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The Role of Environmental Dynamics in Moderating the Influence of Digital Leadership, Digital Transformation, and Digital Innovation on the Financial Performance of the Indonesian Energy Sector.

Yusti Pujisari [1], Bunga Vidyaningrum [2], Eni Dwi Susliyanti [3], Inna Zahara [4]
[1,2,3] Accounting Study Program, Sekolah Tinggi Ilmu Ekonomi SBI
[4] Accounting Study Program, Universitas Jenderal Achmad Yani Yogyakarta

Abstract

The energy sector in Indonesia faces dual challenges of transitioning toward clean energy and digitizing business processes. This study examines the relationships among digital leadership, digital transformation, digital innovation, environmental dynamism, and financial performance. A quantitative approach using Partial Least Squares-Structural Equation Modeling (PLS-SEM) was applied to energy companies, complemented by qualitative data from focus group discussions (FGDs) and interviews. The findings reveal that digital innovation has a significant impact on financial performance, whereas digital leadership and digital transformation show no direct effects. Digital leadership acts as a strategic enabler by fostering transformation and innovation, but its financial impact is indirect. Mediation tests indicate that neither digital transformation nor digital innovation mediates the relationship between digital leadership and financial performance. Furthermore, environmental dynamism does not significantly moderate the relationships among the core variables, suggesting that financial outcomes are more strongly determined by internal factors than external pressures. Qualitative evidence supports this conclusion, highlighting that fluctuations in energy prices and regulatory changes exert limited influence, while internal drivers such as visionary leadership, technological readiness, and an innovation-oriented culture are more decisive. Theoretically, this study contributes to the literature on Dynamic Capabilities Theory and the Resource-Based View within the energy sector. Practically, the findings underscore the importance of strengthening digital leadership and embedding innovation into business strategy to enhance sustainable financial performance.

Keywords: *digital leadership, digital transformation, digital innovation, environmental dynamism, financial performance, energy sector .*

Corresponding author:
Email Address: yustielang@gmail.com

INTRODUCTION

Energy companies in Indonesia face significant challenges in ensuring their financial sustainability amidst rapid technological developments and an increasingly complex business environment. The digital economy and the emergence of advanced technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), cloud computing, and social media have become unavoidable strategic issues (Hair et al., 2022) . Furthermore, fluctuating oil prices, increasingly stringent environmental regulations, and demands for efficiency have made digital transformation a crucial option for energy industry players (Henseler et al., 2009)

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. Digital transformation not only strengthens companies' competitiveness but also plays a crucial role in accelerating the achievement of sustainability goals.

Regarding sustainability issues, *the Institute for Essential Services Reform* (IESR) emphasizes the importance of establishing a renewable energy ecosystem that includes policies and regulations that support the development of a clean energy market in Indonesia (Fornell & Larcker, 1981) . Accordingly, the Indonesian government demonstrated a strong commitment to a sustainable energy transition in 2024. President Prabowo Subianto announced plans to phase out all fossil-fueled power plants within the next 15 years and significantly increase renewable energy capacity. To support this energy transition, in February 2024, the Financial Services Authority (OJK) released the Indonesian Sustainable Finance Taxonomy (TKBI), which classifies sustainable economic activities, with an initial focus on the energy sector (Sarstedt et al., 2014) . The goal is to encourage sustainable financing to achieve the Net Zero Emissions (NZE) target by 2060 or sooner. A 2023 report from the Ministry of Energy and Mineral Resources (ESDM) shows that more than 60% of energy companies have begun implementing digital technologies such as AI and IoT. However, this implementation still faces obstacles, such as regulatory uncertainty, price fluctuations, and disparities in digital adoption between regions, which create unique challenges in realizing a digital transformation that is equitable and has a broad impact on the national energy sector (Henseler et al., 2015) . In this situation, the role of digital leadership is a strategic factor that cannot be ignored (ESDM, 2020) .

Digital leadership is a combination of transformational leadership and digital technology skills. This enables leaders to respond to change and capitalize on digital opportunities (Subhaktiyasa, 2024; Wong, 2013) . Meanwhile, digital transformation is a planned change process aimed at optimizing services through technologies such as IT infrastructure, data, cloud computing, mobile communications, and social media. This transformation enables companies to improve supply chain efficiency, reduce emissions, and monitor energy usage in real time. The digital transformation process in organizations demonstrates the importance of leadership in managing and embracing the digital world (Sarstedt et al., 2014) . Leaders must be flexible and responsive to technological changes, fostering an environment conducive to innovation (Shi et al., 2019) . Research by Shmueli et al. (2016) defines digital innovation as the creation of market offerings, business processes, or models resulting from the use of digital technologies. The three main reasons for innovation and transformation are changing market needs, disruption resulting from digital-based startups, and increasing customer expectations, where digital leadership is a key pillar for digital transformation and digital innovation (Shmueli et al., 2019) .

On the other hand, environmental dynamics require organizations to evaluate efficiency and human resources, as well as redesign business processes. Therefore, the urgency of this research and problem formulation lies in the need for a deeper understanding of how digital leadership, digital transformation, and digital innovation can drive financial performance amidst constantly changing environmental dynamics. This is increasingly important given that the energy industry is under pressure to rapidly transition to clean energy to reduce greenhouse gas emissions and accelerate the path towards decarbonization (Hair et al., 2019) . Without visionary leadership and innovative digital strategies, energy companies risk being left behind in global competition and failing to meet national and international sustainability targets. Empirical evidence confirms the importance of aligning digital technology, business strategy, and leadership roles in driving innovation and sustainable financial and non-financial performance (Barney, 1991; Dong, 2024; Hajiyev et al., 2024; Seo et al., 2020) .

Extensive research has been conducted on digital transformation and organizational performance, particularly in the public sector and information technology. A study by Barba-Sánchez et al. (2024) and Teece et al. (1997) Studies have shown that digital transformation plays a significant role in driving economic benefits, increasing revenue, operational

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efficiency, and strengthening a positive organizational culture. Digital leadership is increasingly being studied as a key success factor in managing digital change. A study by Seo et al. (2020) emphasizes the importance of leaders in aligning digital vision with corporate strategy. Leadership profiles and management attitudes are crucial elements in optimizing the potential of digital transformation to support organizational performance. However, most previous studies have not fully integrated the variables of digital leadership, digital transformation, digital innovation, and environmental dynamics into a comprehensive model framework, particularly in the energy sector in Indonesia. This sector faces significant pressure to reduce its ecological footprint and adopt sustainable business practices (Hair et al., 2019) . Industries with high environmental intensity, such as energy, have the potential to gain strategic benefits from digitalization initiatives aligned with the sustainability agenda (Attah et al., 2024) . Most other studies confirm that digital innovation positively contributes to financial performance through cost efficiency and increased productivity (Chen et al., 2024) . However, the relationship between digital transformation and financial performance is often insignificant in the short term due to high implementation costs and structural factors (Li et al., 2024) . Similarly, the moderating role of environmental dynamics yields contradictory findings with some studies showing a reinforcing effect (Zhou et al., 2024) , while others find no significance (Shams et al., 2022).

Based on the above background, this study aims to examine the relationship between digital leadership, digital transformation, digital innovation, and environmental dynamics on financial performance. This study tests an integrative model specifically designed for the energy sector in Indonesia, which is transitioning towards digitalization and clean energy as part of the 2060 Net Zero Emission target. This model combines internal factors (leadership, transformation, and digital innovation) and external factors (environmental dynamics) to analyze their impact on financial performance. This approach provides a more comprehensive perspective in understanding how digital capabilities and dynamic environmental conditions can interact to influence a company's financial performance. In addition, the findings of this study also provide new empirical evidence relevant to the energy sector, which has so far been relatively understudied, particularly in developing countries like Indonesia. Therefore, this study is expected to enrich the literature on the relationship between digitalization and financial performance, while providing a basis for practical considerations for energy company management in designing adaptive and effective digital strategies to improve financial results.

METHODOLOGY

This study uses a *mixed methods approach* by combining quantitative and qualitative methods. This approach objectively investigates and measures the relationship between digital leadership (DLP), digital transformation (DT), digital innovation (DIN), environmental dynamics (ED), and organizational performance (OP) in the energy sector. The unit of analysis in this study is energy companies in Indonesia. Quantitative data were collected through an online survey distributed to employees at various energy companies in Indonesia, with a total of 59 valid respondents. This survey was used to examine the relationship between digital leadership, digital transformation, digital innovation, environmental dynamics, and financial performance. Each research construct was measured using an instrument adapted from previous research with a five-point Likert scale. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the research hypotheses.

As a complement, qualitative data was obtained through a focus group discussion (FGD) involving ten participants and semi-structured interview with a key informant. Participants were purposively selected based on their managerial and operational roles at a large-scale energy company. The qualitative data was analyzed using thematic analysis to enrich understanding and provide deeper context for the quantitative findings.

DOI: 10.37531/amar.v5i2.3079

RESULTS AND DISCUSSION

This section presents the research findings obtained through quantitative and qualitative data analysis. The quantitative results are presented first to provide a descriptive overview of the respondents' characteristics and the distribution of responses to the research variables. This is followed by structural model testing using PLS-SEM. Next, the qualitative results obtained from focus group discussions (FGDs) and semi-structured interviews are presented to strengthen and provide a deeper understanding of the quantitative findings.

The discussion is structured by linking the research results with theories and findings of previous studies, so that a more comprehensive understanding is obtained regarding the influence of digital leadership, digital transformation, and digital innovation on financial performance, as well as how environmental dynamics play a role as a moderating variable in energy companies in Indonesia.

Descriptive Statistics of Respondents

This study involved 59 respondents working at various energy companies in Indonesia. The majority of respondents were in the productive age group (25–44 years old) with a proportion of 79.2%. Respondents were predominantly male (60.4%), reflecting the general characteristics of the workforce in the energy sector. In terms of education, the majority of respondents had a bachelor's degree (67.9%), followed by a master's degree (26.4%), indicating a relatively high academic background. More than half of the respondents (66.0%) had more than five years of work experience, indicating an adequate level of professional maturity. Sectorally, the majority of respondents came from the oil and gas subsector (62.3%), while the remainder were spread across the electricity, renewable energy, and coal subsectors. These characteristics indicate that the study sample is quite representative in describing the condition of human resources in the energy industry in Indonesia.

Assessment of Measurement Model (*Outer Model*)

Outer model testing was conducted to assess the reliability and construct validity of the measurement model. Construct validity was evaluated through convergent and discriminant validity. Convergent validity was analyzed using *outer loading* and *average variance extracted* (AVE) values, as shown in Table 1. *Factor loading values* are generally accepted if they are greater than 0.70, although values between 0.40 and 0.70 can still be maintained if the construct's AVE meets the minimum threshold of 0.50 (Fornell & Larcker, 1981; Hair et al., 2022) . The analysis results showed that most indicators had *factor loadings* above the threshold, but two items (ED2 and ED4) were eliminated because their values were below 0.70 and resulted in an AVE of less than 0.50. Construct reliability was evaluated through Cronbach's Alpha, rho_A, and Composite Reliability (CR) values. Reliability criteria are considered met if the value is in the range of 0.70 or higher, indicating internal consistency between indicators in measuring the same construct (Hair et al., 2022; Henseler et al., 2009) . The analysis results show that most constructs meet these criteria, with Cronbach's Alpha, rho_A, and CR values above or close to the threshold. For the environmental dynamics construct, although the Cronbach's Alpha value is slightly below 0.70, reliability is still acceptable because the rho_A and CR values remain above 0.70. In addition, potential multicollinearity was also analyzed using the variance inflation factor (VIF). All indicators have VIF values below 5, so it can be concluded that this research model is free from multicollinearity problems.

Table 1. Summary of the results of convergent validity, reliability, and multicollinearity tests.

Variables	Indicator	Outer Loading	AVE	Cronbach's Alpha	rho_A	CR	VIF
Digital Leadership (DLP)	DLP1	0.754	0.551	0.793	0.804	0.859	1,978
	DLP2	0.749					

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	DLP3	0.791					
	DLP4	0.801					
	DLP5	0.597					
Digital Transformation (DT)	DT1	0.870	0.699	0.891	0.923	0.920	4,021
	DT2	0.878					
	DT3	0.894					
	DT4	0.699					
	DT5	0.825					
Digital Innovation (DIN)	DIN1	0.812	0.674	0.902	0.905	0.925	3,643
	DIN2	0.834					
	DIN3	0.733					
	DIN4	0.850					
	DIN5	0.823					
	DIN6	0.866					
Environmental Dynamics (ED)	ED1	0.946	0.800	0.764	0.909	0.888	1,808
	ED3	0.839					
Financial Performance (OP)	OP1	0.918	0.864	0.923	0.943	0.950	
	OP2	0.943					
	OP3	0.928					

To evaluate the construct's discriminant validity, the Fornell–Larcker and Heterotrait-Monotrait Ratio (HTMT) criteria were used. Discriminant validity is met if the square root of a construct's AVE is greater than its correlation with other constructs (3). As a complement, the HTMT method was also used with a cutoff value of <0.90 to indicate that each construct is empirically different from one another (Henseler et al., 2015) .

Table 2. Results of the Discriminant Validity Test with the Fornell-Larcker Criterion

Construct	ED	DIN	DLP	OP	DT
Environmental Dynamics (ED)	**0.894**				
Digital Innovation (DIN)	0.515	**0.821**			
Digital Leadership (DLP)	0.496	0.536	**0.742**		
Financial Performance (OP)	0.391	0.586	0.310	**0.930**	
Digital Transformation (DT)	0.331	0.778	0.400	0.412	**0.836**

Note: the bold numbers on the diagonal are the square roots of AVE, while the other numbers are correlations.

DOI: 10.37531/amar.v5i2.3079

Using the Fornell-Larcker Criterion approach as presented in Table 2, the square root of the AVE value printed in bold for each construct is higher than its correlation with other constructs. Thus, the discriminant validity criteria based on Fornell-Larcker have been met, meaning each construct can be empirically distinguished. Furthermore, the HTMT test in Table 3 confirms this validity by showing that all correlation ratio values between constructs are below the threshold of 0.90 (Henseler et al., 2015) .

Table 3. Results of the Discriminant Validity Test with the Heterotrait-Monotrait Ratio (HTMT)

Construct	ED	DIN	DLP	OP	DT
Environmental Dynamics (ED)					
Digital Innovation (DIN)	0.605				
Digital Leadership (DLP)	0.637	0.623			
Financial Performance (OP)	0.432	0.627	0.350		
Digital Transformation (DT)	0.400	0.866	0.453	0.417	

Structural Model (*Inner Model*)

The results of the structural model evaluation in Table 4 provide an overview of the relationships between the tested variables. Overall, there were three significant paths and three other paths that were not significant. The first significant relationship was shown between digital innovation and financial performance (β = 0.604; p = 0.016), indicating that increased digital innovation contributes positively to a company's financial performance. Furthermore, digital leadership was shown to have a significant effect on digital innovation (β = 0.536; p = 0.000), confirming the important role of leadership in driving innovation. The third significant relationship was between digital leadership and digital transformation (β = 0.400; p = 0.001), indicating that effective leadership is a key driver of successful digital transformation.

On the other hand, three relationship paths were found to be insignificant. Environmental dynamics had no effect on financial performance (β = 0.089; p = 0.585), digital leadership had no direct effect on financial performance (β = –0.074; p = 0.684), and digital transformation was also not significantly related to financial performance (β = –0.020; p = 0.940). Furthermore, tests of the hypothesized mediation and moderation effects (H7–H11) did not receive statistical support, indicating that the relationships between variables in this study are more complex than those assumed in the initial hypothesis.

Table 4. Hypothesis Test Results

No	Hypothesis	Path Coefficient	T-statistic	P-value	Decision
H1	Environmental Dynamics (ED) → Financial Performance (OP)	0.089	0.546	0.585	Not Significant
H2	Digital Innovation (DIN) → Financial Performance (OP)	0.604	2,421	0.016	Significant
H3	Digital Leadership (DLP) → Digital Innovation (DIN)	0.536	5,726	0,000	Significant

DOI: 10.37531/amar.v5i2.3079

H4	Digital Leadership (DLP) → Financial Performance (OP)	-0.074	0.407	0.684	Not Significant
H5	Digital Leadership (DLP) → Digital Transformation (DT)	0.400	3,258	0.001	Significant
H6	Digital Transformation (DT) → Financial Performance (OP)	-0.020	0.075	0.940	Not Significant
H7	Digital Transformation (DT) mediation in DLP → OP relationship	-0.008	0.064	0.949	Not Significant
H8	Digital Innovation Mediation (DIN) in DLP → OP relationship	0.324	1,852	0.064	Not Significant
H9	Moderation (DIN × ED) → Financial Performance (OP)	0.006	0.024	0.981	Not Significant
H10	Moderation (DLP × ED) → Financial Performance (OP)	-0.011	0.050	0.960	Not Significant
H11	Moderation (DT × ED) → Financial Performance (OP)	0.118	0.520	0.603	Not Significant

After testing the significance of the structural paths, the next step is to evaluate the overall model quality. This evaluation includes the coefficient of determination (R^2), partial effect size (f^2), predictive relevance (Q^2), and model fit.

The results show that the R^2 values for digital transformation (0.160), digital innovation (0.287), and financial performance (0.366) are in the weak category (<0.50). This indicates that the independent constructs are only able to explain a small portion of the variation in the endogenous constructs, so other factors outside the model are likely to play a role. However, the f^2 analysis shows substantive contributions: digital leadership has a large effect on digital innovation (0.403), a moderate effect on digital transformation (0.191), and digital innovation has a moderate effect on financial performance (0.158). In contrast, other paths, including moderating interactions, only have small effects (f^2 <0.02). All endogenous constructs also have positive Q^2 values (DIN = 0.183; OP = 0.250; DT = 0.102), indicating predictive relevance despite their relatively limited explanatory power.

To complete the analysis, model feasibility was evaluated through a model fit analysis using the Standardized Root Mean Square Residual (SRMR) indicator. The results showed an SRMR value for the saturated model of 0.095, which is still below the threshold of 0.10 and therefore can be categorized as an acceptable fit. This means that the average difference between the empirical covariance matrix and the matrix predicted by the model is relatively small. Although the value is close to the tolerance limit, this model is still suitable for further structural evaluation, provided there is still room for improvement in certain indicators or pathways.

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The Influence of Environmental Dynamics on Financial Performance (H1)

The results of the hypothesis testing indicate that environmental dynamics do not significantly influence financial performance (β = 0.089; p = 0.585). This finding indicates that external factors such as energy price fluctuations, market uncertainty, and competitive pressure do not directly impact the financial performance of energy companies. This is consistent with the literature stating that the influence of environmental dynamics on performance is usually indirect, through the role of dynamic capabilities and strategic adaptability (Dong, 2024; Seo et al., 2020) .

Qualitative analysis reinforced these findings. Most participants assessed that energy price changes did not impact daily operations. The impact of new regulations was more tangible, for example, on reporting requirements. However, in-depth interviews revealed that internal strategies remained a dominant factor.

> *"Electricity prices go up and down, but the work remains the same."* (P1).
> *"The rise and fall of coal prices is a management matter, we continue to implement SOPs."* (P3).
> *"What I feel is that the new rules make the report change."* (P2).
> *"Even if the environment changes, innovation or leadership remains aligned with internal strategies. Financial impact is more determined by internal factors." (W1).*

The majority of respondents in this study came from large-scale oil and gas companies operating under stable regulations, receiving state support, and with established business models. These conditions mean that external dynamics have not significantly disrupted cash flow or revenue, thus not being reflected in short-term financial performance. Based on the Resource-Based View (RBV) perspective, these results confirm that sustainable competitive advantage is determined more by the management of unique internal resources than simply responding to external changes (Barney, 1991) . Previous findings also indicate that oil companies implement financial stabilization strategies, such as hedging, investment diversification, and cost management, to maintain resilience to global market fluctuations (Hajiyev et al., 2024) . Research in the Polish energy sector even emphasizes that state aid and fiscal policy play a role in supporting financial stability, so that external uncertainty is not directly reflected in financial performance (Zając et al., 2023) . In the era of energy transition, this confirms that dynamic environmental changes do not automatically improve financial performance without adequate internal preparedness to capitalize on sustainability opportunities. Both quantitative and qualitative data confirm that environmental dynamics are not yet a major factor influencing the financial performance of energy companies.

The Impact of Digital Innovation on Financial Performance (H2)

Test results show that digital innovation has a significant impact on financial performance (β = 0.604; p = 0.016). This finding indicates that the adoption of digital technology significantly contributes to company financial improvements, both through cost efficiency, increased productivity, and the creation of sustainable competitive advantages (Parida et al., 2019; Sofyan, 2024) . Qualitative analysis supports these results. FGD participants stated that digitizing reports makes work more efficient and highlights improvements in transparency and accuracy. However, in-depth interviews confirmed the time lag before the financial impact is truly visible.

> *"Previously, reports had to be input manually into Excel, but now you can just pull data from the system." (P1).*
> *"The warehouse is more transparent now that records are digital." (P4).*
> *"The digital system for maintenance makes it possible to detect damage quickly." (P3).*
> *"Predictive maintenance or dashboards are mandatory, but the financial impact is usually only visible after one or two years." (W1).*

DOI: 10.37531/amar.v5i2.3079

These results are consistent with previous research that confirms that digital innovation improves operational efficiency, reduces costs, and strengthens company competitiveness (Barba-Sánchez et al., 2024; Huang et al., 2023) . From the perspective of *Dynamic Capabilities Theory* (Teece et al., 1997) , companies that are able to integrate digital technology into their business processes have the capacity to reconfigure their internal resources to generate higher financial value. In the energy context, digital innovation not only supports cost savings and energy efficiency but also strengthens the integration of renewable energy and supports sustainability strategies (Attah et al., 2024; Cao, 2023).

The Influence of Digital Leadership on Digital Innovation (H3)

Path analysis showed that digital leadership significantly influenced digital innovation ($\beta = 0.536$; $p = 0.000$). These results provide empirical evidence that leaders' abilities to facilitate technology adoption, build digital awareness, and manage organizational change processes play a crucial role in driving digital-based innovation in energy companies.

Qualitative data supports these findings. Some participants emphasized the importance of leadership role models in app use. Others highlighted limited human resource support. In-depth interviews added a strategic perspective:

> *"The software is available, but the training is lacking. So we have to learn on our own." (P5).*
> *"Sometimes innovation ideas stop at one unit because there is no cross-departmental support." (P4).*
> *"Innovation can thrive if there is clear direction and resource allocation from top management." (W1, Interview)*

This emphasizes that digital leadership is not just about adopting technology, but also about having a clear strategic vision and direction in orchestrating innovation.

These findings align with previous research confirming that digital leadership is a key factor in accelerating organizational innovation processes (Araujo et al., 2021; Mollah et al., 2024) . Digital leadership enables the integration of new technologies into business strategies while creating a work climate that supports cross-functional collaboration (Bharadwaj et al., 2013; Tobari et al., 2024) . Within the *Upper Echelon Theory framework* , top leadership's digital vision, strategic orientation, and flexibility are reflected in innovative organizational behavior, thus becoming an important foundation for building sustainable competitive advantage (Hambrick & Mason, 1984) .

In the energy sector, which faces the dual pressures of decarbonization and value chain digitalization, the role of digital leadership is increasingly prominent. Visionary leaders who are able to align digital strategies with Net Zero Emission targets and clean energy initiatives have proven more successful in guiding companies to innovate (Bharadwaj et al., 2013) . This is also reflected in the large effect size in the model ($f^2 = 0.403$), indicating that in technology-based energy companies, leaders' ability to direct digital strategies is a fundamental factor in shaping organizational innovation capacity.

The Influence of Digital Leadership on Financial Performance (H4)

The analysis results show that the direct effect of digital leadership on financial performance is not significant ($\beta = -0.074$; $p = 0.684$). This finding confirms that digital leadership acts as a strategic enabler, not as a direct generator of financial output. From a *Resource-Based View* (RBV) perspective, digital leadership is categorized as a strategic resource that is an enabler, not a direct generator of output (Barney, 1991) . This means that even if a leader has high digital competence, this does not directly result in increased profits if this competence has not been transformed into integrated organizational capabilities, such as process innovation, new business models, or digital marketing strategies. (Bharadwaj et al., 2013) .

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Qualitative findings also point in the same direction. Several respondents emphasized that even though leaders exemplify technology use, financial results are not immediately visible.

> *"The software is available, but the training is lacking. So we have to learn on our own." (P5).*
> *"Digital leadership is more about shaping culture, not directly about profit." (W1).*

These results confirm that digital leadership does indeed drive adoption, but its financial impact is only realized if it is followed by a consistent process of transformation and innovation.

Empirical literature supports this, showing that the effect of digital leadership on financial performance tends to be indirect and mediated by other variables, such as digital transformation and innovation (Senadjki et al., 2023) . Furthermore, the presence of *a time-lag effect* is an additional explanatory factor, as the financial benefits of new digital strategies can be measured in the medium to long term (Kane et al., 2016) . In the capital-intensive energy industry, the effect of digital leadership can also be mitigated by external factors such as energy price volatility or regulatory changes (Matt et al., 2015).

The Influence of Digital Leadership on Digital Transformation (H5)

Theoretically, digital leadership is seen as a crucial driver of organizational transformation, particularly in the strategic and sustainable implementation of digital technology. From the perspective of *Dynamic Capabilities Theory* , digital leadership provides strategic vision, adaptive capabilities, and the ability to capitalize on emerging technological opportunities (Teece et al., 1997) . Leaders with digital competencies can shape vision, guide strategy, and build the culture of innovation needed in the digital era.

The results of this study support this view by demonstrating a significant influence of digital leadership on digital transformation ($\beta = 0.400$; $p = 0.001$). This indicates that leaders with digital competence are able to effectively drive technology adoption and strategic change. Furthermore, qualitative findings provide a more concrete illustration. FGD participants emphasized that leadership role models play a significant role in adoption. However, limited training remains a significant barrier. In-depth interviews reinforced the importance of strategic direction.

> *"If our superiors give us examples of how to use applications, we will be more confident in following them." (P2).*
> *"If top management doesn't have a clear digital vision, the organization will go its own way." (W1).*

This shows that digital leadership plays a role not only in the technical aspects, but also in orchestrating the long-term vision and consistent implementation of the transformation.

These results are consistent with previous research confirming that digital competency-based leadership is a key factor in the success of organizational transformation (Fitzgerald et al., 2013; Luc, 2023) . Leaders with a digital vision not only accelerate the integration of technology into core business processes but are also able to manage implementation risks and ensure the alignment of digital strategies with the company's long-term goals (Han et al., 2025) . In the conservative and capital-intensive energy industry, this role is increasingly important to overcome structural and regulatory barriers that often slow the adoption of new technologies (Junior, 2023) . Thus, effective digital leadership strengthens organizational commitment to transformation programs, while increasing the chances of successful digital strategy implementation (Qiao et al., 2024) .

The Impact of Digital Transformation on Financial Performance (H6)

Path analysis showed that digital transformation did not significantly impact financial performance ($\beta = -0.020$; $p = 0.940$). This finding aligns with the literature, which emphasizes that the benefits of digital transformation are not always immediately visible in financial performance, especially in the early stages of implementation. A study of publicly traded

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companies in China showed that digital transformation increased profitability and reduced operating costs, but these positive impacts were only apparent about one year after implementation, indicating a *time-lag effect.* (Na & Kamaruddina, 2024) . Similar results were found in companies in Sweden, where *Return on Assets* (ROA) and *Return on Equity* (ROE) declined in the early stages of digitalization, but in the long term, market value, as measured by Tobin's Q, actually increased (Jardak & Hamad, 2022) .

Qualitative data supports this explanation. Several participants highlighted that interdepartmental system integration remains a barrier, with implementation inconsistencies and cultural resistance.

> "*The main problem is work culture, many are still comfortable with the old ways.*" *(P3*).
> *"The initial investment is large, but the financial results are not yet visible." (W1*).

This statement indicates that the digital transformation process is not yet fully mature, so its impact on financial performance is not yet significant in the short term.

In addition to time, the insignificant relationship can also be influenced by company characteristics and external conditions. Research in the manufacturing and logistics sectors in China found a U-shaped relationship between the level of digitalization and financial performance. At low to moderate levels of adoption, financial impacts were not yet apparent, while positive impacts emerged at more mature levels of adoption (Na & Kamaruddina, 2024; Yonghong et al., 2023) . Structural factors such as company size, ownership, and policy support also play a significant role. State-owned enterprises reportedly benefited more quickly due to market stability and regulatory support, while private companies faced greater initial challenges in leveraging digital transformation (Na & Kamaruddina, 2024) .

Thus, these findings can be interpreted as indicating that the energy companies in the sample are likely still in the early stages of digital transformation. Structural barriers, cultural resistance, and limited integration prevent digital transformation from directly contributing to financial performance. Positive impacts will only be realized in the long term as digital adoption matures and is supported by mediating mechanisms such as cost efficiency and increased information symmetry (Liu et al., 2023) .

The Mediation of Digital Transformation on the Relationship between Digital Leadership and Financial Performance (H7)

The analysis results show that digital transformation did not mediate the relationship between digital leadership and financial performance ($\beta = -0.008$; $p = 0.949$). This is consistent with the H6 finding, which stated that digital transformation itself does not have a significant impact on financial performance. Thus, although digital leadership can drive organizational change, the benefits of digital transformation are not yet strong enough to translate this leadership into improved financial performance. This finding aligns with a study in the defense industry that found a similar pattern, where digital leadership influences both digital transformation and financial performance, but digital transformation does not show a significant impact on financial performance (Kurniawan & Soediantono, 2022) .

Qualitative results support this interpretation. Several participants highlighted barriers to digital implementation, particularly cross-functional integration and cultural resistance.

> "*Our digitalization is still limited to the automation of routine work, and has not yet touched on major strategies.*" *(P4*).
> *"Transformation is used for operational efficiency, not yet directed towards creating new value." (W1*).

This statement shows that digital transformation is still focused on modernizing operational processes, not yet fully directed at creating strategic value that can boost financial performance.

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Previous literature emphasizes that digital transformation mediates financial performance through specific mechanisms, such as increased innovation capability (Wang & Yan, 2024) , psychological empowerment (Muneer et al., 2025) , and business model innovation (Chen et al., 2024) . Furthermore, the financial effects of digital transformation are *time-lagged* . Studies in the automotive industry show that digital investments rapidly increase asset efficiency, but a significant impact on profitability only appears on ROE after two years (Benedek et al., 2025) . Analysis of Chinese companies also reveals differences between technology types: automation technology immediately reduces financing constraints, while digital networking technology increases financing constraints initially before reducing them later (Wu et al., 2025) . In the energy sector, this situation is even more pronounced. Digital transformation focuses more on improving operational efficiency, such as predictive maintenance and process digitalization, the benefits of which on financial performance are not immediately visible in the short term. Therefore, the insignificance of this mediation effect can be explained by *the time lag* and the orientation of digital transformation which is still centered on process efficiency, not yet fully directed at creating strategic value that is immediately reflected in financial reports.

The Mediation of Digital Innovation on the Relationship between Digital Leadership and Financial Performance (H8)

specific indirect effects analysis indicate that digital innovation does not mediate the relationship between digital leadership and financial performance ($\beta = 0.324$; $p = 0.064$). This value indicates a positive relationship, but it is not strong enough to reach statistical significance at the 95% confidence level. Therefore, current digital innovation capabilities in energy companies are not yet capable of directly transforming the influence of digital leadership into financial performance.

Qualitative findings clarified this situation. Several participants emphasized that even after digital innovations were implemented, the financial impact was only visible after a certain period. This indicates that adopting digital innovations requires a relatively lengthy process of diffusion and feasibility testing. FGD participants also emphasized the need for technological and human resource readiness. This suggests that while digital leadership has driven innovation initiatives, limited training and organizational readiness have prevented significant financial impact.

> *"Predictive maintenance or dashboards are mandatory, but the financial impact is usually only visible after one or two years."* (W1).
> *"The software is available, but the training is lacking. So we have to learn on our own."* (P5).

Empirically, these results differ from several previous studies that found a mediating role for digital innovation. Studies in the information technology sector showed a partial mediation effect, where digital innovation partially strengthened the relationship between digital leadership and performance (Mollah et al., 2024) . Research in the manufacturing industry even reported a full mediation effect, where digital innovation fully linked digital leadership to improved operational and financial performance (Mao & Wang, 2024) . These differences indicate that the nature and strength of the mediation effect are highly contextual, depending on industry characteristics, competitive intensity, and level of digital maturity.
The absence of a significant mediation effect in this study confirms that digital leadership strategies in energy companies need to be directed beyond simply encouraging innovation ideas or projects. Organizations need to build a supportive ecosystem that ensures digital innovation truly generates economic value, through integration into business models, adequate resource allocation, and cross-functional collaboration that accelerates market adoption (Hambrick & Mason, 1984; Kane et al., 2016) . Thus, without structural and strategic readiness, digital innovation tends to remain merely an experimental activity that is unlikely to significantly contribute to short-term financial performance.

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Moderation of Environmental Dynamics on the Influence of Digital Innovation on Financial Performance (H9)

The analysis results show that environmental dynamics do not moderate the relationship between digital innovation and financial performance (β = 0.006; p = 0.981). This means that despite increasing levels of environmental dynamics, the influence of digital innovation on financial performance does not change significantly. This indicates that the relationship between digital innovation and financial performance is relatively stable, regardless of external fluctuations.

Qualitative data supports these findings. Several participants emphasized that changes in the external environment do not directly impact the effectiveness of digital innovation. Companies rely more heavily on existing internal strategies and innovation capabilities.

> "*What I feel is that the new rules make the report change.*" (P2).
> "*Even if the environment changes, innovation or leadership remains aligned with internal strategies. Financial impact is more determined by internal factors.*" (W1).

Conceptually, digital innovation is typically expected to increase in importance in a dynamic, competitive, and disruptive business environment. However, in Indonesia's energy sector, external dynamics have not yet exerted sufficient pressure to make digital innovation a key determinant of financial performance. The sector's conservative, asset-intensive nature and long decision cycles limit the scope for external pressures to influence the innovation-performance relationship (Seo et al., 2020) . Empirical evidence also suggests that the direction and intensity of digital innovation in highly regulated sectors are more influenced by regulations, efficiency targets, and long-term investment commitments (Du et al., 2023; Parida et al., 2019) .

Previous research has even found that environmental dynamics do not always strengthen the relationship between innovation and organizational performance, but can be non-linear or dependent on the company's internal conditions (Kamasak et al., 2016; Tsai & Yang, 2013) . Other studies also report that environmental dynamics do not significantly moderate the relationship between digital transformation and digital innovation, although they can influence the pattern of structural relationships in the model (Mollah et al., 2024) . This is consistent with the *Dynamic Capabilities Theory framework* , which emphasizes that organizational performance in dynamic conditions is determined more by internal capabilities in integrating, building, and reconfiguring competencies than simply the level of environmental dynamics (Teece et al., 1997) .

Furthermore, this insignificant moderation aligns with the main findings, which indicate that the direct relationship between digital innovation and financial performance in this study was also insignificant. In other words, because the underlying relationship is not yet sufficiently strong, environmental dynamics do not have sufficient room to strengthen or weaken the influence of digital innovation on financial performance.

Moderation of Environmental Dynamics on the Influence of Digital Leadership on Financial Performance (H10)

The test results indicate that environmental dynamism does not moderate the relationship between digital leadership and financial performance (β = –0.011; p = 0.960). The negative coefficient indicates a tendency for increasing environmental dynamism to slightly weaken the effect of digital leadership on financial performance, but because it is not statistically significant, this pattern cannot be generalized. Thus, the effect of digital leadership on financial performance is relatively stable across different levels of environmental dynamism.

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These results align with previous research that found that although digital leadership plays a significant role in driving digital transformation, innovation, and organizational performance, environmental dynamics did not prove to be a significant moderator of this relationship (Mollah et al., 2024) . Other studies have shown that environmental dynamics play a more significant role as *a driver of* digital capability development through strategic orientation or green entrepreneurship, rather than as a variable that changes the intensity of the relationship between digital leadership and financial outcomes (Liang et al., 2024) .

The energy industry context provides additional insight. Most respondents came from oil and gas companies operating within stable market structures with high resilience to external fluctuations. Under such conditions, environmental dynamics are not strong enough to alter the relationship between digital leadership and financial performance. Research in emerging economies like China has also found a similar pattern, where environmental dynamics serve more as a driver of internal capability development than as a moderator of the relationship between strategic variables (LI & Liu, 2014).

Overall, these results indicate that, in the context of Indonesian energy companies, the influence of digital leadership on financial performance is direct and relatively independent of the level of external dynamics. The practical implication is that strengthening digital leadership remains relevant even in relatively stable business environments. The effectiveness of digital leadership can be further optimized when supported by internal factors, such as absorptive capacity *and* an organizational culture of innovation, as evidenced by recent research showing that internal factors can strengthen the impact of digital leadership on organizational sustainability (Cheng et al., 2025) .

Moderation of Environmental Dynamics on the Influence of Digital Transformation on Financial Performance (H11)

The test results show that environmental dynamics do not have a significant moderating effect on the relationship between digital transformation and financial performance ($\beta = 0.118$; $p = 0.603$). This indicates that in the energy sector, the effect of digital transformation on financial performance is independent of the level of uncertainty or volatility in the external environment.

Qualitative findings are consistent with these results. Participants stated that regulatory stability and long-term contracts make companies relatively resilient to external dynamics.

> *"Energy prices fluctuate, but contracts remain in place, so the financial impact is not felt." (P2*).
> *"Government regulations make the market relatively stable, so the external environment doesn't have much influence." (W1*).

This statement shows that the main challenges of digital transformation stem more from internal factors, such as incomplete system integration and inconsistent implementation, rather than external environmental pressures.

The results of this study align with previous studies that found that environmental dynamics do not always act as a moderator. Research on IT organizations in Bangladesh showed that environmental dynamics did not moderate the relationship between core variables, although they could indirectly influence other variables (Mollah et al., 2024) . Similarly, a study on manufacturing SMEs in Pakistan reported that environmental dynamics did not moderate the relationship between big data analytics capabilities and artificial intelligence on firm performance (Naz et al., 2022) . This reinforces the view that in industries with stable characteristics such as energy, internal factors such as technological capabilities, human resource quality, and organizational structure are more dominant than external pressures.

However, these findings differ from studies in other contexts. Research on manufacturing firms in China found that the moderating effect of environmental dynamics

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can vary, with a negative effect on the relationship between digitalization and business model innovation, but a positive effect on the relationship between network capabilities and innovation (Li et al., 2024) . Studies in the Norwegian fisheries sector also showed that dynamic capabilities can enhance sustainability performance in highly dynamic environments (Harun et al., 2023) . These differences are likely related to variations in the operationalization of the concept of environmental dynamics, for example, focusing on market volatility versus technological change (Wati et al., 2025; Zhou et al., 2024).

Contextually, this research's findings confirm that Indonesia's energy sector is relatively structured and heavily influenced by government regulations. Energy companies operate within long-term policy frameworks, such as the target of a 23% renewable energy mix by 2025 and 31% by 2050 (Coordinating Ministry for Economic Affairs, 2023) . Major programs such as the USD 20 billion *Just Energy Transition Partnership* (JETP), the implementation of a carbon tax, incentives, subsidies, and financing guarantees, provide significant protection against market pressures (ESDM, 2023) . Thus, energy companies can still invest in digital transformation, but the financial impact is determined more by regulatory support than by market dynamics.

CONCLUSION

This study examines the relationship between digital leadership, digital transformation, digital innovation, environmental dynamics, and financial performance in energy companies in Indonesia using the PLS-SEM approach and qualitative analysis through focus group discussions (FGDs) and interviews. The results generally confirm that internal organizational factors are more dominant than external factors in determining financial performance. In detail, the quantitative results show that digital innovation has a significant effect on financial performance (H2), while digital transformation (H6) and digital leadership (H4) do not have a direct effect on financial performance. Digital innovation has been shown to be an important *driver* for increasing operational efficiency, transparency, and productivity, although its financial impact is *time-lagged* . In contrast, the influence of digital leadership is more indirect, through its role in driving transformation (H5) and digital innovation (H3).

However, the mediation test showed that neither digital transformation (H7) nor digital innovation (H8) were significant mediators of the relationship between digital leadership and financial performance. This indicates that although digital leadership drives innovation and transformation, existing digital capabilities are still focused on modernizing operational processes and have not been integrated into business strategies capable of generating tangible financial impact. Furthermore, the results of the moderation test showed that environmental dynamics did not significantly moderate the relationship between core variables (H9–H11). Qualitative findings support this, with participants stating that energy price fluctuations or regulatory changes are mostly perceived as management's responsibility and do not alter work patterns or short-term financial results. Thus, external dynamics in the Indonesian energy sector tend to be shielded by regulations and long-term contracts, resulting in relatively limited impact on financial performance.

Overall, this study confirms three key points. First, digital leadership plays a crucial role as an enabler, primarily creating a strategic vision, exemplifying technology use, and a culture of innovation. However, its financial impact is indirect. Second, digital innovation is a significant determinant of financial performance, albeit with a delayed effect, requiring technological readiness, human resource training, and integration into business models to generate real economic value. Third, environmental dynamics are not a significant moderating factor, as Indonesia's energy sector is more determined by regulatory stability and government support than market fluctuations.

The practical implication of these findings is that energy companies need to focus their strategies on strengthening internal capabilities, including digital leadership, technology readiness, and a culture of innovation, to maximize the potential of digital transformation.

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Meanwhile, the theoretical implications enrich the literature on Dynamic *Capabilities Theory* and *the Resource-Based View* (RBV) by emphasizing that in capital-intensive and heavily regulated industries like energy, environmental dynamics are not always a key factor for success.

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