Unveiling the Mediating Nexus of Digital Transformation on Digital Leadership and Enterprise Performance in Manufacturing Firms

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Abstract: In today's rapidly evolving business landscape, digital transformation has become an imperative for organizations seeking to stay competitive and relevant. The relentless advancement of technology has brought about unprecedented opportunities and challenges, necessitating a shift in leadership paradigms to embrace the digital era fully. This investigation seeks to test the nexus between digital leadership, digital transformation, and enterprise performance. Empirically, the Smart PLS approach was employed to test the affiliation between digital leadership and enterprise performance, through the mediating effect of digital transformation. We collected data on manufacturing firms consisting of 471 managers across the various regions of Ghana. The finding indicates that digital leadership and digital transformation exhibit a positive affiliation with enterprise performance. Finally, digital transformation had a favorable mediating effect on the nexus between digital leadership and enterprise performance. Practitioners and firms would be motivated to seize the advantages of digital transformation as an opportunity to improve firm performance. Again, manufacturing firms that want to be leaders in the digital space have to acquire the services of a digital leader as part of their management portfolio team. This study contributes to the literature by providing new theoretical explanations for the inconsistent affiliation between digital leadership, digital transformation, and enterprise performance. This investigation also assists enterprises in reevaluating their digital strategies.

Keywords: Digital leadership, Digital transformation, Enterprise performance, Manufacturing enterprise

1. Introduction

In the face of the rapidly evolving business landscape, characterized by advancements in technology and shifting customer expectations, digital transformation has emerged as a crucial strategic imperative for organizations worldwide (Teece, 2019). The manufacturing sector, in particular, faces the pressing need to harness the power of digital technologies to stay competitive, enhance operational efficiency, and drive business growth (Chiarini, 2021). As a result, organizational leaders are increasingly adopting the role of "digital leadership" to navigate the complexities of the digital era and foster innovation and adaptability within their firms.

Digital leadership is the ability of organizational leaders to envision, execute, and sustain effective digital strategies that harness the potential of technology to drive innovation, agility, and customer-centricity (Abbu *et al.*, 2022). As more organizations recognize the strategic importance of digital leadership, scholars and practitioners have increasingly investigated its influence on various aspects of organizational performance (Klus and Müller, 2021) digital leader in current organizational challenges, (Quaquebeke and Gerpott, 2023), the now, new, and next DIGIL, and (Fatima and Masood, 2023) digital leadership and open innovation.

Organizational performance, often viewed through financial metrics, market share, and customer satisfaction, is a key determinant of an organization's overall success and growth. Scholars have shown a keen interest in understanding the factors that positively impact organizational performance, and digital leadership's role in this context has gained considerable attention. Shin, Mollah and Choi (2023) explored the effect of DIGIL on DIGI culture and employee DIGI capability affiliated with organizational performance. Similarly, eight European oil and gas enterprises corporate transformation and digitalization were investigated by (Fernandez-Vidal *et al.*, 2022). The results demonstrated that organizations select combinations of small transformation strategies to accomplish large digital transformation goals.

Moreover, the journey towards digital transformation has its complexities, and simply adopting digital technologies does not guarantee success (Marcon, Le Dain and Frank, 2022). To ensure a successful transition, organizations need to manage the interplay between digital leadership and digital transformation effectively (Zhuo and Chen, 2023). This raises an intriguing question: does digital transformation play a mediating role in the relationship between digital leadership and organizational performance?

1.1 Research Contribution and Implications

This research intends to contribute valuable insights to both academia and practice by untangling the intricate dynamics between digital leadership, digital transformation, and organizational performance. By substantiating

the mediating role of digital transformation, we aim to provide a comprehensive understanding of how organizations can optimize their digital leadership strategies to achieve sustainable success in the digital age.

Furthermore, our findings can offer practical guidance to organizational leaders seeking to navigate the complexities of digital transformation effectively. Understanding the mediating role of digital transformation will enable leaders to design more targeted and impactful digital strategies, leading to enhanced performance and competitiveness.

2. Literature Review

2.1 Digital Leadership and Digital Transformation Nexus

Digital leadership encompasses the ability of organizational leaders to envision, implement, and sustain effective digital strategies that leverage technology to transform their organizations (Carranza, Bustamante and Peiró, 2022). Successful digital leadership not only involves technology adoption but also necessitates the development of a digital-savvy culture, where employees embrace digital tools to enhance productivity and collaboration (Pham and Vu, 2022). Zulu and Khosrowshahi (2021) explored the taxonomy of DIGIL in the construction sector. The investigation was carried out at 41 institutions in the construction sector. The primary result was a taxonomy of digital leadership types classified according to six key areas: proactive and forward-thinking leaders; supportive leaders; leaders who lack coordination or caution; leaders who are reluctant to change; and leaders who lack vision and motivation. Klus and Müller (2021) indicate the need for "hiring new CEOs with excellent self-organization and IT abilities, a strong capacity to drive others, and a profound ability to think and act entrepreneurially." Wasono Mihardjo and Rukmana (2018) looked at 88 managers in Indonesian telecommunications companies to analyze the effect DIGIL has on agility. The findings suggest that DIGIL has an effect on alliance capability, dynamic capability, and market orientation, demonstrating that managers and businesses with an adaptable culture and behavior that are sensitive to the market and customers produce value for both parties. The tension for industries to adjust to the changing digital environment has caused institutions to employ DIGIL to transform their organizations to meet the competition era. The first hypothesis was that.

Hypothesis 1: DIGIL positively influences DIGIT.

2.2 Digital Leadership and Enterprise Performance Nexus

A company's digital strategy and business environment can benefit from having strong digital leadership. Benitez et al., (2022). Notably, digital leadership involves adopting novel ideas that advance digital development in areas including hiring, market entry, product commercialization, knowledge acquisition, and the strategic deployment of the company's IT assets to improve business outcomes (Davison, Wong and Peng, 2023). Fatima and Masood (2023) explored DIGIL on innovation within telecom and IT institutions. The results from the analysis of 250 employees indicate that top management knowledge sharing had a favorable impact on open innovation through DIGIL. In South Korea, (Shin, Mollah and Choi, 2023) gathered data on 149 employees and employed the structural equation approach to analyze the affiliation. The results demonstrated that DIGIL had a positive direct and indirect influence on organizational performance. (Tagscherer and Carbon, 2023) conducted a literary work on external and internal ways to digitalization. The study consists of both systematic and meta-analysis methodologies based on the reverse logistics model. The results depicted that the gap in research is in the areas of digitalization and particularly digital leadership. Chatterjee et al., (2023) investigated the moderating influence of digital leadership capabilities on employing workplace performance and efficiency. The results from the PLS analysis illustrated that 335 respondents confirmed a positive moderating effect of DIGIL capability on workplace performance and enterprise efficiency. From the above literary work, the hypothesis on the affiliation between DIGIL and performance was developed.

Hypothesis 2: DIGIL positively influences ENTP.

2.3 Digital Transformation and Mediation Nexus

The term "digital transformation" is used to describe how people and organizations are adapting to take use of digital technology to provide substantial benefits for their operations, customers' experiences, and business models (Abdulquadri *et al.*, 2021). The term "digital transformation" is defined more narrowly in (Vial, 2021). To be more specific, digital transformation is the process of enhancing something by drastically altering its characteristics via the application of various forms of information, computer, communication, and networking technology. Bhatia (2021) research on the DIGIT within the Indian manufacturing sector. The results from the PLS outcome demonstrated that IT, institutional mindfulness, strategic alignment, and competition pressures had a favorable effect on DIGIT as a mediation construct. In the context of Tunisia, (Chouaibi *et al.*, 2022)

explored the affiliation between DIGIT and ENTP in 270 enterprises through a linear regression approach. The results demonstrated that DIGIT had a material effect on organizational efficiency. Masoud and Basahel (2023) analyzed DIGIT and efficiency, considering the influence of IT innovation and customer experience in Saudi Arabia. Within the service industry, 164 data was collected, findings illustrated that DIGIT had a significant effect on organizational performance. The importance of DIGIT to improve organizational performance and competitiveness has led to a surge in interest in the correlation between digital transformation and business results in recent years. Organizational performance is predicted to improve for those that undertake digital transformation successfully.

Hypothesis 3: DIGIT positively influences ENTP.

Hypothesis 3a: DIGIT mediates the affiliation between DIGIL and ENTP.

2.4 Conceptual Framework Development

While the direct effects of digital leadership and digital transformation are well-established, we propose that the nexus between digital leadership and organizational performance is further strengthened through the mediating effect of digital transformation. In other words, digital transformation acts as a conduit through which the positive impacts of digital leadership are translated into tangible improvements in organizational performance (Wasono Mihardjo and Rukmana, 2018) argued that digital technology may provide instantaneous two-way contact between businesses and their consumers or staff. It has the potential to make businesses watch how they're perceived by the public.

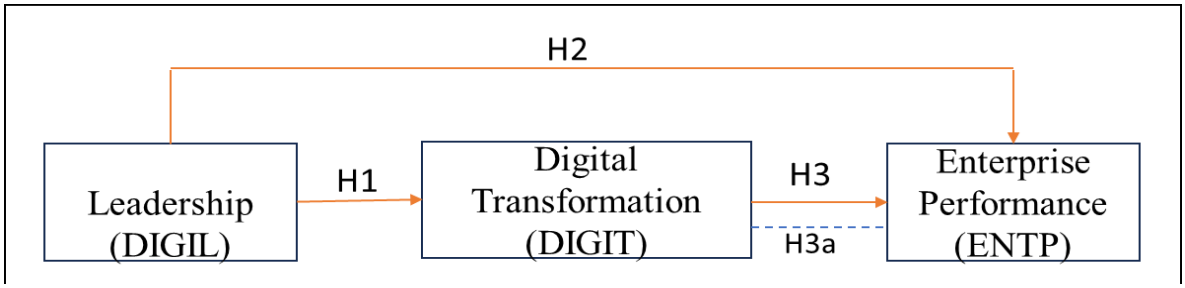

Figure 1: Conceptual model

3. Methodology

3.1 Data Collection, Sampling, and Analysis

To achieve the research objective, a mixed-methods approach was employed, with a focus on data collection from manufacturing firms operating in diverse regions. Quantitative data was gathered through surveys distributed to key stakeholders, including managers and decision makers. The survey will capture insights into digital leadership practices, the extent of digital transformation initiatives, and enterprise performance metrics. The qualitative component will involve in-depth interviews with select organizational leaders to gain a deeper understanding of their digital transformation journey, the role of digital leadership in driving transformational efforts, and the observed impacts on enterprise performance. The final sample consists of 471 managers. The sample size was determined based on statistical power analysis to ensure an adequate number of respondents for robust analysis. To ensure the validity and reliability of the measurement indicators, a pilot check was conducted with a small subset of respondents from the target population. The pilot test assesses the clarity, comprehensibility, and relevance of the survey items. Necessary adjustments were made based on feedback and psychometric properties were evaluated employing statistical techniques such as factor analysis and reliability analysis. All research procedures were conducted in accordance with the highest standards of ethics. Participants gave their informed consent, guaranteeing their privacy and safety. All information was kept confidential and was utilized for academic inquiry alone. Male 293 and the remaining accounted for female. All respondents have master's education and more than 7 years of experience. To examine these hypotheses, we employed PLS-SEM implemented in Smart PLS 3.3.5. PLS-SEM is commonly used in management research (Bhatia, 2021; Aftab et al., 2022) and it is well-suited to both straightforward and complex models (Hair, Howard and Nitzl, 2020). PLS-SEM provides a number of options for determining a scale's validity and reliability. For instance, you can use factor loading to verify the dependability of each survey question. The minimum acceptable item loading, as indicated by (Hair, Howard and Nitzl, 2020), is 0.5.

3.2 Measurement of Variables

The survey includes both five Likert scale items and demographic questions to gather background information. The measuring items for DIGIL are comprised of five dimensions (DIGIL1- DIGIL5). Again, DIGIT consists of five items (DIGIT1–DIGIT5), and enterprise performance adopted five constructs (ENTP1-ENTP5).

measurement model		
Variables	Definition	sources
Digital transformation	DIGIT 1 (0.809)- In our company, we aim to digitalize everything that can be digitized	(Abdulquadri *et al.*, 2021; Gong and Ribiere, 2021; Masoud and Basahel, 2023)
	DIGIT 2 (0.859) - In our company, we collect massive volumes of data from different sources	
	DIGIT 3 (0.908) - In our company, we aim to create stronger networking between the different business processes with digital technologies	
	DIGIT 4 (0.821) - In our company, we aim to enhance an efficient customer interface with digitality	
	DIGIT 5 (0.759) - In our company, we aim at achieving information exchange with digitality	
Digital Leadership	DIGIL 1 (0.871) - I can make others enthusiastic about the digital transformation.	(Abbu *et al.*, 2022; Shin, Mollah and Choi, 2023)
	DIGIL 2 (0.881) - I have a clear idea of the structures and processes that are needed for the digital transformation.	
	DIGIL 3I would say I am a digital expert	
	DIGIL 4 (0.924) - I am driving the digital transformation forward proactively in our unit.	
	DIGIL 5 (0.896) - When it comes to digital knowledge, I am always up to date	
Enterprise performance	ENTP 1 (0.857) - Profitability	(Park, & and 2020, 2020; Wang and Liu, 2022)
	ENTP 2 (0.915) - Net profit margin	
	ENTP 3 (0.896) - Profitability growth	
	ENTP 4 (0.896) - Sales performance	
	ENTP 5 (0.881) - Overall performance.	

3.3 Measurement Model

Digital leadership, digital transformation, and enterprise performance were among the characteristics examined to determine their validity and dependability. Cronbach's alpha, rho A, composite reliability, and the average variance extract were used to determine the consistency of each variable (AVE). The data analysis showed that each of the variables was highly reliable. The reliability coefficients, measured by Cronbach's alpha, were quite high, ranging from 0.888 to 0.936. The range of Rho A values, from 0.894 to 0.938, demonstrates the consistency of the data. When compared to the recommended threshold of 0.7, which indicates good dependability, the composite reliability ratings ranged from 0.918 to 0.952. Furthermore, the AVE values were above 0.5, showing convergent validity, ranging from 0.693 to 0.797. The high reliability scores for each construct indicate that the items used to test that construct reliably capture the intended concept. Meaningful associations and consequences for DIGIL, DIGIT, and ENTP can now be evaluated with the help of the study's reliable variables.

3.4 Empirical Results

Table 1: Measurement of validity and reliability

Variables	Proxy	Cronbach's alpha	Rho_A	Composite reliability	Average variance extract
Enterprise performance	ENTP	0.934	0.938	0.950	0.797

Variables	Proxy	Cronbach's alpha	Rho_A	Composite reliability	Average variance extract
Digital transformation	DIGIT	0.888	0.894	0.918	0.693
Digital Leadership	DIGIL	0.936	0.938	0.952	0.791

3.5 Discriminant Validity

Discriminant validity is an essential aspect of construct validity that ensures that the measures of different constructs are distinct from each other. It demonstrates that the variables under study are measuring unique aspects of the underlying concepts and are not simply redundant or measuring the same underlying construct. In Table 2, correlation between DIGIL and DIGIT is 0.893, which is slightly lower than the square root of AVE for both variables (0.894 for DIGIL and 0.832 for DIGIT). This indicates good discriminant validity, suggesting that DIGIL and DIGIT are measuring distinct constructs. The correlation between DIGIL and ENTP is 0.637, which is lower than the square root of AVE for both variables (0.894 for DIGIL and 0.892 for ENTP). This finding supports the discriminant validity between DIGIL and ENTP, indicating that they are measuring different constructs. The correlation between DIGIT and ENTP is 0.763, which is lower than the square root of AVE for both variables (0.832 for DIGIT and 0.892 for ENTP). This suggests good discriminant validity between DIGIT and ENTP, indicating that they are distinct constructs.

Table 2: Discriminant validity

	DIGIL	DIGIT	ENTP
DIGIL	**0.893**		
DIGIT	0.827	**0.833**	
ENTP	0.637	0.763	**0.889**

3.6 Model Fitness

Several fitness measures are compared to determine the overall fitness of a model. As a result, we also computed the RMSEA, GFI, CFI, and IFI in addition to the CMIN/df. Table 3 displays the median and minimum values for each index. It can be concluded that the measurement model is fit because all of the estimated values of the indices fall inside the threshold limit. Therefore, it was concluded that the measurement model was satisfactory, and it was anticipated that the SEM results would likewise be satisfactory.

Table 3: Model fitness

	CMIN/DF	RMSEA	IFI	CFI	GFI
Decision value	≤ 3	≤ 0.08	≥ 0.90	≥ 0.90	≥0.80
Obtained value	1.352	0.077	0.958	0.934	0.864

3.7 Assessment of R Square

The research used R^2 as a measure of the model's predictive accuracy. Employing the PLS algorithm used in Smart-PLS, we were able to determine the R2 of this model. All the results appear to be greater than 0.10, as that seems to be the cutoff level (Falk and Miller, 1992). DIGIT's R2 is 0.0.684, while the overall performance is 0.583. These numbers are far higher than the cutoff (0.10). In our model, the Q^2 values of all endogenous constructs are well above 0.25, indicating good predictive power.

Table 4: Assessment of R square and Q square

	R square	Q^2
ENTP	0.583	0.457
DIGIT	0.684	0.456

3.8 Hypothesis Assessment and Discussions

Table IV presents the results of the direct and indirect effects between the variables Digital Leadership (DIGIL), Digital Transformation (DIGIT), and Enterprise Performance (ENTP). The table provides the estimates, standard deviations, t-statistics, and p-values. The path coefficient from DIGIL to ENTP ***(H1)*** has a favorable affiliation with

an estimated value of 0.827 and t- value of 41.549 demonstrating that the estimate is highly reliable. The statistical material effect is demonstrated in the p value of 0.000.

On the part of the nexus between DIGIL and ENTP ***(H2)*** was found to be insignificant with a Coeff value of 0.018 and t value of 0.292. This is confirmed with a value of 0.771. There is a weak association between DIGIL to ENTP.

Again, the path from DIGIT to ENTP ***(H3)*** has a positive and significant direct effect with an estimate of 0.748. The t-statistic of 13.679 indicates high reliability, and the p-value of 0.000 confirms the statistical significance. Therefore, there is strong evidence to support the inference that Digital Transformation has a positive and significant direct effect on Enterprise Performance.

Finally, the mediating affiliation of DIGIT on DIGIL and ENTP ***(H3a)*** was analyzed. The findings demonstrated that there exists a mediating effect DIGIT on the variables. The mediating effect confirms that though DIGIL had no direct correlation with ENTP when DIGIT was introduced as a mediating effect the impact was improved. The findings support the works of (Abdulquadri *et al.*, 2021) investigation in Nigeria which indicated that digital transformation improve customer engagement and efficiency. Similarly, (Bhatia, 2021) investigation confirm a DIGIT mediating affiliation between the dimension of transformation and enterprise performance.

Table 5: Direct effect and indirect

Path	Original sample	Std.Dev.	t-statis	p-value	Conclusion
DIGIL->DIGIT	0.827	0.020	41.760	0.000	Agreed
DIGIL->ENTP	0.018	0.063	0.292	0.771	Disagreed
DIGIT->ENTP	0.748	0.054	13.679	0.000	Agreed
DIGIL->DIGIT ->ENTP	0.619	0.041	14.948	0.000	Agreed

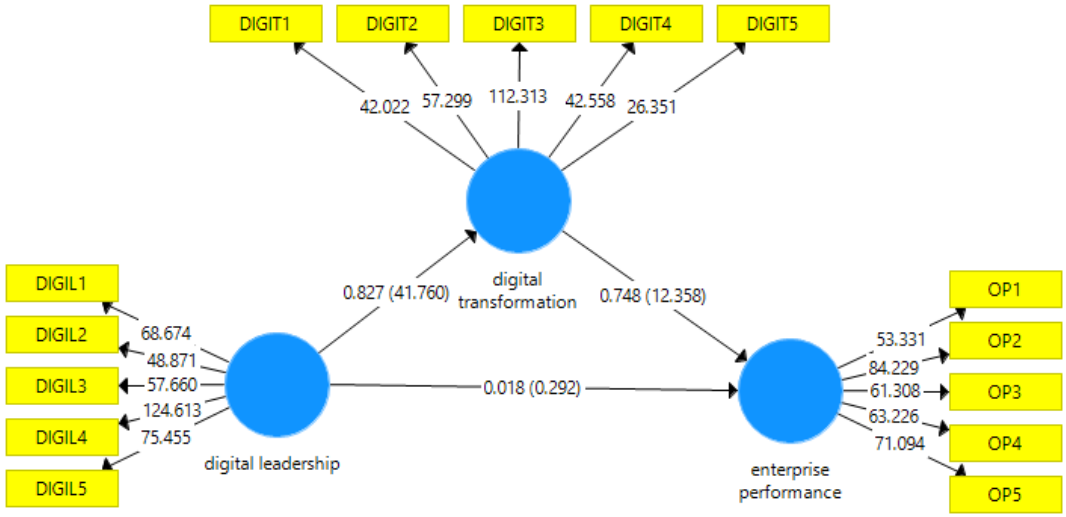

Figure 2: Structural model

4. Conclusion, Managerial Implication, and Limitations of the Research

The purpose of this investigation was to explore the affiliation between digital leadership and enterprise performance, through the mediating influence of digital transformation. The study consisted of manufacturing enterprises in Ghana an emerging nation. A total of 471 respondence responded to the distributed questionnaire. The respondence was selected based on their position and knowledge of digitalization. To achieve the developed hypothesis, the Smart PLS 3 was employed. The findings demonstrated that DIGIL had a significant effect on DIGIT. Similarly, DIGIT had a material affiliation with ENTP. However, DIGIL had an immaterial direct

link with ENTP. This was corrected when DIGIT was set as a mediating construction on the association between the two variables. The outcome of this investigation has shed enough light on DIGIL, DIGIT, ENTP within the manufacturing sectors of Ghana an emerging state. The report also makes some managerial suggestions and ramifications for businesses who are looking to create digital leadership and digital transformation plans to improve their performance.

5. Managerial Policy

This research fills in the gaps left by the few existing studies on the connections between digital leadership and the successful digital transformation of businesses. The study's empirical findings confirmed that digital transformation opens up several performance-enhancing options for businesses. Therefore, SMEs' managers should put money into various DIGITS and DIGIL that might boost productivity. For the simple reason that a company's entire operation can benefit from digital leadership's efforts to convert digitality into value. Managers that are thinking about embracing digital transformation should look into how it will work with their existing infrastructure to boost productivity, according to the results of this study. While many businesses may be able to adopt digitalization, capitalizing on the resulting potential to boost internal and external performance will likely depend on the availability of technologies designed to assist with, rather than replace, existing firm strategy.

6. Limitations and Further Research

There are gaps in this study that present chances to encourage further investigation. First, an in-depth study of the data to uncover the necessary techniques in the digital processes may be jeopardized by cross-sectional data and a lack of longitudinal data. Second, there is a risk of bias and limited generalizability if data are collected from a particular nation (Ghana) and analyzed based on management perceptions. Research in many nations and with varied responders from various company departments are both viable options for future investigations.

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