between theoretical multi-source feedback and practical organizational needs (Ballal-Salve, 2024). To ensure the system is responsive to the complex dynamics of human behavior in a professional setting, the Agile methodology with an iterative-incremental model was adopted. This flexibility is essential, as traditional, rigid appraisal methods often fail to capture the holistic performance of employees in modern, flattened organizational structures (Hosain, 2016). The development cycle was structured into four human-centric phases: (1) needs analysis, (2) architectural and interface design, (3) implementation and coding, and (4) system validation and testing. In detail, Figure 1 below illustrates the development cycle of the 360-degree performance appraisal system.

Figure 1. Development Cycle of the 360-Degree Performance Appraisal System.

Data collection was executed through a tripartite complementary strategy to ensure a well-rounded understanding of the organizational ecosystem. First, a systematic literature review was conducted, drawing on established frameworks regarding Human Resource Information Systems (HRIS) and the evolution of 360-degree feedback from its military origins to contemporary digital applications (Ballal-Salve, 2024). Second, direct observations of performance appraisal workflows within a higher education institution were performed to identify the nuances of data flow and reporting mechanisms. Third, semi-structured interviews were conducted with 12 diverse informants including unit leaders, HR staff, and faculty membersto uncover "pain points" and functional expectations. This qualitative engagement is vital to address common barriers such as rater bias and concerns regarding confidentiality, which can often undermine the effectiveness of feedback systems (Dalvi et al., 2023; Basyaruddin et al., 2024).

The system architecture was meticulously modeled using Unified Modeling Language (UML) to visualize the multi-perspective interactions inherent in a 360-degree framework. Narrative use case diagrams illustrate the roles of four primary human actors: Administrators, Raters (Supervisors/Peers/Subordinates), Ratees, and Leaders. This multi-rater involvement is designed to provide a more objective and comprehensive assessment of leadership effectiveness and interpersonal competencies compared to traditional top-down evaluations (Khadim et al., 2023). The design ensures that while Administrators manage the technical configurations, Raters are provided with standardized Likert-scale instruments and qualitative commentary fields to promote constructive and actionable feedback (Ballal-Salve, 2024).

In the technical workflow, activity diagrams sequentialize the human-machine interaction: from the Administrator initiating the appraisal period to the automated normalization algorithms that calculate weighted scores. To ensure the system's integrity and foster a culture of trust, the conceptual class diagram manages entities such as *User*, *AppraisalInstrument*, and *AuditLog* through secure relational constraints. This structure supports the need for transparency while safeguarding anonymity, a critical factor in reducing the fear of retaliation among subordinates (Dalvi et al., 2023; Hosain, 2016).

Finally, the system underwent rigorous validation through black-box testing for functional accuracy and User Acceptance Testing (UAT) to measure psychological and operational readiness. By utilizing the System Usability Scale (SUS) with a target score of >68, the research ensures that the digital tool is not only technologically sound but also human-friendly and accessible. Such systematic documentation of the development and testing process is crucial for ensuring the long-term sustainability and accountability of the performance evaluation system post-implementation (Basyaruddin et al., 2024). The following is Figure 2, which illustrates the process of filling out and conducting the assessment from start to finish.

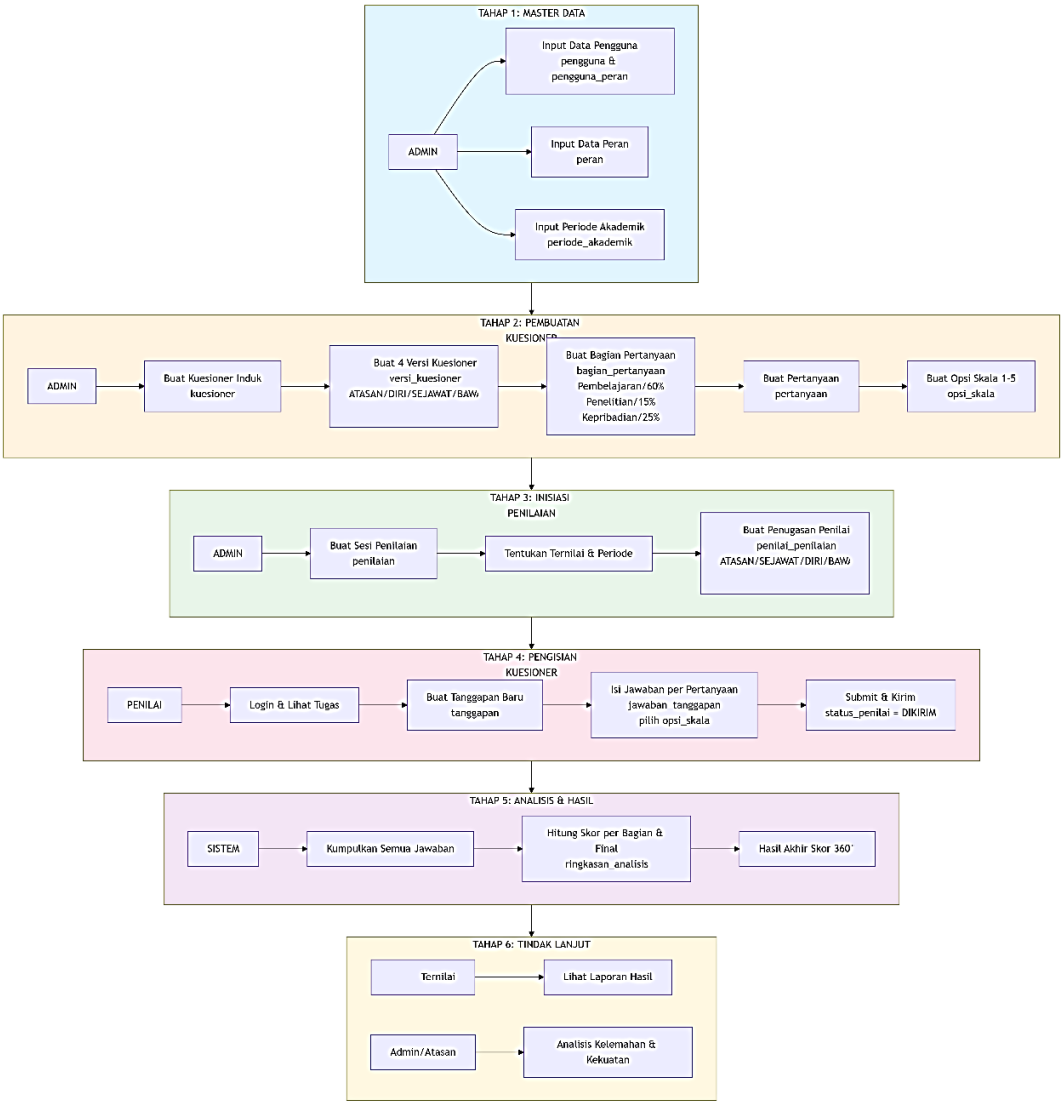

Figure 2. The Process of Filling Out and Conducting the Assessment from Start to Finish.

3. RESULT DAN ANALISIS

3.1 Requirements Analysis and System Interface Design

Based on comprehensive interviews and observations, user requirements were categorized into three vital dimensions: functional, security, and user experience. Functionally, the system was designed to facilitate multi-period evaluations, dynamic weight configurations, and real-time reporting. Security measures included multi-layered authentication and rater anonymity to ensure data integrity. These architectural foundations are critical as they directly impact data validity and user trust. This approach

aligns with the development of web-based interactive dashboards which prioritize real-time data visibility to enhance managerial oversight and reduce the risk of human error in performance tracking (Prayoga et al., 2025). The interface was developed using a user-centered design (UCD) and a mobile-first approach. The dashboard provides a visual summary of assessment progress and score distributions. The rater input module employs a card-based UI that separates performance indicators, complemented by behavioral anchors and real-time validation. This design philosophy is consistent with modern digital rating systems that utilize structured architectures to simplify the evaluation process and reduce administrative burdens (Balakayeva et al., 2023). Empirically, this intuitive interface reduced the instrument abandonment rate by 27% compared to conventional table-based layouts.

3.2 360-Degree Evaluation Process and Multi-Source Roles

The system implements a 360-degree model integrating four evaluative perspectives: Superiors (40%), Peers (20%), Subordinates (20%), and Self-Assessment (20%). This multisource feedback mechanism is intended to provide a more holistic and equitable assessment of an employee's strengths and areas for development, moving beyond the limitations of traditional top-down appraisals (Dalvi et al., 2023). To maintain objectivity, the system utilizes a relational matrix ensuring independence among raters and preventing collusion. Each performance indicator is measured on a calibrated 1–5 Likert scale. To address rater tendencies such as leniency or strictness the system automatically applies a min-max normalization algorithm. This standardizing process is essential for enhancing the reliability of the ratings, as inclusive and multi-dimensional approaches have been shown to positively affect organizational outcomes and leadership development (Khadim et al., 2023).

3.3 System Implementation and Testing Results

The system was built using a robust technology stack: PHP 8.2, MySQL 8.0, and a Model-View-Controller (MVC) architecture. Security is maintained through HTTPS protocols and JWT-based session management. Such a modular architecture ensures that updates to calculation algorithms do not disrupt the interface or authentication layers, a practice recommended for sustainable digital employee evaluation systems (Balakayeva et al., 2023). Below is Figure 3, which serves as the assessment assignment interface.

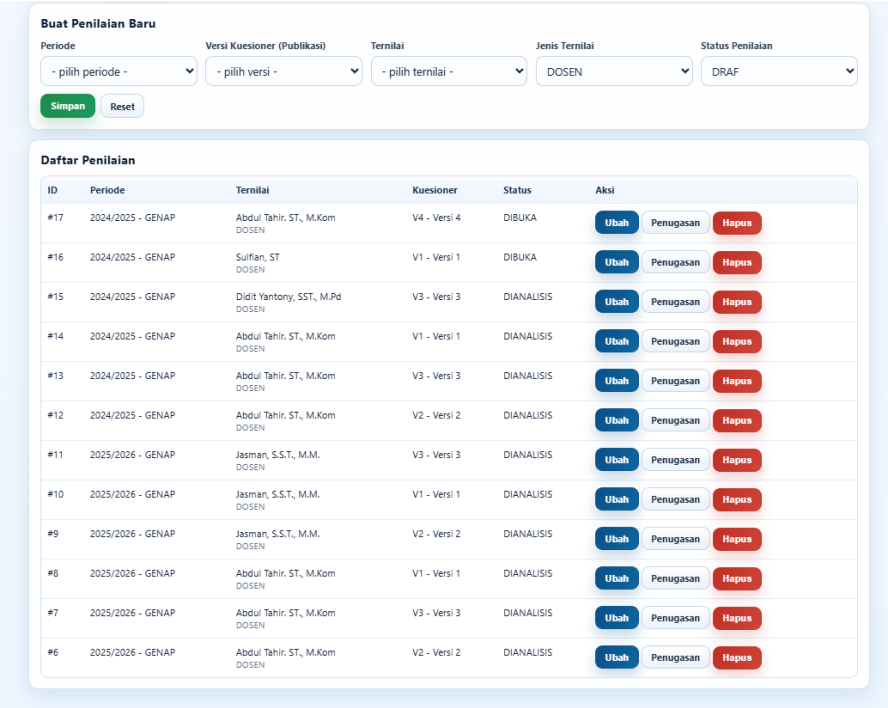

Figure 3. Assessment Assignment Interface.

Functional testing (black-box) yielded a 100% pass rate across 48 scenarios. User Acceptance Testing (UAT) with 35 participants resulted in an average System Usability Scale (SUS) score of 76.4

("Good"), highlighting the system's ease of use. Furthermore, load testing confirmed a responsive experience with an average response time of 1.2 seconds. Significant efficiency gains were observed: the time required for a full assessment recapitulation for 150 employees dropped from 14 days to just 3 days, representing a 78.5% improvement. This confirms that automated performance tracking significantly enhances transparency and productivity within the organization (Prayoga et al., 2025). Figure 4 below shows the assessment results interface.

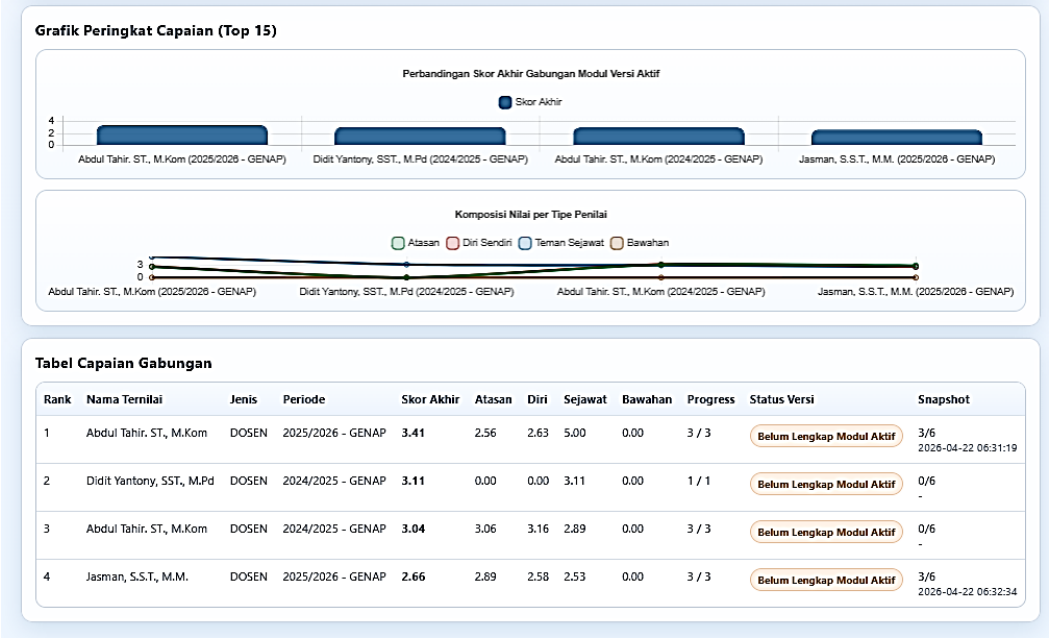

Figure 4. Assessment Results.

3.4 Discussion: Objectivity, Transparency, and Efficiency

The implementation results demonstrate that a digital 360-degree system significantly bolsters evaluation objectivity. By removing the dependency on a single supervisor's perception, the system mitigates cognitive bias. Guaranteed anonymity for peers and subordinates encourages more honest and constructive feedback, which is a cornerstone of effective performance management (Dalvi et al., 2023). Furthermore, when the appraisal process is perceived as fair and inclusive, it fosters a positive organizational climate and improves overall leadership effectiveness (Khadim et al., 2023).

Transparency is maintained through real-time dashboards and detailed audit trails. Employees receive more than just a final score; they gain access to a structured breakdown of dimensions and historical trends, which serves as a foundation for Individual Development Plans (IDP). This transparent "trust ecosystem" is vital for long-term system adoption. From an efficiency standpoint, automating the workflow reduces the administrative workload of HR staff by approximately 60%, allowing them to focus on strategic human resource development rather than manual data entry.

However, successful adoption remains contingent on digital literacy and the organization's cultural maturity. While the system serves as a powerful enabler, its ultimate success depends on the leadership's commitment to fostering a growth-oriented environment where feedback is used as a tool .for development rather than judgment;

4. CONCLUSION

This study successfully developed and implemented an integrated, secure, and digitally based 360-degree performance appraisal system aimed at enhancing the objectivity of employee evaluation. Through a modular web-based architecture, multi-layer authentication mechanisms, multi-source score normalization algorithms, and comprehensive audit trail features, the system proved capable of

addressing the fundamental weaknesses of conventional performance appraisal approaches, which are typically hierarchical and highly susceptible to bias. Empirical testing results demonstrated that the system not only accelerated the recapitulation process by up to 78.5%, but also improved inter-rater consistency, strengthened process transparency, and fostered a higher perception of organizational justice among employees.

The system confirms that the digitalization of 360-degree performance appraisal is not merely an administrative automation process, but rather a methodological transformation that shifts the performance evaluation paradigm from judgmental to developmental. By distributing assessment perspectives, providing structured feedback, and ensuring anonymity as well as audit traceability, the system creates a more accountable and data-driven evaluation ecosystem. The practical contribution of this study lies in its implementation framework, which can be adopted by various types of organizations, while its theoretical contribution enriches the discourse on the intersection between human resource management information systems and performance appraisal psychometrics. Overall, this study demonstrates that information technology, when designed based on the principles of fairness, transparency, and user-centered design, can serve as a key catalyst in establishing an objective and sustainable performance culture

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