Digital Leadership and Innovation Management Toward Inovation Performance at Telkom Indonesia

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Abstract.

This study aims to examine the influence of digital leadership and innovation management on innovation performance in organizations. The research used a quantitative approach, with 100 respondents, and collected data via structured questionnaires. The analysis was performed using Structural Equation Modeling with Partial Least Squares (SEM-PLS) to evaluate the relationships among the variables. The results indicate that both digital leadership and innovation management have a significant and positive impact on innovation performance. Digital leadership enables leaders to utilize technology, foster an adaptive and innovative organizational culture, and support creative problem-solving. At the same time, effective innovation management ensures structured, collaborative, and responsive processes for idea generation, development, and implementation. Based on these findings, organizations are recommended to strengthen digital leadership capabilities and implement systematic innovation management practices to enhance innovation performance and sustain competitive advantage. These measures are crucial for organizations to respond effectively to environmental changes and achieve long-term growth.

Keywords: *Digital Leadership; Innovation Management; Innovation Performance; Organizational Competence and Technology Adoption.*

I. INTRODUCTION

The rapid development of digital technologies and the increasing complexity of business competition have made innovation a critical source of competitive advantage for organizations [1], [2]. Companies that adopt emerging technologies and foster continuous innovation are more likely to sustain performance and strengthen their market position in the long term [3]. Telkom Indonesia, the largest digital telecommunications company in Indonesia, places innovation at the center of its strategic transformation to become a leading digital telco. This strategic direction is reflected in the company's continuous improvement in digital capabilities and accomplishment of various innovation awards, which demonstrate its commitment to strengthening digital competitiveness.To accelerate digital innovation within the organization, Telkom has developed the Digital Amoeba program, a corporate innovation laboratory designed to nurture employee creativity and produce digital solutions. This program adopts the Lean Startup methodology, emphasizing experimentation, rapid iteration, and validation to ensure the feasibility of innovation. Although the program has generated thousands of innovation proposals over multiple batches, only a tiny percentage of ideas successfully progress to the final stage and graduate as validated digital products. This condition indicates that a high level of innovation effort must be supported by strong internal leadership and effective innovation management to translate ideas into impactful outcomes for the company.Innovation performance represents an organization's ability to successfully produce and implement new ideas that create value for customers and sustain the business [4], [5].

Prior studies highlight that innovation performance can be strongly influenced by digital leadership, particularly through leaders' ability to drive digital adoption, encourage creative problem-solving, and foster collaborative and agile work environments [6], [7], [8], [9]. Leaders with strong digital vision can shape an innovation-oriented culture that empowers employees to explore new opportunities and integrate digital technology into work processes. In addition, innovation management processes play a vital role in guiding idea development through systematic mechanisms of evaluation, resource allocation, and commercialization.Although Telkom Indonesia operates under an integrated corporate strategy, the structure

of its business units across seven regional operational areas results in variations in leadership styles and innovation management approaches. These differences may contribute to inconsistent levels of innovation outcomes across regions. While Telkom continues to invest significantly in innovation through Digital Amoeba and other initiatives, an empirical understanding is needed to explain how digital leadership and innovation management collectively influence innovation performance within this organizational context.The current study aims to provide empirical evidence on the effect of digital leadership and innovation management on innovation performance at Telkom Indonesia. The findings are to strengthen theoretical insights regarding the strategic role of leadership and innovation management in digital-based organizations. This study is aims to provide practical implications for enhancing innovation effectiveness and ensuring that investments in innovation programs yield optimal value for the company's performance and competitive sustainability.

II. METHODS

This study employs a quantitative research approach to analyze the influence of digital leadership and innovation management on innovation performance at PT Telkom Indonesia. Quantitative research uses numerical data, such as questionnaires, and applies statistical techniques to analyze the relationships among variables [10]. Unlike qualitative research, which examines non-numerical data such as words, images, or videos, quantitative research provides structured measurements to understand behaviors, motivations, and attitudes in a population [11]. This study is descriptive-explanatory, as it not only describes the phenomenon of innovation practices at Telkom Indonesia but also explains the causal relationships among variables [10], [12].The population of this study consists of employees participating in Telkom Indonesia's Digital Amoeba program across all seven regional offices, from Sumatra to Eastern Indonesia. The research focuses on employees who actively submit ideas, develop them, and follow the innovation validation process. Purposive sampling was employed to select respondents with direct experience in these innovation activities, ensuring that the collected data accurately represent the target population.

A total of 120 respondents were targeted to provide sufficient data for statistical analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM).The study includes three main variables: digital leadership, innovation management, and innovation performance. Digital leadership is the independent variable, measured through indicators such as thought leadership, creative leadership, global vision, inquisitive leadership, and profound leadership. Innovation management, an independent variable, is assessed using indicators such as loose control and coordination. Innovation performance is the dependent variable, evaluated through indicators such as value realization, future-focused leadership, purposeful direction, innovation culture, exploitable insights, mastery of uncertainty, and agile management. Operationalization of variables involves translating abstract concepts into observable, measurable elements [12].

Table 1. Operationalization of variables and indicators

Variable	Dimension	Indicators
Digital Leadership (X1)	Thought Leader	Uses critical thinking in decision-making
		Takes time to consider issues before important decisions
		Considers others' perspectives before concluding
	Global Visionary	Integrates global developments into strategy and plans.
		Knowledgeable about global trends affecting the organization.
		Encourages diversity and inclusion within the team.
	Creative Leader	Encourages creative thinking and innovative solutions.
		Supports and values innovative ideas from team members.
		Promotes an environment supporting controlled experimentation and risk.
	Leader Inquisitive	Encourages the team to continuously learn and seek new answers.
		Open to feedback and constructive criticism.
		Encourages exploration of the latest technological developments.
	Leader Profound	Communicates a clear vision and core values.
		Motivates and inspires to achieve broader impact.
		Builds meaningful relationships with the team in a digital context.
Innovation Management (X2)	Realisation of Value	Successfully realizes value from implemented innovations.

Variable	Dimension	Indicators
		Has effective methods to assess the value of innovation.
		Measures financial/non-financial impact of realized innovations.
	Future-focused Leaders	Has a forward-looking view to identify future innovation opportunities.
		Encourages and supports experimentation and concept development.
		Forms and implements future-oriented innovation strategies.
	Purposeful Direction	Has clear vision and goals for innovation.
		Has a well-defined, effectively communicated innovation strategy.
		Involves team in formulating/updating innovation goals.
	Innovation Culture	Encourages and values innovative ideas from all members.
		Is open to change and risk-taking necessary for innovation.
		Provides adequate resources and time for experimentation.
	Exploitable Insights	Has a process to identify/collect/analyze new knowledge for innovation.
		Uses available data for innovative decision-making.
		Encourages cross-team collaboration to share knowledge.
	Mastering Uncertainty	Anticipates and manages uncertainty related to innovation implementation.
		Has an effective risk management strategy for innovation.
		Evaluates and learns from failures/challenges in implementation.
	Agile Management	Implements responsive and adaptive management approaches.
		Conducts quick evaluations and adjustments to ongoing strategies.
		Encourages effective collaboration/communication for innovation.
Innovation Performance (Y)	Futures focus	The innovation adopts/follows future industry trends.
		The innovation creates solutions for future needs/challenges.
		The innovation is positioned for future competitive advantage.
	Market Impact	The innovation has potential to transform/create new markets.
		The innovation can be adopted/accepted by the market.
		The innovation has potential market penetration and share.
	Capabilities and Image	The innovation is supported by adequate technology/expertise.
		The innovation builds the firm's image as an innovation leader.
		The innovation generates customer trust and satisfaction.
	Process	The innovation successfully improves process efficiency/productivity.
		The innovation improves quality within processes.
		The innovation provides user satisfaction.
	Sustainability and Overall Effectiveness	The innovation helps optimize company resources.
		The innovation helps achieve set business/organizational goals.
		The innovation provides added value/benefits for stakeholders.

Data were collected using structured questionnaires distributed to selected employees. All items were measured using a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). The collected data were screened for completeness, outliers, and normality before analysis. Hypothesis testing and model assessment were conducted using PLS-SEM with SmartPLS 4 software. The analysis included evaluating the measurement model to assess construct reliability and validity, including convergent validity via Average Variance Extracted (AVE), discriminant validity using the Fornell-Larcker criterion, and internal consistency reliability via Cronbach's alpha and composite reliability.The structural model was evaluated by examining path coefficients, the coefficient of determination (R^2), and the predictive relevance (Q^2) to assess the significance of hypothesized relationships. Bootstrapping with 5,000 subsamples was applied to assess the significance of path coefficients at a 0.05 significance level. Ethical considerations, such as voluntary participation, informed consent, and confidentiality, were strictly maintained throughout the study.

III. RESULT AND DISCUSSION

The analysis begins with a descriptive overview of the data to characterize the sample and the central tendencies of the key variables. Subsequently, the results of the hypothesis testing are presented and discussed in the context of the existing theoretical framework.

Descriptive Analysis

Descriptive analysis aims to provide a summary of the data to facilitate understanding and deliver informative insights. The information presented is based on responses from 100 respondents across three

variable components. The scoring intervals were divided into five categories to determine the average score of each respondent's answer.

Respondents' Perception of Digital Leadership

Digital leadership was assessed based on 15 indicators. The respondents' perceptions are summarized in Table 2.

Table 2. Recapitulation of Respondents' Perceptions of Digital Leadership

No	Statement	Mean
1	Top management applies critical thinking in decision-making.	4.655
2	Top management takes adequate time to consider issues before making important decisions.	4.530
3	Top management considers others' perspectives before reaching a conclusion.	4.330
4	Top management pays attention to and integrates global developments into strategies and work plans.	4.250
5	Top management is knowledgeable about global trends and developments that affect the organization.	4.295
6	Top management encourages diversity and inclusion within the team to achieve broader goals.	4.390
7	Top management encourages the team to think creatively and find innovative solutions.	4.375
8	Top management supports and values innovative ideas from team members.	4.655
9	Top management promotes an environment that supports experimentation and controlled risk-taking.	4.600
10	Top management encourages the team to continuously learn and seek new answers.	4.505
11	Top management is open to feedback and constructive criticism.	4.475
12	Top management encourages deeper exploration and understanding of the latest technological developments.	4.290
13	Top management communicates a clear vision and core values upheld in their leadership.	4.150
14	Top management motivates and inspires employees to achieve a broader impact.	4.205
15	Top management builds meaningful relationships with the team in the context of digital leadership.	4.045
Overall Mean		4.35

Source: Processed Data, 2025

The overall mean score of 4.35 indicates that respondents perceive digital leadership as very good (Likert scale 1–5). This result suggests that leaders possess strong digital competencies to guide the organization toward technology-driven transformation. According to the literature, digital leadership involves developing a strategic vision for technology, integrating it into organizational processes, and fostering an adaptive and innovative culture [13], [14]. High perception scores indicate that leaders possess both technical and strategic competencies, enabling them to guide digital adoption, optimize data-driven decision-making, and lead digital transformation projects [15], [16].

Respondents' Perception of Innovation Management

Innovation management was assessed through 21 indicators, with respondents' perceptions summarized in Table 3.

Table 3. Respondents' Perception of Innovation Management

No	Statement	Mean
1	The innovation management function successfully realizes the value of implemented innovations.	4.205
2	The innovation management function has effective methods and processes for assessing the value of innovations.	4.170
3	The innovation management function measures and evaluates the financial or non-financial impacts of realized innovations.	4.225
4	The innovation management function has a forward-looking perspective in identifying future innovation opportunities.	4.145
5	The innovation management function encourages and supports experimentation and the development of innovative concepts.	4.550
6	The innovation management function formulates and implements innovation strategies aligned with future direction.	4.525
7	The innovation management function has a clear vision and objectives related to innovation.	4.535
8	The innovation management function establishes well-defined innovation strategies that are effectively communicated across the organization.	4.340
9	The innovation management function involves team members in formulating and updating innovation goals.	4.350
10	The innovation management function encourages and appreciates innovative ideas from all team members.	4.325

No	Statement	Mean
11	The innovation management function is receptive to changes and risk-taking necessary for innovation.	4.320
12	The innovation management function provides adequate resources and time for experimentation and development of innovative concepts.	4.455
13	The innovation management function has processes for identifying, collecting, and analyzing new knowledge or insights that can be used for innovation.	4.510
14	The innovation management function uses available data and information to support innovative decisions.	4.330
15	The innovation management function encourages collaboration among teams or departments to share innovative knowledge and insights.	4.465
16	The innovation management function anticipates and manages uncertainty related to innovation implementation.	4.450
17	The innovation management function has effective risk management strategies in the context of innovation.	4.615
18	The innovation management function evaluates and learns from failures or challenges in innovation implementation.	4.360
19	The innovation management function applies responsive and adaptive management approaches to innovation-related changes.	4.330
20	The innovation management function conducts rapid evaluation and adjustment of ongoing innovation strategies.	4.450
21	The innovation management function encourages effective collaboration and communication between teams or departments for innovation purposes.	4.205
Overall		4.32

Source: Processed Data, 2025

The mean score of 4.32 indicates that respondents perceive innovation management as good to very good, implying that the organization effectively manages innovation processes from ideation to implementation. Effective innovation management allows organizations to be adaptive, systematic, and capable of creating sustainable value [17], [18]. Challenges remain in maintaining consistent innovation portfolio management, resource allocation, and diffusion of innovation across units [19], [20]. Continuous monitoring, technological support, and a collaborative culture are crucial for sustaining innovation.

Respondents' Perception of Innovation Performance

Innovation performance was measured using 21 indicators. The results are presented in Table 4.

Table 4. Respondents' Perception of Innovation Performance

No	Statement	Mean
1	The innovation management function successfully realizes the value of implemented innovations.	4.205
2	The innovation management function has effective methods and processes for assessing the value of innovations.	4.170
3	The innovation management function measures and evaluates the financial or non-financial impacts of realized innovations.	4.225
4	The innovation management function has a forward-looking perspective in identifying future innovation opportunities.	4.145
5	The innovation management function encourages and supports experimentation and the development of innovative concepts.	4.550
6	The innovation management function formulates and implements innovation strategies aligned with future direction.	4.525
7	The innovation management function has a clear vision and objectives related to innovation.	4.535
8	The innovation management function establishes well-defined innovation strategies that are effectively communicated across the organization.	4.340
9	The innovation management function involves team members in formulating and updating innovation goals.	4.350
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14	The innovation management function uses available data and information to support innovative decisions.	4.330
15	The innovation management function encourages collaboration among teams or departments to share innovative knowledge and insights.	4.465
16	The innovation management function anticipates and manages uncertainty related to innovation implementation.	4.450
17	The innovation management function has effective risk management strategies in the context of innovation.	4.615
18	The innovation management function evaluates and learns from failures or challenges in innovation implementation.	4.360
19	The innovation management function applies responsive and adaptive management approaches to innovation-related changes.	4.330
20	The innovation management function conducts rapid evaluation and adjustment of ongoing innovation strategies.	4.450
21	The innovation management function encourages effective collaboration and communication between teams or departments for innovation purposes.	4.205
Overall		4,35

Source: Processed Data, 2025

The overall mean score of 4.35 indicates that the organization is perceived as effective in generating innovations in terms of quality, sustainability, and operational impact. High respondent perception suggests that the organization is on the right track in creating valuable innovations while continuous improvement is needed to maintain relevance and responsiveness to external changes.

Instrument Validity and Reliability

Instrument validity was confirmed using SEM-PLS with a minimum loading factor of 0.6. Reliability was assessed with Cronbach's Alpha, showing high reliability for all constructs: Digital Leadership (0.958), Innovation Management (0.965), and Innovation Performance (0.967). Discriminant validity using the Fornell-Larcker criterion also confirmed that all constructs were valid. Coefficient of determination (R^2) for Innovation Performance was 0.933, indicating that 93% of variance in innovation performance is explained by digital leadership and innovation management.

Table 5. Instrument Validity and Reliability

Discriminant Validity (Fornell-Lacker criterion)			
Variable	**Digital Leadership**	**Innovation Management**	**Innovation Performance**
Digital Leadership	0,781		
Innovation Management	0,913	0,779	
Innovation Performance	0,930	0,958	0,845
Reliability Test			
	Value	**Decission**	
Digital Leadership	0,958	Reliabel	
Innovation Management	0,965	Reliabel	
Innovation Performance	0,967	Reliabel	
Coefficient of Determination			
	R Square	**R Square Adjusted**	
Innovation Performance	0,937	0,935	

Source: Processed Data, 2025

The results presented in Table 5 indicate that the measurement model meets the required validity and reliability criteria. The correlations in the Fornell–Larcker matrix indicate that each construct has a higher square root of its AVE on the diagonal than its correlations with other constructs, confirming adequate discriminant validity. The Cronbach's Alpha values for all constructs are above 0.90, indicating excellent

internal consistency. Furthermore, the R^2 value of 0.937 for Innovation Performance suggests that digital leadership and innovation management collectively explain 93.7% of the variance in innovation performance, indicating a strong predictive capability of the structural model. Overall, these findings confirm that the measurement and structural models are statistically robust and suitable for hypothesis testing.

Evaluation of Measurement Model (Outer Model)

According to Ghozali (2015), "the outer model functions as a measurement model used to assess the validity and reliability of a model." Meanwhile, the inner model aims to predict relationships between latent variables. Convergent reliability is evaluated by measuring parameters in the measurement model, such as loading factor values and the Average Variance Extracted (AVE), which serve as indicators of convergent validity. In addition, discriminant validity is examined through cross-loadings, and the measurement model's reliability is evaluated using Composite Reliability. Using SmartPLS software, the validity and reliability of each latent variable can be assessed during the outer model evaluation. The results of this analysis, obtained from SmartPLS data processing, are summarized in the outer model diagram shown in Figure 1.

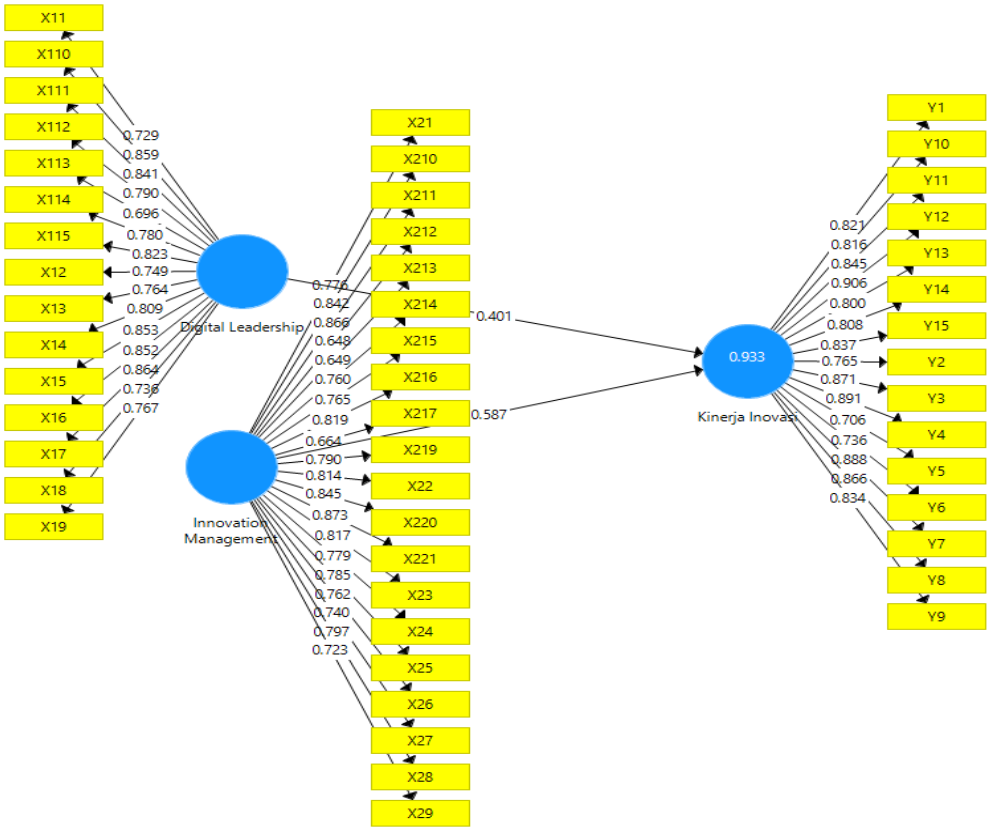

Fig 1. *Evaluation of Measurement Model (Outer Model)*

The initial analysis of the outer model shows that all coefficient values for the variables and their respective indicators meet the established criteria. These results indicate that the model demonstrates good, consistent validity and reliability.

Evaluation of Structural Model Assessment (Inner Model)

The evaluation of the inner model is conducted to ensure that the relationships among the three latent variables are appropriate. In SmartPLS, path coefficients and t-statistics are generated via bootstrapping. The requirement that the calculated t-value exceeds the t-table value of 1.66 and the p-value is less than 0.05 indicates that the variables in the model have a significant positive influence. The results of the SmartPLS bootstrapping analysis are presented in Table 6.

Table 6. Hypothesis Testing

Path	T Statistics	P Values
Digital Leadership on Innovation Performance	4,638	0.000
Innovation Management on Innovation Performance	9,524	0.000

Source: Processed Data, 2025

These results indicate that Digital Leadership has a significant influence on Innovation Performance, as the T-Statistic is well above 1.66 (4.638) and the P-Value is below 0.05. This implies that the higher the digital leadership capability demonstrated by leaders—such as the ability to manage technology, encourage digital utilization, and drive digital transformation—the greater the organization's innovation performance. Therefore, Hypothesis 1 is supported. Furthermore, the exceptionally high T-statistic value (9.524) and the P-value of 0.000 show that Innovation Management significantly influences Innovation Performance. This means that an effective innovation management process—covering idea generation, development, collaboration, evaluation, and innovation implementation—directly enhances the quality and success of innovation within the organization. Thus, Hypothesis 2 is accepted, confirming that Innovation Management has a positive impact on Innovation Performance.

The Effect of Digital Leadership on Innovation Performance

The analysis reveals that both Digital Leadership and Innovation Management significantly influence Innovation Performance. These findings suggest that innovation performance is highly dependent on leaders' abilities to manage digital initiatives and the effectiveness of innovation management processes within the organization. The significant effect of Digital Leadership on Innovation Performance (T-Statistics = 4.638; P-Value = 0.000) indicates that the stronger the leader's capability to leverage digital technologies, direct digital transformation, and nurture an adaptive organizational culture, the better the resulting innovation performance. Leaders with strong digital competencies can deploy relevant technologies, leverage data for decision-making, accelerate workflows, and foster an environment that encourages experimentation and creativity.This aligns with previews study, who found that digital leadership directly drives innovation performance in SMEs through digital transformation as a mediator.

The supporting literature also emphasizes the role of digital leaders as primary drivers of innovation [22], [23], [24]. For example, [25] found that digital leadership, mediated by innovation and IT capabilities, positively and significantly impacts organizational performance in the fashion SME sector. Additionally, from the perspective of organizational culture and employee involvement, digital leadership has been shown to encourage innovative work behavior. Nugroho, Saputro & Sugiharto (2024) noted that digital leadership positively affects organizational moral culture and work engagement, which, in turn, influence employee creative behavior. Therefore, the role of a digital leader is not only technical but also socio-cultural, as they are responsible for building a climate that supports employees' creative participation.The significant influence of Digital Leadership on Innovation Performance is highly aligned with existing literature. Digital Leadership facilitates digital transformation not only through technology but also by enhancing organizational culture and innovation systems. Hence, organizations must strengthen digital leadership capabilities as part of long-term strategies to increase innovation and competitiveness.

The Effect of Innovation Management on Innovation Performance

Innovation Management is also proven to have a strong and significant influence on Innovation Performance (T-Statistics = 9.524; P-Value = 0.000), indicating that a structured innovation management process—from idea formulation, development, and collaboration to implementation—is crucial for determining innovation success. The high average perception score among respondents suggests that the organization has generally implemented innovation management practices effectively. However, several aspects still require improvement, such as consistency in continuous evaluation, optimization of the feedback process, and the establishment of a stronger innovation culture throughout the organization.When innovation management is systematically and integratively executed, the quality of innovation improves and positively contributes to overall organizational performance. These findings are consistent with previous studies. Organizational innovation is strongly linked to business performance growth and emphasized the strategic importance of process and marketing innovation [26]. Similarly, [27] highlighted that adaptive and innovative management plays a vital role in enhancing organizational performance, enabling rapid responses to environmental changes and supporting collaboration and idea generation across functions.These findings provide critical managerial implications.

Organizations must enhance digital leadership capacity across managerial levels—not only to deepen technology understanding but also to enable data use, drive change, build adaptive work cultures, and

facilitate digital-based collaboration. Leadership development programs, such as digital literacy training and coaching initiatives, are necessary to strengthen transformation efforts. Moreover, innovation management must be strengthened through a structured mechanism for idea creation, selection, development, and implementation. Encouraging a stronger innovation culture—through incentives, opportunities for experimentation, and support for risk-taking—is essential. Continuous evaluation and feedback loops must also be improved to assess the quality, impact, and sustainability of innovation outcomes.The combination of strong digital leadership and effective innovation management serves as a key driver of higher innovation performance. These results reinforce the need for organizations to strengthen leaders' digital competencies and ensure that innovation processes are systematically executed and involve all organizational elements. Both variables complement each other: Digital Leadership provides direction and technological support, while Innovation Management offers a process framework to actualize innovation optimally. These findings can serve as a strategic foundation for sustainably improving human resource development, technology adoption, and innovation culture.

IV. CONCLUSION

This study confirms that Digital Leadership has a significant influence on Innovation Performance. Leaders with strong digital capabilities can drive digital transformation, effectively leverage technology, and foster an adaptive work culture, resulting in faster, higher-quality innovation outcomes.Innovation Management has also been shown to significantly affect Innovation Performance. A structured innovation management process—covering ideation, development, evaluation, and implementation—plays a crucial role in ensuring innovation success and enhancing the organization's competitiveness.Overall, improving innovation performance requires a strong synergy between digital leadership and effective innovation management. The combination of these two elements ensures that innovation efforts are well-directed, measurable, aligned with market needs, and able to support organizational sustainability and strategic growth.Organizations are encouraged to strengthen digital leadership capabilities, continuously improve innovation management processes, and ensure that developed innovations deliver market value through comprehensive market research, pilot testing, effective communication strategies, mitigation of adoption barriers, cross-functional collaboration, and periodic evaluation of innovation performance and market acceptance to enhance innovation effectiveness.

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