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Digital Technology as a Strategic Mediator in Enhancing Employee Competitive Advantage: Evidence from Indonesia's Nickel Mining Industry

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Abstract: Employee competitive advantage has become a critical factor in enhancing organizational performance and sustainability, particularly in technology-driven industries such as nickel mining. However, the mechanisms through which human resource factors contribute to employee competitive advantage remain insufficiently understood, especially in the context of digital transformation. This study aims to examine the effects of Employee Satisfaction, Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement on Employee Competitive Advantage, with Digital Technology as a mediating variable and Work Motivation as a moderating variable. A quantitative research design was employed using a survey method. Data were collected from employees working in nickel mining companies in Central Sulawesi, Indonesia. The collected data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS software. The results indicate that Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement have significant positive effects on Employee Competitive Advantage, whereas Employee Satisfaction does not directly influence Employee Competitive Advantage. Furthermore, all human resource factors significantly affect Digital Technology utilization, with Transformational Leadership emerging as the strongest predictor. Digital Technology was found to have the strongest direct effect on Employee Competitive Advantage and significantly mediates the relationships between all human resource factors and employee competitiveness. In addition, Work Motivation significantly strengthens the relationships among human resource factors, Digital Technology, and Employee Competitive Advantage. These findings highlight the strategic role of Digital Technology in transforming organizational resources into competitive capabilities and demonstrate that digital transformation serves as a critical mechanism linking human resource practices to employee competitiveness. This study contributes to the literature by integrating human resource management, digital transformation, and competitive advantage perspectives within a single framework and provides empirical evidence from Indonesia's nickel mining industry. The findings offer practical implications for organizations seeking to strengthen workforce

competitiveness through the integration of human resource development, digital technology adoption, and employee motivation initiatives.

Keywords: Employee Competitive Advantage, Digital Technology, Transformational Leadership, Employee Engagement, Nickel Mining Industry

INTRODUCTION

The global transition toward renewable energy has significantly increased the strategic importance of nickel as a critical mineral for electric vehicle batteries and energy storage systems. Nickel is no longer viewed merely as a conventional mining commodity but has become an essential resource in supporting global decarbonization efforts and sustainable industrial development. As demand for electric vehicles continues to rise, competition among nickel-producing countries has intensified, requiring mining companies to develop sustainable competitive advantages beyond natural resource ownership (Gautam et al., 2022).

Indonesia currently holds a strategic position in the global nickel industry, particularly through the rapid development of downstream processing and refining activities in Sulawesi. Central Sulawesi has emerged as one of the most important nickel production centers, supported by large-scale industrial zones such as Morowali and North Morowali. According to the International Nickel Study Group (2025), global nickel production increased from 3.37 million tons in 2023 to a projected 4.08 million tons in 2026, while global surplus is expected to rise from 176 thousand tons to 261 thousand tons during the same period. This condition indicates that future competition in the nickel industry will not be determined solely by production capacity but increasingly by operational efficiency, technological innovation, and the quality of human resources.

The increasing global supply surplus has intensified competitive pressures within the nickel industry. Companies are required to produce higher-quality outputs with greater efficiency while maintaining sustainability and operational excellence. Consequently, organizations can no longer rely exclusively on natural resources and capital investments. Instead, employee capabilities, adaptability, and technological competencies have become critical strategic assets in sustaining organizational competitiveness (Sihotang et al., 2025). Resource-Based View (RBV) theory argues that sustainable competitive advantage is generated through valuable, rare, inimitable, and non-substitutable resources, including human capital and organizational capabilities (Barney, 1991).

Despite massive investments in mining infrastructure and downstream industrialization, several challenges continue to hinder the development of employee competitive advantage within Indonesia's nickel mining sector. Empirical observations indicate that mining companies still experience high employee turnover, disparities in workforce productivity, and varying levels of digital competence among employees. Operational personnel, particularly those occupying technical and production positions, often encounter difficulties in adapting to digital systems such as real-time production monitoring, enterprise resource planning (ERP), automated control systems, and digital safety management platforms. These conditions suggest that technological investments have not always been accompanied by corresponding improvements in employee capabilities and competitiveness.

Digital transformation has fundamentally changed operational practices in the mining industry. The implementation of Internet of Things (IoT), automation systems, artificial intelligence, predictive maintenance, and real-time monitoring technologies has enhanced operational efficiency and decision-making quality. However, the effectiveness of digital transformation depends largely on employees' ability and willingness to adopt and utilize technological innovations effectively (Abhari, 2025). Therefore, digital technology should not

merely be viewed as an operational tool but as a strategic mechanism capable of transforming human resource management practices into employee competitive advantage.

Previous studies have identified several human resource factors that contribute to employee performance and organizational competitiveness. Employee satisfaction has been found to improve organizational commitment, adaptive behavior, and contextual performance (Yulia et al., 2025). Similarly, Quality of Work Life (QWL) contributes to employee well-being, loyalty, and readiness to embrace organizational changes (Anggraini, 2023; Ardiano & Ekowati, 2025). Transformational leadership encourages innovation, organizational learning, and employee adaptability in dynamic environments (Nguyen et al., 2023). Compensation systems have been recognized as strategic instruments for enhancing motivation and retention (Zayed et al., 2022), while employee engagement promotes discretionary effort, collaboration, and organizational resilience (Adamu, Abubakar et al., 2025).

Although previous studies have established the importance of these human resource factors, most investigations have examined them independently. Research concerning employee satisfaction, Quality of Work Life, transformational leadership, compensation, and employee engagement has generally focused on their direct influence on employee performance, organizational commitment, or organizational competitiveness. Limited attention has been given to understanding how these human resource factors collectively contribute to employee competitive advantage through digital technology adoption, particularly within capital-intensive and technology-driven industries such as nickel mining.

Furthermore, the existing literature presents several inconsistencies regarding the relationship between human resource practices and competitive outcomes. While some studies report significant positive effects of employee satisfaction and Quality of Work Life on organizational competitiveness, others suggest that such relationships may depend on contextual factors, technological readiness, and organizational capabilities. Similarly, the role of digital technology has predominantly been examined as an independent predictor of organizational performance rather than as a strategic mediating mechanism linking human resource practices to employee competitive advantage (Alrawahi et al., 2020).

Therefore, a significant research gap remains regarding the integration of human resource determinants and digital transformation in explaining employee competitive advantage. Existing studies tend to adopt fragmented perspectives by focusing on individual antecedents or isolated technological variables. Few studies have simultaneously examined employee satisfaction, Quality of Work Life, transformational leadership, compensation, and employee engagement as antecedents of digital technology utilization and employee competitive advantage within the context of the nickel mining industry. This gap becomes increasingly important considering the rapid digitalization and intensifying global competition faced by Indonesia's nickel sector.

To address this gap, the present study develops and tests an integrated model in which digital technology functions as a strategic mediating variable linking employee satisfaction, Quality of Work Life, transformational leadership, compensation, and employee engagement to employee competitive advantage. By focusing on employees working in nickel mining companies in Central Sulawesi, Indonesia, this study seeks to provide empirical evidence regarding the mechanisms through which human resource practices contribute to employee competitiveness in the era of digital transformation. The findings are expected to enrich the Resource-Based View perspective and Digital Transformation Theory while offering practical implications for managers seeking to strengthen workforce competitiveness in strategic mining industries.

Literature Review

Employee Competitive Advantage

Employee competitive advantage refers to the ability of employees to create superior value, demonstrate unique competencies, and contribute to organizational performance in ways that are difficult for competitors to imitate. From the Resource-Based View (RBV) perspective, employees represent strategic resources capable of generating sustainable competitive advantage when they possess valuable, rare, inimitable, and non-substitutable capabilities (Barney, 1991). In the context of the nickel mining industry, employee competitive advantage is reflected in employees' ability to adapt to technological changes, improve productivity, solve operational problems, and support organizational innovation. As mining companies increasingly adopt digital technologies, employee competitiveness becomes a critical determinant of organizational success and sustainability.

Employee Satisfaction

Employee satisfaction refers to the extent to which employees feel positively about their jobs, work environment, and organizational practices. It reflects employees' evaluation of whether their expectations regarding work conditions, rewards, career opportunities, and interpersonal relationships are fulfilled (Qibtiyana et al., 2025). Satisfied employees tend to exhibit higher commitment, stronger organizational loyalty, and greater willingness to contribute beyond formal job requirements. Previous studies indicate that employee satisfaction positively influences performance, innovation, and organizational effectiveness, making it an important antecedent of employee competitive advantage (Yulia et al., 2025).

Quality of Work Life (QWL)

Quality of Work Life (QWL) refers to employees' perceptions of the balance between work demands and personal well-being, including job security, workplace safety, career development opportunities, and work-life balance. QWL emphasizes creating a supportive working environment that enhances employees' physical and psychological welfare (Anggraini, 2023). In high-risk industries such as mining, QWL plays a crucial role in reducing stress, preventing burnout, and increasing employee commitment. Employees who experience a high quality of work life are generally more productive, adaptable, and motivated to contribute to organizational goals (Zhenjing et al., 2022).

Transformational Leadership

Transformational leadership is a leadership style that inspires employees to exceed organizational expectations by creating a compelling vision, encouraging innovation, and fostering personal development. Transformational leaders motivate followers through idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Avolio & Benzaquen, 2023). In rapidly changing business environments, transformational leadership promotes organizational learning, employee adaptability, and readiness for digital transformation. Previous research suggests that transformational leadership significantly enhances employee performance, engagement, and organizational competitiveness (Qalati et al., 2022).

Compensation

Compensation refers to the financial and non-financial rewards provided by organizations in exchange for employees' contributions and performance. Effective compensation systems include salaries, incentives, bonuses, benefits, and recognition programs designed to motivate employees and improve job satisfaction. According to Expectancy Theory, employees are more likely to exert effort when they perceive a clear relationship

between performance and rewards (Yeh & Huang, 2025). In labor-intensive and high-risk industries such as nickel mining, fair and competitive compensation is essential for attracting, retaining, and motivating qualified employees. Previous studies have demonstrated that compensation positively influences employee commitment, productivity, and organizational competitiveness (Maria & Cen Pujianto, 2024).

Employee Engagement

Employee engagement refers to the psychological connection and emotional commitment employees have toward their organization and work. Engaged employees demonstrate enthusiasm, dedication, and willingness to contribute beyond their formal responsibilities. According to Social Exchange Theory, employees reciprocate organizational support and positive treatment through higher levels of commitment and engagement (Blau, 1964). Employee engagement has been recognized as a critical driver of organizational effectiveness because engaged employees are more innovative, collaborative, and resilient when facing workplace challenges. In the mining industry, employee engagement contributes significantly to operational efficiency, workplace safety, and long-term competitiveness (Safariningsih et al., 2025).

Digital Technology

Digital technology refers to the application of digital systems, information technologies, and automated processes that support organizational operations and decision-making. In the mining industry, digital technologies include Internet of Things (IoT), Enterprise Resource Planning (ERP), artificial intelligence, predictive maintenance systems, automation, and real-time monitoring platforms. Digital Transformation Theory suggests that organizations that successfully integrate digital technologies can improve efficiency, innovation, and competitive performance (Alrawahi et al., 2020). However, the success of digital transformation depends largely on employees' ability to adopt and effectively utilize technological systems. Therefore, digital technology serves as a strategic mechanism that connects human resource capabilities with competitive outcomes.

METHODS

Research Design

This study employed a quantitative research approach using a survey method to examine the relationships among employee satisfaction, Quality of Work Life (QWL), transformational leadership, compensation, employee engagement, digital technology, and employee competitive advantage in the nickel mining industry. A quantitative approach was considered appropriate because the study aimed to test the causal relationships among variables and evaluate the mediating role of digital technology in enhancing employee competitive advantage. The research adopted an explanatory design to provide empirical evidence regarding the influence of human resource management factors on employee competitive advantage through digital technology utilization.

Population and Sample

The population consisted of employees working in nickel mining and nickel processing companies located in Central Sulawesi, Indonesia. These companies represent one of the largest nickel industrial clusters in the country and play a strategic role in supporting Indonesia's downstream mineral industry. The target respondents included employees occupying operational, supervisory, administrative, and managerial positions involved in mining and processing activities.

The sample was selected using a proportionate random sampling technique to ensure adequate representation of employees across different organizational levels and job functions. Following the minimum sample size requirements for Partial Least Squares Structural Equation Modeling (PLS-SEM), the study collected data from 400 employees, which exceeded the recommended minimum threshold for complex structural models.

Data Collection Procedure

Primary data were collected through a structured questionnaire distributed directly to employees working in nickel mining companies in Central Sulawesi. The questionnaire was designed based on previously validated measurement scales adapted from relevant literature and adjusted to the context of the nickel mining industry. Respondents were asked to evaluate each statement using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to the full survey administration, the instrument was reviewed by experts and pilot-tested to ensure clarity, relevance, and content validity.

Measurement of Variables

This study included seven latent variables. Employee satisfaction, Quality of Work Life (QWL), transformational leadership, compensation, and employee engagement were specified as exogenous variables. Digital technology was treated as a mediating variable, while employee competitive advantage was specified as the endogenous variable. Employee satisfaction was measured through indicators related to job satisfaction, work environment satisfaction, and organizational support. Quality of Work Life (QWL) was measured through work-life balance, workplace safety, career development opportunities, and employee well-being. Transformational leadership was assessed through idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Compensation was measured through perceptions of fairness, adequacy, and reward systems. Employee engagement was evaluated through vigor, dedication, and absorption at work. Digital technology was measured through the utilization of digital systems, technology adoption, and digital competency, whereas employee competitive advantage was measured through productivity, adaptability, innovation, and work performance superiority.

Data Analysis Technique

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. PLS-SEM was selected because it is suitable for complex predictive models involving multiple constructs and mediation effects while imposing minimal distributional assumptions. The analysis was conducted in two stages. The first stage involved evaluating the measurement model (outer model), including convergent validity, discriminant validity, and construct reliability. Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE), with recommended threshold values above 0.70 and 0.50, respectively. Reliability was evaluated through Cronbach's Alpha and Composite Reliability, with values exceeding 0.70 indicating acceptable reliability. Discriminant validity was examined using the Fornell-Larcker criterion, cross-loadings, and Heterotrait-Monotrait Ratio (HTMT). The second stage involved evaluating the structural model (inner model) through the assessment of coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and hypothesis testing. Direct and indirect effects were examined using the bootstrapping procedure with 5,000 subsamples. Hypotheses were considered significant when the t-statistic exceeded 1.96 and the p-value was below 0.05. The mediating effect of digital technology was assessed through indirect path analysis following the bootstrapping results.

Research Model

The proposed research model positions employee satisfaction, Quality of Work Life (QWL), transformational leadership, compensation, and employee engagement as antecedents of digital technology adoption and employee competitive advantage. Digital technology serves as a mediating mechanism through which human resource management practices contribute to employee competitive advantage in the nickel mining industry. The model was developed based on the Resource-Based View (RBV) and Digital Transformation Theory, emphasizing the strategic role of human resources and technology in creating sustainable competitive advantage.

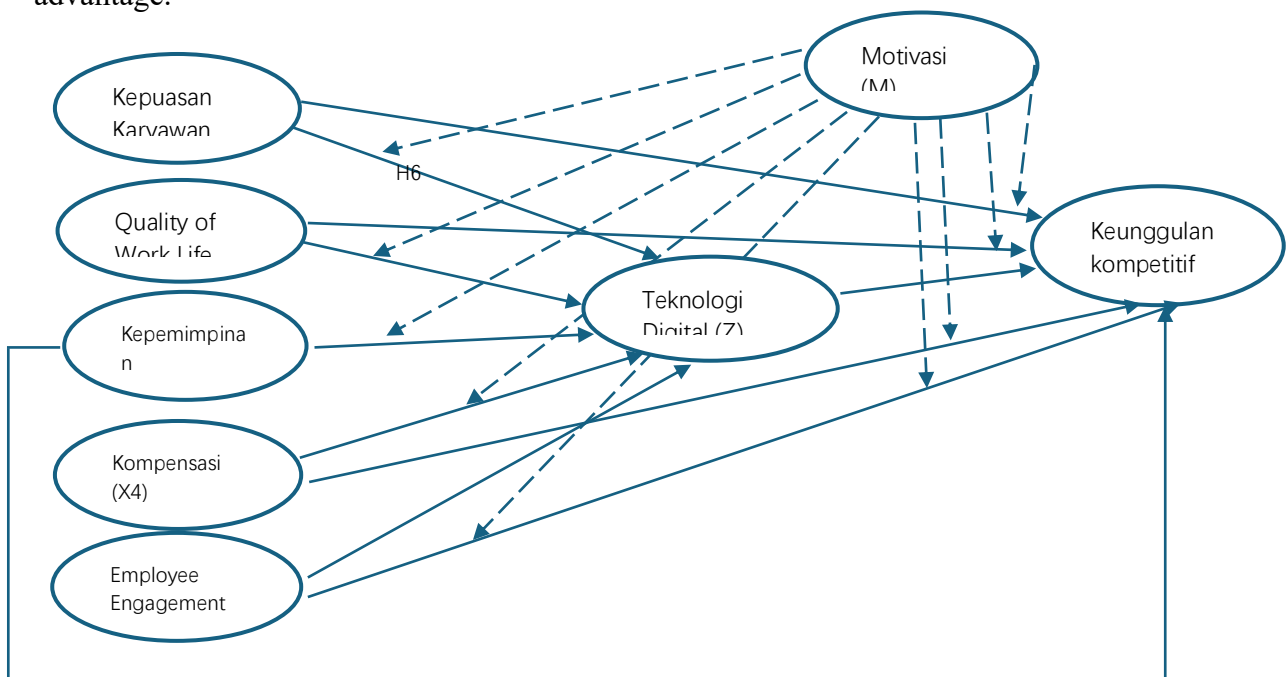


Figure 1. Research Framework

Results and Discussion

Result

1. Data Analysis Result

a. Respondent Profiles

Table 1. Respondent Profile

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	244	62.56
	Female	146	37.44
Position	Staff/Operator	268	68.72
	Supervisor	90	23.08
	Manager	29	7.44
	Top Management	3	0.77
Education Level	High School/Vocational School	14	3.59
	Diploma (D3)	93	23.85
	Bachelor's/Master's Degree	283	72.56
Age	≤ 22 years	5	1.28
	23–30 years	59	15.13
	31–40 years	102	26.15
	> 40 years	224	57.44

Characteristic	Category	Frequency	Percentage (%)
Length of Service	< 1 year	31	7.95
	2–5 years	124	31.79
	6–10 years	226	57.95
	> 10 years	9	2.31

Table 1 presents the demographic characteristics of the respondents. The majority of respondents were male (62.56%), reflecting the workforce composition commonly found in the nickel mining industry. Most respondents worked as staff/operators (68.72%), indicating strong representation from operational-level employees. In terms of education, the majority held bachelor's or master's degrees (72.56%), suggesting a relatively well-educated workforce. Regarding age, most respondents were over 40 years old (57.44%), indicating substantial professional experience. Similarly, the largest proportion of respondents had worked between six and ten years (57.95%), demonstrating considerable organizational tenure and familiarity with industry practices. Overall, the respondent profile suggests that the sample consisted primarily of experienced operational employees with adequate educational backgrounds, providing a reliable basis for examining the determinants of employee competitive advantage in Indonesia's nickel mining industry.

b. Descriptive Statistical Analysis

Table 2. Descriptive Statistics of Research Variables

Variable	Number of Indicators	Mean Range	Median	Mode	Standard Deviation Range
Employee Competitive Advantage (Y)	8	2.171–3.092	2–3	2–3	0.222–0.342
Digital Technology (Z)	12	2.777–3.645	3–4	3–4	0.235–0.371
Employee Satisfaction (X1)	9	3.731–3.788	4	4	0.533–0.562
Quality of Work Life (X2)	9	3.790–3.844	4	4	0.515–0.557
Transformational Leadership (X3)	12	3.706–3.795	4	4	0.531–0.567
Compensation (X4)	9	3.793–3.885	4	4	0.512–0.556
Employee Engagement (X5)	9	3.726–3.806	4	4	0.535–0.558
Work Motivation (M)	9	3.716–3.824	4	4	0.503–0.563

Table 2 presents the descriptive statistics of the study variables. Overall, the findings indicate that respondents reported favorable perceptions across all constructs. Employee Satisfaction, Quality of Work Life, Transformational Leadership, Compensation, Employee Engagement, and Work Motivation exhibited relatively high mean scores, ranging from approximately 3.70 to 3.89 on a five-point scale. These results suggest that employees generally perceived positive organizational conditions within the nickel mining industry. Among the independent variables, Compensation demonstrated the highest average responses, particularly on indicator X4-5 (mean = 3.885), while Quality of Work Life also received consistently positive evaluations. In contrast, Employee Competitive Advantage and Digital Technology showed comparatively lower mean scores. Employee Competitive Advantage

ranged from 2.171 to 3.092, whereas Digital Technology ranged from 2.777 to 3.645, indicating opportunities for further improvement in strengthening employee competitiveness through greater utilization of digital technologies. Furthermore, the relatively low standard deviation values across all variables indicate a high degree of response consistency and suggest that respondents shared similar perceptions regarding the organizational and technological conditions within their companies. These findings provide an initial indication that human resource factors are perceived positively, while digital technology adoption and employee competitive advantage remain areas with substantial potential for development.

c. Variabel Descriptif

Table 3. Descriptive Summary of Research Variables

Variable	Mean Score	Category	Highest Indicator (Mean)	Lowest Indicator (Mean)
Employee Competitive Advantage (Y)	3.04	Moderate–High	Competitive advantage compared to other workers (3.11)	Using technology to improve performance (2.44)
Employee Satisfaction (X1)	4.01	High	Opportunity to express opinions (4.07)	Work provides meaning (3.95)
Quality of Work Life (X2)	4.02	High	Harmonious relationship with coworkers (4.07)	Workplace safety and promotion fairness (3.98)
Transformational Leadership (X3)	4.04	High	Encouraging innovation and valuing new ideas (4.08)	Leader integrity (3.98)
Compensation (X4)	4.02	High	Performance is appropriately rewarded (4.06)	Compensation policy transparency (3.98)
Employee Engagement (X5)	4.04	High	Striving to deliver the best performance (4.08)	Emotional attachment to work (4.00)
Digital Technology (Z)	3.29	Moderate	Real-time work monitoring (3.35)	Use of application-based systems (3.23)
Work Motivation (M)	3.96	High	Achieving work targets (4.05)	Recognition increases motivation (3.83)

Table 3 summarizes respondents' perceptions of the study variables. Overall, the findings indicate favorable evaluations across most constructs. Employee Satisfaction ($M = 4.01$), Quality of Work Life ($M = 4.02$), Compensation ($M = 4.02$), Transformational Leadership ($M = 4.04$), Employee Engagement ($M = 4.04$), and Work Motivation ($M = 3.96$) were all rated at a high level, suggesting that employees generally perceive positive organizational conditions within the nickel mining industry. In contrast, Employee Competitive Advantage ($M = 3.04$) and Digital Technology ($M = 3.29$) received comparatively lower scores, although both remained within the moderate-to-high range. These findings suggest that while human resource practices and employee attitudes are relatively strong, there remains considerable room for improvement in strengthening employee competitiveness and enhancing the utilization of digital technologies. The results also indicate that digital transformation and technology-based

work practices have not yet reached their full potential as strategic drivers of employee competitive advantage in the Indonesian nickel mining sector.

2. Measurement Model Assesment

Convergent Validity

Convergent validity was evaluated using outer loadings and Average Variance Extracted (AVE). Following the recommendation of Hair et al. (2022), indicator loadings should exceed 0.70 and AVE values should be greater than 0.50 to confirm that indicators adequately represent their respective constructs. The results showed that all indicator loadings ranged from 0.706 to 0.902, exceeding the recommended threshold. The highest loading was observed for indicator Y3 (0.902), while the lowest loading was reported for indicator Y4 (0.706). These findings indicate that all indicators contributed substantially to their respective constructs and no indicator removal was required.

Table 4. Convergent Validity and Reliability Results

Construct	AV E	Cronbach's Alpha	Composite Reliability
Employee Satisfaction (X1)	0.64 4	0.931	0.942
Quality of Work Life (X2)	0.61 7	0.922	0.936
Transformational Leadership (X3)	0.63 4	0.948	0.954
Compensation (X4)	0.62 6	0.925	0.938
Employee Engagement (X5)	0.63 8	0.929	0.941
Digital Technology (Z)	0.60 2	0.940	0.948
Employee Competitive Advantage (Y)	0.67 2	0.929	0.942
Work Motivation (M)	0.64 2	0.930	0.942

All AVE values exceeded the minimum threshold of 0.50, ranging from 0.602 to 0.672. Employee Competitive Advantage demonstrated the highest AVE (0.672), while Digital Technology showed the lowest AVE (0.602). These results confirm satisfactory convergent validity for all constructs.

Discriminant Validity

Discriminant validity was assessed using Cross Loadings, Heterotrait-Monotrait Ratio (HTMT), and the Fornell-Larcker criterion. First, all indicators exhibited higher loadings on their assigned constructs than on other constructs, indicating adequate discriminant validity based on cross-loading assessment. Second, all HTMT values were below the recommended threshold of 0.90. The highest HTMT value was observed between Digital Technology and Employee Competitive Advantage (0.831), while the lowest value was found between Employee Satisfaction and Employee Engagement (0.043). These findings demonstrate that each construct is empirically distinct from the others.

Table 5. HTMT Results

Relationship	HTMT
Digital Technology ↔ Employee Competitive Advantage	0.831
Work Motivation ↔ Digital Technology	0.405
Employee Engagement ↔ Employee Competitive Advantage	0.273
Employee Satisfaction ↔ Employee Engagement	0.043

The Fornell-Larcker criterion further confirmed discriminant validity. The square root of AVE for each construct was greater than its correlations with other constructs. Although the correlation between Digital Technology and Employee Competitive Advantage was relatively high (0.784), it remained below the corresponding square root of AVE values, indicating acceptable discriminant validity.

Reliability Assessment

Reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR). As presented in Table 4, all constructs exceeded the recommended threshold of 0.70. Cronbach's Alpha values ranged from 0.922 to 0.948, while Composite Reliability values ranged from 0.936 to 0.954. Transformational Leadership recorded the highest Composite Reliability (0.954), whereas Quality of Work Life exhibited the lowest value (0.936). Nevertheless, all values indicate excellent internal consistency. Overall, the measurement model demonstrated satisfactory convergent validity, discriminant validity, and reliability. Therefore, all constructs were retained for subsequent structural model evaluation.

3. Structural Model Evaluation

Multicollinearity Assessment

Multicollinearity was assessed using the Variance Inflation Factor (VIF). Most indicators exhibited VIF values ranging from 1.286 to 2.844, indicating the absence of serious collinearity issues. Although several indicators ($Y_2 = 6.331$, $Y_3 = 5.926$, $Z_3 = 5.388$, and $Z_7 = 5.569$) slightly exceeded the recommended threshold of 5.0, all values remained below the more conservative threshold of 10.0. Therefore, multicollinearity was not considered a significant concern, and the structural model could be evaluated further.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) was used to evaluate the explanatory power of the model for endogenous constructs.

Table 6. Coefficient of Determination (R^2)

Endogenous Variable	R^2	Adjusted R^2	Interpretation
Digital Technology (Z)	0.574	0.561	Moderate
Employee Competitive Advantage (Y)	0.791	0.783	Substantial

Source: SmartPLS Output (2026)

The results indicate that Employee Satisfaction, Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement jointly explained 57.4% of the

variance in Digital Technology. Furthermore, the entire model explained 79.1% of the variance in Employee Competitive Advantage, indicating substantial predictive power.

Effect Size (f^2)

Effect size analysis was conducted to assess the contribution of each exogenous construct to the endogenous variables.

Table 7. Effect Size (f^2)		
Relationship	f^2	Effect Size
X1 → Y	0.013	Small
X2 → Y	0.031	Small
X3 → Y	0.021	Small
X4 → Y	0.020	Small
X5 → Y	0.021	Small
X1 → Z	0.060	Small
X2 → Z	0.043	Small
X3 → Z	0.082	Small
X4 → Z	0.023	Small
X5 → Z	0.046	Small
Z → Y	0.305	Medium

The strongest effect in the model was observed for the relationship between Digital Technology and Employee Competitive Advantage ($f^2 = 0.305$), indicating a moderate effect size. In contrast, all direct effects of the HR-related variables demonstrated relatively small effect sizes. Among the antecedents of Digital Technology, Transformational Leadership exhibited the largest contribution ($f^2 = 0.082$). These findings reinforce the strategic role of Digital Technology as a mechanism through which HR factors enhance employee competitiveness.

Predictive Relevance (Q^2)

Predictive relevance was assessed using the blindfolding procedure. All Q^2 values exceeded zero, indicating that the model possesses predictive relevance. The Q^2 values for Digital Technology indicators ranged from 0.179 to 0.285, indicating moderate predictive relevance. Meanwhile, Employee Competitive Advantage indicators ranged from 0.192 to 0.387, reflecting moderate to strong predictive capability. Several indicators ($Y5 = 0.353$, $Y6 = 0.387$, and $Y8 = 0.360$) exceeded the 0.35 threshold, suggesting strong predictive relevance. Overall, the model demonstrated satisfactory predictive performance for both endogenous constructs.

Model Fit Assessment

Model fit was evaluated using the Standardized Root Mean Square Residual (SRMR).

Table 8. Model Fit Indices

Fit Index	Saturated Model	Estimated Model	Threshold
SRMR	0.059	0.061	< 0.08

Source: SmartPLS Output (2026)

The SRMR values for both the saturated model (0.059) and estimated model (0.061) were below the recommended threshold of 0.08, indicating a good model fit. Therefore, the proposed structural model adequately represents the empirical data and is suitable for hypothesis testing.

4. Hypothesis Test

Table 9. Summary of Hypothesis Testing Results

Hypothesis	Relationship	β (Path Coefficient)	t-value	p-value	Result
H1	Employee Satisfaction → Competitive Advantage	0.055	1.515	0.130	Not Supported
H2	Quality of Work Life → Competitive Advantage	0.085	3.017	0.003	Supported
H3	Transformational Leadership → Competitive Advantage	0.070	2.220	0.026	Supported
H4	Compensation → Competitive Advantage	0.067	2.232	0.026	Supported
H5	Employee Engagement → Competitive Advantage	0.070	2.255	0.024	Supported
H6	Employee Satisfaction → Digital Technology	0.162	3.508	0.000	Supported
H7	Quality of Work Life → Digital Technology	0.137	4.345	0.000	Supported
H8	Transformational Leadership → Digital Technology	0.189	5.617	0.000	Supported
H9	Compensation → Digital Technology	0.099	2.950	0.003	Supported
H10	Employee Engagement → Digital Technology	0.141	4.246	0.000	Supported
H11	Digital Technology → Competitive Advantage	0.396	3.980	0.000	Supported
H12	Employee Satisfaction → Digital Technology → Competitive Advantage	0.064	3.915	0.000	Supported
H13	Quality of Work Life → Digital Technology → Competitive Advantage	0.054	3.260	0.001	Supported
H14	Transformational Leadership → Digital Technology → Competitive Advantage	0.075	2.848	0.004	Supported

Hypothesis	Relationship	β (Path Coefficient)	t-value	p-value	Result
H15	Compensation $\rightarrow$ Digital Technology $\rightarrow$ Competitive Advantage	0.039	3.209	0.001	Supported
H16	Employee Engagement $\rightarrow$ Digital Technology $\rightarrow$ Competitive Advantage	0.056	3.276	0.001	Supported
H17	Motivation $\times$ Employee Satisfaction $\rightarrow$ Digital Technology	0.278	6.343	0.000	Supported
H18	Motivation $\times$ Quality of Work Life $\rightarrow$ Digital Technology	0.255	7.863	0.000	Supported
H19	Motivation $\times$ Transformational Leadership $\rightarrow$ Digital Technology	0.235	6.082	0.000	Supported
H20	Motivation $\times$ Compensation $\rightarrow$ Digital Technology	0.229	6.602	0.000	Supported
H21	Motivation $\times$ Employee Engagement $\rightarrow$ Digital Technology	0.292	8.401	0.000	Supported
H22	Motivation $\times$ Employee Satisfaction $\rightarrow$ Competitive Advantage	0.242	6.861	0.000	Supported
H23	Motivation $\times$ Quality of Work Life $\rightarrow$ Competitive Advantage	0.216	7.696	0.000	Supported
H24	Motivation $\times$ Transformational Leadership $\rightarrow$ Competitive Advantage	0.201	6.227	0.000	Supported
H25	Motivation $\times$ Compensation $\rightarrow$ Competitive Advantage	0.225	7.784	0.000	Supported
H26	Motivation $\times$ Employee Engagement $\rightarrow$ Competitive Advantage	0.229	7.049	0.000	Supported

Table 9 shows that 25 out of 26 hypotheses were supported. Among the direct effects, Digital Technology exerted the strongest influence on Employee Competitive Advantage ($\beta = 0.396$, $p < 0.001$), confirming its strategic importance in enhancing workforce competitiveness. Transformational Leadership emerged as the strongest predictor of Digital Technology adoption ($\beta = 0.189$, $p < 0.001$). The only unsupported hypothesis was the direct effect of Employee Satisfaction on Employee Competitive Advantage ($\beta = 0.055$, $p = 0.130$). The mediation analysis demonstrated that Digital Technology significantly mediated the relationships between all HR-related factors and Employee Competitive Advantage. The strongest indirect effect was observed in the Transformational Leadership $\rightarrow$ Digital Technology $\rightarrow$ Competitive Advantage pathway ($\beta = 0.075$, $p = 0.004$). Furthermore, Work Motivation significantly moderated all proposed relationships. The strongest moderating effect was found in the interaction between Employee Engagement and Digital Technology ($\beta = 0.292$, $p < 0.001$), indicating that higher levels of employee motivation strengthen the contribution of engagement toward digital technology utilization.

Discussion

The findings indicate that Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement have significant positive effects on Employee Competitive Advantage, whereas Employee Satisfaction does not directly influence Employee

Competitive Advantage. These results suggest that in Indonesia's nickel mining industry, employee competitiveness is not merely determined by how satisfied employees feel with their jobs, but rather by organizational factors that directly support performance, capability development, and value creation. According to Human Capital Theory (Becker, 1993), employees represent strategic assets whose knowledge, skills, and competencies contribute to organizational competitiveness. Therefore, organizations that provide a supportive work environment, inspirational leadership, fair compensation systems, and opportunities for active involvement are more likely to develop employees with superior competitive capabilities.

The significant effect of Quality of Work Life on Employee Competitive Advantage confirms previous studies indicating that employees who experience favorable working conditions, work-life balance, and organizational support tend to demonstrate higher productivity and stronger commitment to organizational goals. In the mining industry, where operational demands and occupational risks are relatively high, maintaining employees' quality of work life becomes an essential strategy for sustaining workforce performance and competitiveness. Likewise, the positive effect of Transformational Leadership supports the argument of Bass and Avolio (1994) that leaders who inspire, motivate, and intellectually stimulate employees are capable of encouraging them to achieve performance beyond expected standards. Through transformational leadership, employees become more adaptive, innovative, and willing to embrace organizational changes, which ultimately strengthens their competitive advantage.

The positive influence of Compensation on Employee Competitive Advantage is consistent with Expectancy Theory (Vroom, 1964), which posits that employees are motivated to exert greater effort when they perceive a clear relationship between performance and rewards. Fair and competitive compensation systems encourage employees to improve their performance and continuously develop their competencies. Similarly, Employee Engagement significantly contributes to Employee Competitive Advantage, supporting the Social Exchange Theory (Blau, 1964), which explains that employees who feel valued and supported by their organizations tend to reciprocate through greater dedication, commitment, and performance. Engaged employees are more willing to contribute additional effort, share knowledge, and participate in organizational improvement initiatives, all of which enhance competitive performance.

However, the insignificant relationship between Employee Satisfaction and Employee Competitive Advantage suggests that satisfaction alone is insufficient to generate superior competitiveness. While satisfied employees may experience positive attitudes toward their work, such attitudes do not automatically translate into higher performance or strategic capabilities. In highly competitive and technology-intensive industries such as nickel mining, employees require not only satisfaction but also access to technological resources, leadership support, learning opportunities, and organizational systems that enable them to transform positive attitudes into productive outcomes. This finding is consistent with previous studies suggesting that employee satisfaction often serves as a precursor to organizational commitment and engagement rather than as a direct predictor of competitive advantage.

Another important finding is that Employee Satisfaction, Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement all significantly influence Digital Technology utilization. These results support the Socio-Technical Systems Theory, which emphasizes that organizational success depends on the alignment between social systems and technological systems. Technology implementation cannot be separated from human and organizational factors because employees ultimately determine whether technology is adopted and utilized effectively. Among all antecedent variables, Transformational Leadership demonstrated the strongest influence on Digital Technology adoption. This finding reinforces the growing body of literature on digital transformation, which highlights the

importance of leadership in creating a digital culture, encouraging innovation, and reducing employee resistance to technological change. Leaders who communicate a compelling vision and foster a climate of learning are more successful in promoting digital readiness and technological adaptation among employees.

The significant relationship between Quality of Work Life and Digital Technology further indicates that employees are more willing to utilize digital technologies when they perceive organizational support, adequate resources, and a positive working environment. Similarly, compensation and employee engagement contribute to technology adoption by increasing employees' motivation to participate in organizational transformation initiatives. In the context of nickel mining operations, digital technologies such as real-time monitoring systems, predictive maintenance applications, automation tools, and data analytics platforms have become increasingly important for improving operational efficiency and workforce effectiveness. Consequently, organizations that successfully integrate human resource management practices with digital transformation initiatives are more likely to enhance employee capabilities and organizational competitiveness.

The results also reveal that Digital Technology has the strongest direct influence on Employee Competitive Advantage. This finding supports Dynamic Capability Theory (Harmawati et al., 2024), which argues that sustainable competitive advantage depends on an organization's ability to integrate, build, and reconfigure resources in response to environmental changes. Digital technology enables employees to access information more efficiently, improve decision-making processes, enhance communication, and optimize operational performance. In the nickel mining industry, where operational complexity and market competition continue to increase, the ability to utilize digital technologies effectively becomes a critical source of competitive advantage. The relatively large effect of Digital Technology compared with other variables suggests that technological capability has evolved beyond a supporting function and now serves as a strategic resource that directly influences employee performance and competitiveness.

Furthermore, the mediation analysis demonstrates that Digital Technology significantly mediates the relationships between all human resource factors and Employee Competitive Advantage. These findings provide empirical support for the Resource-Based View (Barney, 1991), which emphasizes that organizational resources create competitive advantage when they are transformed into valuable and difficult-to-imitate capabilities. Human resource factors such as leadership, engagement, compensation, quality of work life, and employee satisfaction represent important organizational resources; however, their impact on competitiveness becomes stronger when they facilitate the effective utilization of digital technologies. In other words, Digital Technology acts as a strategic mechanism through which organizational resources are converted into competitive outcomes.

Among the indirect relationships, the strongest mediation effect was observed in the relationship between Transformational Leadership and Employee Competitive Advantage through Digital Technology. This result indicates that transformational leaders not only improve employee performance directly but also encourage the adoption and effective utilization of digital technologies, which subsequently enhance employee competitiveness. Similar findings have been reported in previous digital transformation studies, which suggest that leadership plays a crucial role in bridging organizational capabilities and technological innovation. Therefore, leadership development programs aimed at strengthening digital competencies may provide substantial benefits for organizations operating in technology-driven industries.

The moderation analysis further reveals that Work Motivation significantly strengthens all relationships between human resource factors, Digital Technology, and Employee Competitive Advantage. These findings indicate that motivated employees are more responsive

to organizational initiatives, more willing to adopt digital technologies, and more capable of translating organizational support into superior performance. The strongest moderating effect was found in the relationship between Employee Engagement and Digital Technology, suggesting that highly motivated employees are more likely to transform their engagement into active participation in digital transformation efforts. This result is consistent with motivational theories, which argue that motivation functions as an internal driving force that determines the intensity, direction, and persistence of employee behavior. Consequently, organizations seeking to improve employee competitiveness should not only invest in leadership, compensation, engagement, and technology but also develop policies and practices that strengthen employee motivation.

Overall, the findings suggest that enhancing employee competitive advantage in Indonesia's nickel mining industry requires an integrated approach that combines effective human resource management practices with digital transformation strategies. Digital Technology emerges as a key strategic mechanism linking organizational resources and employee competitiveness, while Work Motivation strengthens the effectiveness of these relationships. Therefore, organizations should prioritize investments in digital capability development, transformational leadership, employee engagement programs, and motivational initiatives to achieve sustainable competitive advantage in an increasingly dynamic and technology-driven business environment.

This study contributes to the human resource management and digital transformation literature by providing empirical evidence regarding the mechanisms through which human resource factors influence employee competitive advantage in the Indonesian nickel mining industry. While previous studies have generally examined the direct effects of employee satisfaction, quality of work life, transformational leadership, compensation, and employee engagement on employee performance or organizational outcomes, this study demonstrates that Digital Technology plays a strategic role in translating these human resource factors into employee competitive advantage. Furthermore, this study extends the Resource-Based View (RBV) and Dynamic Capability Theory by showing that human resource practices alone are insufficient to generate sustainable competitive advantage unless they are supported by digital capabilities. The findings suggest that digital technology functions as an organizational capability that enables firms to transform human resources into strategic assets capable of creating superior performance and competitiveness.

The findings provide important implications for managers and policymakers in the nickel mining sector. First, organizations should not rely solely on traditional human resource management practices but must integrate these practices with digital transformation initiatives. Second, transformational leadership should be strengthened because it was found to be the strongest predictor of digital technology utilization. Leaders who encourage innovation and digital adoption can significantly improve employee competitiveness. Third, organizations should continuously invest in digital infrastructure, employee digital skills development, and technology-based operational systems. The significant influence of Digital Technology on Employee Competitive Advantage indicates that technological capability has become a critical success factor in modern mining operations. Finally, employee motivation should be enhanced through appropriate reward systems, career development opportunities, and supportive organizational cultures because motivation strengthens the effectiveness of human resource practices and digital technology adoption.

The novelty of this study lies in three main aspects. First, unlike previous studies that primarily investigated the direct relationship between human resource practices and employee performance, this study positions Digital Technology as a strategic mediating mechanism that links human resource factors to employee competitive advantage. Second, this study integrates Human Capital Theory, Resource-Based View, Dynamic Capability Theory, and Digital

Transformation perspectives into a single conceptual framework, providing a more comprehensive explanation of how employee competitiveness is developed in the digital era. Third, empirical studies examining the interaction between human resource management practices, digital technology, and employee competitive advantage remain limited in the context of Indonesia's nickel mining industry. Therefore, this study contributes new empirical evidence from one of the world's most strategically important mining sectors, where digital transformation and workforce competitiveness have become critical determinants of organizational sustainability.

Despite its contributions, this study has several limitations that should be considered when interpreting the findings. First, the study employed a cross-sectional research design, which limits the ability to establish causal relationships over time. Future studies may utilize longitudinal approaches to examine the dynamic relationships among human resource factors, digital technology, and employee competitive advantage. Second, the research focused exclusively on employees within the Indonesian nickel mining industry. Consequently, the generalizability of the findings to other industrial sectors may be limited. Future studies are encouraged to validate the proposed model across different industries and organizational contexts. Third, although the model explains a substantial proportion of variance in Employee Competitive Advantage ($R^2 = 0.791$), other factors such as organizational culture, digital literacy, innovation capability, knowledge management, and organizational learning were not included in the present study. Incorporating these variables may provide a more comprehensive understanding of employee competitiveness in the era of digital transformation.

CONCLUSION

This study concludes that Digital Technology plays a critical role in enhancing Employee Competitive Advantage in Indonesia's nickel mining industry. The results indicate that Quality of Work Life, Transformational Leadership, Compensation, and Employee Engagement have significant positive effects on Employee Competitive Advantage, whereas Employee Satisfaction does not exhibit a significant direct effect. Furthermore, all human resource factors significantly influence Digital Technology utilization, with Transformational Leadership emerging as the strongest predictor. The findings also demonstrate that Digital Technology significantly mediates the relationships between Employee Satisfaction, Quality of Work Life, Transformational Leadership, Compensation, Employee Engagement, and Employee Competitive Advantage. This confirms that digital technology serves as a strategic mechanism through which human resource practices are translated into competitive outcomes. In addition, Work Motivation significantly strengthens the relationships among human resource factors, Digital Technology, and Employee Competitive Advantage, indicating that motivated employees are more capable of leveraging organizational resources and digital capabilities to improve performance. Overall, the study highlights that sustainable employee competitive advantage is achieved not only through effective human resource management practices but also through the integration of digital transformation initiatives and motivational strategies. Therefore, organizations in the nickel mining sector should prioritize the development of digital capabilities, transformational leadership, employee engagement, and motivational programs to strengthen workforce competitiveness in an increasingly dynamic and technology-driven environment.

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