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THE INFLUENCE OF DIGITAL TRANSFORMATION AND HUMAN RESOURCE DEVELOPMENT ON EMPLOYEE PERFORMANCE WITH THE MEDIATION OF EMPLOYEE ATTITUDES IN THE HEAD OFFICE OF THE METEOROLOGY, CLIMATOLOGY, AND GEOPHYSICS AGENCY IN JAKARTA

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ABSTRACT
This study examines the effect of digital transformation and human resource development on employee performance, with employee attitudes as a mediating variable. The research focuses on employees at the Head Office of the Meteorology, Climatology, and Geophysics Agency (BMKG), a public sector organization facing rapid technological and organizational changes. Based on the Resource-Based View (RBV) theory, this study emphasizes the importance of human capital, learning, and capability development in improving organizational performance. A quantitative approach was employed, with data collected from 160 employees using structured questionnaires. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. The results indicate that digital transformation and human resource development significantly influence employee performance, both directly and indirectly through employee attitudes. Employee attitudes play a crucial mediating role, strengthening the impact of organizational initiatives on performance outcomes. This study contributes to the development of human resource management literature, particularly in the public sector context. Practically, the findings highlight the importance of integrating technological advancement, continuous competency development, and positive employee attitudes to enhance overall organizational performance.
Keywords*: Digital Transformation, Human Resource Development, Employee Performance, Employee Attitudes.*

1. Introduction

Indonesia is an archipelagic nation facing complex geographic, geological, and meteorological vulnerabilities, making it highly susceptible to severe natural hazards such as earthquakes, tsunamis, and extreme weather. As the national authority mandated to deliver strategic meteorological, climatological, and geophysical information, the Meteorology, Climatological, and Geophysical Agency (Badan Meteorologi, Klimatologi, dan Geofisika / BMKG) fundamentally relies on digital technologies, including early warning systems and automated monitoring. However, BMKG faces operational constraints, including aging infrastructure, uneven service station distribution, budget limitations, and a shortage of specialized personnel. Strengthening human resource (HR) capacity is therefore essential to achieving an accurate and responsive early warning system, aligning with BMKG's vision (2015–2045) to become a world-class socio-entrepreneurial institution. In public administration, employee performance directly reflects organizational effectiveness and public service quality (Munadil et al., 2024; Ardian, 2020; Vrchota et al., 2020). While digital transformation enhances service speed, accuracy, and operational transparency (Andriole, 2018; Rodríguez-Abitia & Bribiesca-Correa, 2021; Faisol et al., 2024; Denmamode & Panchoo, 2024; Rialti & Zollo, 2023), strategic HR development builds technical competency, loyalty, and commitment (Taufiq et al., 2019; Dwi Cintia et al., 2024; Syahiroh et al., 2024). Empirically, BMKG's performance reports from 2020 to 2024 indicate steady progress, with information accuracy rising from 85.71% in 2020 to 94.05% in 2024, public satisfaction consistently remaining high (3.66–3.71 out of 4), and bureaucratic reform scores reaching 100.36% of its target in 2024. Despite these positive institutional results, prior literature reveals inconsistent findings regarding the direct effects of digital transformation and HR development on performance.

Some empirical studies report no significant direct impact from digital transformation (Adisaksana, 2022; Oktafien et al., 2023) or HR development (Monalis et al., 2020), whereas others confirm strong positive relationships (Rukani & Ratnasari, 2024; Firmansyah & Napitupulu, 2024; Syukron et al., 2022). This research gap suggests that the relationship is indirect and mediated by psychological and behavioral factors. Consequently, this study incorporates Employee Attitude as a mediating variable (Retnowati & Darmawan, 2022b; Porotu'o et al., 2021; Siregar et al., 2023; Ahad et al., 2021). At BMKG, despite advanced systems like the Smart Weather System, challenges remain regarding technological adaptation and resistance to new workflows. Thus, this study examines how employee attitude mediates the impact of digital transformation and HR development on employee performance in BMKG.

The core research problem stems from the operational friction within BMKG, where advanced systems such as the Smart Weather System encounter adaptation bottlenecks and resistance to new workflows, alongside structural constraints like aging infrastructure and personnel shortages. From a theoretical standpoint, this operational challenge is compounded by a clear empirical research gap regarding whether digital transformation and strategic HR development directly translate into improved individual performance. Given the mixed evidence in prior literature, technology and training alone appear insufficient unless channeled through internal psychological mechanisms. Therefore, this study addresses the critical problem of understanding how employee attitude serves as an essential mediating pathway that connects technological adoption and HR initiatives with actual employee performance within a public hazard-monitoring institution.

To resolve this research problem and address the existing literature gap, this study systematically investigates several key research questions. First, it examines the direct impacts of digital transformation and strategic HR development on both employee performance and employee attitude at BMKG. Furthermore, it explores the direct influence of employee attitude on employee performance. Most importantly, the study seeks to answer whether employee attitude plays a significant mediating role in transmitting the indirect effects of digital transformation and HR development onto the final performance outcomes of BMKG personnel.

In alignment with these questions, the main objective of this study is to deliver a comprehensive empirical analysis of the structural relationships within BMKG's operational environment. Specifically, the study aims to analyze and evaluate the direct influence of digital transformation and HR development on employee attitude and performance. Ultimately, the central goal of this research is to test and demonstrate the mediating function of employee attitude, providing clear insights into how psychological adaptation and workforce readiness enable digital and managerial strategies to successfully enhance overall employee performance in a national public service context.

2. Literature Review

2.1 Resource-Based View (RBV) Theory

The Resource-Based View (RBV) Theory, originally conceptualized by Barney (1991), posits that an organization achieves sustained competitive advantage and superior operational performance when it possesses and effectively deploys resources that are Valuable, Rare, Inimitable, and Non-substitutable (VRIN). In public management context, resources comprise tangible assets (such as advanced digital infrastructure, cloud computing, and automated monitoring systems) and intangible assets (such as organizational knowledge, employee competencies, and psychological work attitudes).

Within the RBV framework, digital tools and structured HR development programs represent essential strategic resource inputs. However, technological architecture and training curricula alone do not automatically guarantee superior operational output. The RBV framework highlights that these external strategic resources must interact with internal human capabilities. Employee attitude serves as a vital psychological asset that enables personnel to internalize digital tools and training insights, translating organizational potential into high-level

task performance and administrative excellence.

2.2 Conceptual Definitions of Research Variables

2.2.1 Digital Transformation (X1)

Digital transformation is defined as a comprehensive organizational evolution that integrates modern digital technologies, advanced software platforms, automated workflows, and data-driven mindsets across all institutional functions to fundamentally streamline operational processes, optimize public service delivery, and enhance organizational agility (Marx et al., 2021). Various research findings show conflicting results regarding the impact of digital transformation on employee performance. In a study examining the influence of digital transformation, business innovation models, and creativity on MSME performance with competitive advantage as an intervening variable, digital transformation was found to have no effect on performance (Adisaksana, 2022). Similarly, an investigation into the impact of HR digital transformation, emotional intelligence, and career development on employee performance mediated by organizational culture within the Bandung Regency Government revealed that HR digital transformation does not have a significant effect on employee performance (Oktafien et al., 2023).

These findings contrast with research examining employee engagement, digital transformation, and talent management among staff at Hotel Mercure Jakarta Kota, which concluded that digital transformation exerts a positive and significant impact on improving employee performance (Firmansyah & Napitupulu, 2024). Comparable results were also obtained from an investigation into the impact of digital transformation and employee collaborative innovation on performance, along with the mediating role of dynamic innovation capabilities, which confirmed that digital transformation has a positive and meaningful influence on employee performance (Rukani & Ratnasari, 2024). In public sector organizations like BMKG, digital transformation represents more than hardware procurement; it encompasses four critical dim ensions: Digital Mindset (psychological readiness to adopt digital tools), Digital Practices (utilization of paperless and automated workflows), Digital Talent (proficiency in navigating complex analytical software), and Data Access & Integration (seamless real-time information sharing across operational units).

2.2.2 Human Resource (HR) Development (X2)

Human Resource Development is defined as a systematic, structured, and continuous organizational framework encompassing technical training, education, professional skill upgrading, and career enhancement initiatives designed to increase employees' domain knowledge, operational competencies, and adaptive capabilities (Bernardin & Russell, 2013). A study on employee performance concluded that HR development does not have a significant effect on employee performance (Monalis et al., 2020). However, this finding differs from research conducted on employees at the Riau Province Tourism Office, which revealed that HR development has a positive and significant effect on employee performance through work motivation as an intervening variable (Syukron et al., 2022). These differing results indicate that the relationship between digital transformation, HR development, and employee performance is heavily influenced by the organizational context, the nature of the work, and the mediating variables involved. At BMKG, HR development reflects the strategic investment in human capital required to keep pace with evolving scientific technologies. It is measured across three core dimensions: Training Quality & Relevance (alignment of training content with job demands), Competency Enhancement (mastery of specialized scientific and administrative techniques), and Career Growth Pathways (transparent professional advancement frameworks).

2.2.3 Employee Attitude (Y1)

Employee attitude is conceptualized as an individual's enduring psychological disposition, evaluative judgment, and emotional alignment toward their job responsibilities, organizational technological systems, and institutional leadership (Ahad et al., 2021). Grounded in the classic tripartite attitude model, employee attitude comprises three essential dimensions: Cognitive Dimension (beliefs, awareness, and trust regarding the usefulness of digital tools and training), Affective Dimension (emotional attachment, job satisfaction, and enthusiasm toward organizational goals), and Behavioral Dimension (readiness to act, willingness to exert discretionary effort, and compliance with operational standards).

2.2.4 Employee Performance (Y2)

Employee performance is defined as the overall measurable work output, accomplishments, and job-related behaviors demonstrated by an employee in fulfilling assigned institutional duties, adhering to established standards of quality, quantity, and timeliness within a specified period (Bernardin & Russell, 2013). In public service institutions, employee performance directly determines service delivery efficacy. It is operationalized through six comprehensive dimensions: Work Quality (accuracy, thoroughness, and scientific precision), Work Quantity (volume of completed tasks and reports), Timeliness (adherence to operational deadlines and rapid early warning issuance), Cost-Effectiveness (efficient resource utilization), Independence (ability to execute duties with minimal supervision), and Interpersonal Impact (team cooperation and communication).

2.3 Hypothesis Development

Digital Transformation and Employee Performance: The adoption of modern digital platforms, automated data processing, and cloud-based reporting systems eliminates administrative redundancies, minimizes manual error rates, and accelerates task execution. Employees equipped with digital tools can analyze meteorological and geophysical datasets faster and with greater accuracy. Therefore, it is hypothesized:
H1: Digital Transformation has a positive and significant effect on Employee Performance.

Digital Transformation and Employee Attitude: When organizations introduce intuitive, efficient, and user-friendly digital tools, employee frustration associated with manual paperwork decreases. Clear digital workflows enhance employees' cognitive trust in institutional systems and build positive affective dispositions toward organizational modernization. Thus, it is hypothesized:
H2: Digital Transformation has a positive and significant effect on Employee Attitude.

HR Development and Employee Performance: Continuous training and targeted competency upgrading equip civil servants with updated scientific knowledge, procedural expertise, and problem-solving capabilities. Well-trained employees exhibit higher confidence and proficiency when performing complex meteorological analyses, directly boosting work quality and output. Therefore, it is hypothesized:
H3: HR Development has a positive and significant effect on Employee Performance.

HR Development and Employee Attitude: Organizational investments in employee learning signal that the institution values its human capital. This perceived organizational support elevates employee job satisfaction, strengthens affective commitment, and fosters proactive behavioral mindsets. Thus, it is hypothesized:
H4: HR Development has a positive and significant effect on Employee Attitude.

Employee Attitude and Employee Performance: Employees who possess favorable cognitive beliefs, positive emotional attachment, and proactive behavioral tendencies are more likely to demonstrate diligence, discipline, and high task dedication. A positive work attitude

directly translates into reduced absenteeism, higher operational thoroughness, and superior job performance. Therefore, it is hypothesized:
H5: Employee Attitude has a positive and significant effect on Employee Performance.

The Mediating Role of Employee Attitude: While digital transformation and HR development provide the infrastructure and knowledge necessary for high productivity, their ultimate effectiveness depends on employee acceptance and psychological buy-in. Modern digital platforms and advanced training modules enhance employee job satisfaction and psychological readiness (attitude), which in turn drives discretionary effort and task execution (performance). Hence, employee attitude serves as an indispensable psychological bridge. Accordingly, it is hypothesized:
H6: Employee Attitude mediates the effect of Digital Transformation on Employee Performance.
H7: Employee Attitude mediates the effect of HR Development on Employee Performance.

3. Research Methods

3.1 Research Design and Sample

This study adopted a quantitative explanatory research design to test empirical relationships and mediating mechanisms among the constructs. The study was conducted at the Headquarters of the Meteorology, Climatology, and Geophysics Agency (BMKG) in Jakarta. The target population comprised active permanent employees across technical, analytical, and administrative divisions. A sample size of 160 respondents was selected using convenience sampling, satisfying Hair et al.'s (2021) rule-of-thumb requiring a sample size at least 10 times the maximum number of structural model indicators ($16 \times 10 = 160$).

3.2 Operationalization and Measurement of Variables

Primary data were collected through a standardized closed-ended questionnaire administered digitally. Each item was measured using a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The measurement instruments were adapted from established academic literature:

- Digital Transformation (X1): Measured using 16 indicator items adapted from Marx et al. (2021), covering digital mindset, digital practices, talent proficiency, and data integration.
- HR Development (X2): Measured using 12 indicator items adapted from Bernardin & Russell (2013) and Baiti et al. (2021), covering training quality, competency building, and career growth pathways.
- Employee Attitude (Y1): Measured using 12 indicator items adapted from Ahad et al. (2021) and Retnowati & Darmawan (2022), evaluating cognitive, affective, and behavioral dimensions.
- Employee Performance (Y2): Measured using 18 indicator items adapted from Bernardin & Russell (2013), covering quality, quantity, timeliness, cost-effectiveness, independence, and interpersonal impact.

3.3 Data Analysis Method

Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) executed via SmartPLS 4.0 software. PLS-SEM was selected due to its robustness in handling complex structural models with indirect mediating relationships without requiring strict multivariate normality assumptions. The evaluation proceeded in two stages:

1) Measurement Model (Outer Model): Evaluated convergent validity (outer loadings > 0.70, Average Variance Extracted / AVE > 0.50), discriminant validity (Fornell-Larcker criterion and Heterotrait-Monotrait / HTMT ratio < 0.90), and construct reliability (Cronbach's Alpha > 0.70, Composite Reliability > 0.70).
2) Structural Model (Inner Model): Assessed coefficient of determination (R^2), Stone-Geisser predictive relevance (Q^2), effect sizes (f^2), and direct/indirect path hypotheses via a non-parametric bootstrapping procedure with 5,000 resamples

($\alpha = 0.05, t > 1.96, p < 0.05$).

4. Research Findings and Discussion

4.1 Demographic Profile of Respondents

The demographic analysis of 160 respondents revealed a balanced representation across organizational units at BMKG Headquarters. In terms of gender, 57.5% ($n=92$) were male and 42.5% ($n=68$) were female. Regarding age distribution, 21.3% were aged 20–30 years, 42.5% were aged 31–40 years, 26.2% were aged 41–50 years, and 10.0% were over 50 years old. Educational background showed that 57.5% held a Bachelor's degree (S1), 28.1% held a Master's degree (S2), 11.9% held a Diploma, and 2.5% held a Doctorate (S3). Work tenure analysis indicated that 34.4% had served for 6–10 years, 28.8% for 11–15 years, 20.6% for over 15 years, and 16.2% for 1–5 years. Unit distribution spanned the Deputy for Meteorology (26.9%), Deputy for Climatology (21.3%), Deputy for Geophysics (22.5%), and Secretariat General / Support Units (29.3%).

4.2 Measurement Model (Outer Model) Evaluation

The measurement model results confirmed high convergent validity and reliability. All individual indicator outer loadings exceeded the 0.70 threshold (ranging from 0.742 to 0.912). The Average Variance Extracted (AVE) values for all constructs exceeded 0.50: Digital Transformation ($\text{AVE} = 0.615$), HR Development ($\text{AVE} = 0.638$), Employee Attitude ($\text{AVE} = 0.621$), and Employee Performance ($\text{AVE} = 0.598$). Construct reliability was supported as Cronbach's Alpha and Composite Reliability values for all constructs surpassed 0.80. Discriminant validity was fully established, as all HTMT values remained well below the 0.85 conservative threshold.

4.3 Structural Model (Inner Model) Evaluation

The structural model demonstrated substantial explanatory power and predictive relevance. The coefficient of determination (R^2) for Employee Attitude was 0.682, indicating that 68.2% of the variance in employee attitude is explained by Digital Transformation and HR Development. The R^2 for Employee Performance was 0.745, demonstrating that 74.5% of performance variance is explained by Digital Transformation, HR Development, and Employee Attitude. The blindfolding procedure yielded Q^2 values of 0.412 for Employee Attitude and 0.435 for Employee Performance, both well above zero, confirming strong predictive relevance.

4.4 Hypothesis Testing Results

Hypothesis testing was performed using SmartPLS 4.0 bootstrapping (5,000 samples). Detailed path coefficients, t-statistics, p-values, and empirical decisions are summarized in Table 1.

Hypothesis	Structural Path / Relationship	Path Coeff. (β)	Sample Mean (M)	t-Statistic	p-Value	Decision
H1	Digital Transformation → Employee Performance	0.284	0.281	3.412	0.001	Accepted
H2	Digital Transformation → Employee Attitude	0.395	0.392	4.821	0.000	Accepted
H3	HR Development → Employee Performance	0.265	0.268	3.115	0.002	Accepted
H4	HR Development → Employee Attitude	0.462	0.465	5.304	0.000	Accepted
H5	Employee Attitude → Employee Performance	0.381	0.379	4.210	0.000	Accepted
H6	Digital Trans. → Employee Attitude → Performance	0.150	0.148	3.180	0.002	Accepted (Mediation)
H7	HR Development → Employee Attitude → Performance	0.176	0.176	3.325	0.001	Accepted (Mediation)

Table 1. Structural Model Hypothesis Testing Results

4.5 Discussion

1) **Direct Effect of Digital Transformation on Employee Performance**: The structural analysis confirms that digital transformation exerts a direct, positive, and statistically significant effect on employee performance ($\beta = 0.284, t = 3.412, p = 0.001$). At BMKG Headquarters, modern digital infrastructure—including automated data ingestion, real-time warning platforms, and cloud-based administrative portals—directly simplifies workflow complexity. Employees spend less time on redundant manual data entry and more on high-value meteorological forecasting and risk analysis. This result aligns with findings by Firmansyah & Napitupulu (2024) and Rukani & Ratnasari (2024).

2) **Direct Effect of Digital Transformation on Employee Attitude**: Digital transformation positively impacts employee attitude ($\beta = 0.395, t = 4.821, p = 0.000$). Modern, reliable, and user-friendly digital tools enhance employees' cognitive trust in institutional systems and reduce operational stress, fostering higher job satisfaction and constructive work mindsets.

3) **Direct Effect of HR Development on Employee Performance**: HR development demonstrates a direct, positive, and significant impact on employee performance ($\beta = 0.265, t = 3.115, p = 0.002$). Structured training programs and specialized technical workshops directly enhance staff domain expertise, enabling personnel to execute complex geophysical analysis and administrative duties with higher accuracy and timeliness. This finding reinforces the conclusions of Baiti et al. (2021) and Syukron et al. (2022).

4) **Direct Effect of HR Development on Employee Attitude**: HR development exerts the strongest direct positive effect on employee attitude ($\beta = 0.462, t = 5.304, p = 0.000$). Continuous investment in employee learning signals organizational commitment and valuation of staff, triggering strong affective commitment, loyalty, and positive behavioral engagement.

5) **Direct Effect of Employee Attitude on Employee Performance:** Employee attitude strongly and directly improves job performance ($\beta = 0.381, t = 4.210, p = 0.000$). Personnel who exhibit positive cognitive beliefs, affective job satisfaction, and proactive work behaviors consistently deliver higher work quality, meet operational deadlines, and demonstrate greater initiative in team environments.

6) **The Mediating Role of Employee Attitude:** Specific indirect effect testing confirms that employee attitude significantly mediates the impact of Digital Transformation ($\beta = 0.150, t = 3.180, p = 0.002$) and HR Development ($\beta = 0.176, t = 3.325, p = 0.001$) on employee performance. Because the direct paths (H1 and H3) remain statistically significant alongside the indirect paths, employee attitude acts as a partial mediator. In accordance with Resource-Based View (RBV) Theory, digital infrastructure and training frameworks serve as foundational resource inputs. However, these external inputs produce their maximum impact on operational performance when they successfully cultivate positive, receptive, and highly motivated employee attitudes.

5. Conclusion

5.1 Conclusion

This study establishes that digital transformation and human resource development are vital catalysts for enhancing employee performance at BMKG Headquarters. Both factors exert significant direct positive effects on performance and work attitude. Furthermore, employee attitude functions as a key partial mediator that reinforces the translation of digital platforms and training investments into superior administrative, analytical, and operational performance outcomes.

5.2 Theoretical and Practical Implications

Theoretical Implications: This study extends the applicability of Resource-Based View (RBV) Theory in public sector management by demonstrating that technological assets and training resources require psychological internalization—specifically positive employee work attitudes—to achieve optimal operational performance.

Practical Implications: For BMKG leadership, technology acquisition must not occur in isolation. Digital transformation initiatives must be paired with comprehensive change management, user-centric interface design, and continuous technical mentoring to foster positive employee mindsets and maximize institutional productivity.

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