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Unlocking the potential: the impact of digital leadership on firms' performance through digital transformation

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Abstract

Purpose – This study aims to investigate the impact of digital leadership (capabilities, experience, predictability and vision) and green organizational culture on firms' digital transformation and financial performance. Additionally, the research aims to evaluate the mediating role of digital transformation in the relationship between digital leadership and firms' financial performance.

Design/methodology/approach – A purposive sampling technique was employed to identify and select individuals with relevant expertise and experiences in the field of digital transformation. A total of 164 responses were collected, and the questionnaire was designed based on a five-point Likert-type scale. The data were analyzed using SmartPLS 4 (Statistical Software for Structural Equation Modeling).

Findings – The findings indicate that digital leadership capabilities, experience, predictability and vision do not directly impact firms' performance. However, there is an indirect influence on firms' performance through digital transformation. While both digital transformation and green organizational culture (GOC) positively influence firms' financial performance, GOC, leader predictability and leader vision positively influence digital transformation. The results confirm that digital transformation mediates the relationship between capabilities, experience, predictability and vision and firms' financial performance.

Research limitations/implications – The study highlights that strategic capabilities can enhance value-added processes during digital transformation, contributing to sustainability in the digital era. Overall, this research significantly advances both theoretical understanding and practical applications in the context of digital leadership and its impact on firms. Limited digital transformation stages among Malaysian firms impact the research, with some entities cautious about data disclosure and having limited cooperation with researchers. Gathering data from diverse sources would have strengthened the findings and methodological rigor of this multilevel study. Despite these limitations, the research offers fresh insights into the role of GOC, different facets of digital leadership and their influence on digital transformation and financial performance. This enhances existing knowledge and challenges assumptions of the transformational leadership theory (TLT) framework.

Practical implications – The study opens the door to further research into distinct leadership components and their effects in a similar context. By highlighting the positive influence of capabilities, experience, predictability and vision on digital transformation, it expands the theoretical and empirical scope in the realm of digital leadership. These findings encourage critical examination, refinement and evolution of TLT, providing insights for leaders and managers as they navigate digitalization, financial performance and

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digital leadership within organizations. In an era of digital transformation, leaders play a central role in building a psychologically safe environment and nurturing digitally skilled teams capable of managing technological changes. Leaders should possess the digital capabilities, experience, vision and predictability necessary to drive digital transformation, mitigate potential threats and adapt to the dynamic digital landscape.

Social implications – These findings support government initiatives to accelerate digitalization and Industry 4.0 implementation. Collaboration between the government and private organizations is essential to create policies and practices that facilitate broad participation in digital transformation programs. Policymakers must adopt a proactive approach to address issues related to Internet accessibility, trade barriers, financing access and resource reallocation. These policies aim to ensure a high-quality and affordable digital infrastructure, cultivate trust in digital technologies and equip organizational leaders with the necessary digital skills.

Originality/value – This research provides valuable insights for practitioners to enhance firms' digital transformation. As a practical contribution, this study's findings can inform how firms can better manage their key digital leadership resources and GOC to foster digital transformation and improve their financial performance.

Keywords Digital leadership, Digital transformation, Green organizational culture, Firms' financial performance

Paper type Research paper

1. Introduction

The fourth industrial revolution, commonly referred to as Industry 4.0, has ushered in a new era characterized by the widespread integration of modern technologies. This digital revolution has transformed the way businesses operate by infusing digital assets and capabilities into various aspects of manufacturing, production and service processes. Digital assets, such as information stored on computers, smartphones and digital accounts, are now considered integral to business operations (Chen and Hao, 2022). In this context, the success of firms in embracing digital transformation depends on several key factors, including the implementation of effective digital leadership. Firms that adapt to the demands of rapid technological change and embrace digitization infrastructure are better positioned for success. Moreover, the adaptability of employees is a crucial skill in the Industry 4.0 era (Kapure, 2021). According to Wahid and Zulkifli (2021), leadership plays a pivotal role in guiding organizations through the complexities of digital transformation. An effective leadership style can positively impact an organization's efficiency and effectiveness. Transformational leadership, in particular, has been associated with improved organizational performance, fostering creativity and innovation and enhancing overall efficiency. Digital leadership, a concept emerging in the digital age, has become crucial in facilitating the dynamic and effective management of organizations. It plays a vital role in fostering a culture of digitization, driving work efficiency and promoting the adoption of modern technologies in manufacturing and production processes (Anak Agung Sagung and Sri Darma, 2020; Wahid and Zulkifli, 2021). Digital transformation, characterized by the extensive adoption of smartphones, electronic currency and e-commerce, has catalyzed foundational shifts in how businesses operate (Pellegrini *et al.*, 2020). To achieve successful digital transformation, there is a need for the implementation of a digital culture that reflects and can underpin the access and ability to deal with digital transformation. Digital culture includes new methods, technologies and media that can be used to perform set tasks. By deploying a digital culture to drive their digital transformation, firms can significantly raise their level of performance (Ly, 2023).

As an emerging economy, Malaysia has begun embracing digital transformation. Although small businesses constitute 76.5% of firms in Malaysia, contributing 38.3% to the Malaysian gross domestic product (GDP), these firms continue to perform poorly due to insufficient awareness of the necessary digital capabilities. A substantial proportion of firms

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still rely on outdated technology, with 30% using technology commonly used before the Industry 4.0 era (Sheikh, 2017). According to a survey by Forrester in late 2020, only 46% of firms in Malaysia adopted digital transformation and 34% planned to start digital transformation in 2021. However, the performance of these firms is considered relatively poor due to a lack of knowledge and awareness about digitization. Existing literature debates that firms lack an understanding of digital transformation, digital maturity, knowledge and skills (Prashar and Hamid, 2022). The leadership of organizations in Malaysia and their level of digital maturity play a critical role in the success of digital transformation. As Malaysia aims to become a digital-savvy nation, many firms need to accelerate their adoption of digital capabilities (Ladkin and Patrick, 2022). The study aims to bridge the gap of the digital divide by investigating the relationships between digital leadership, digital transformation, green organizational culture (GOC) and the financial performance of firms in Malaysia. In particular, it explores how various dimensions of digital leadership influence digital transformation and financial performance. The study also evaluates the role of GOC in shaping these relationships.

2. Research framework

This research employs the transformational leadership theory (TLT) as a guiding framework for conceptualization and analysis. TLT focuses on cultivating leaders capable of inspiring and motivating their teams to reach their full potential and accomplish organizational objectives. Applied to digital leadership, which steers businesses through digital transformation, TLT posits that deploying digital leadership and embracing digital transformation can enhance firms' business performance. This enhancement is achievable by integrating digital technologies into all areas of business operations (Shields, 2022). TLT paradigm was developed to investigate the interconnection between digital leadership, digital transformation and business outcomes. Leaders, as conceptualized by TLT, successful in the digital realm, can encourage and empower their teams to fully embrace digital transformation and deliver optimal performances (Ladkin and Patrick, 2022; Shields, 2022). TLT has been proposed as a theoretical framework for understanding the link between digital leadership, digital transformation and firms' financial performance, though other factors may also influence this connection. The success or failure of digital transformation initiatives depends on several factors, such as the company's mindset, resource quality and the external environment (Guandalini, 2022).

TLT stresses the importance of leaders in establishing a common goal and motivating their teams to achieve it. Leaders, in the context of digital transformation, must articulate and successfully communicate a vision for how the organization can benefit from digital technology. Successful digital transformation requires leaders to ensure their teams have access to the tools and information needed to learn and apply the skills and knowledge required for effective implementation. Leaders can foster staff innovation and creativity by involving them in the digital transformation process. Developing new digital goods, services and business models is facilitated when leaders foster an environment that engenders innovation. De Araujo *et al.* (2021) suggest that transformational leaders can inspire employees to excel and exceed their expected targets. According to TLT, a firm's performance is influenced by factors such as digital leadership, enhanced productivity of leaders and team members, better job quality and increased motivation and involvement. Moreover, the long-term viability and expansion of the organization are often the focal points of transformational leadership. Decisions promoting innovation, employee growth and customer relationships may eventually improve firm performance.

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Firms often place a premium on the quality of distinct leadership experiences because leaders play a pivotal role in guiding the organization and influencing employees. Today's leaders require emotional intelligence, the ability to empower individuals in the face of constant change and adaptability. Leadership behavior is now a collective effort based on cooperation and interaction throughout the organization (Teoh *et al.*, 2021). The advancements evidenced by Industry 4.0 and digitization continue to compel firms to reassess their leadership styles and embrace the tenets of digital leadership (Anak Agung Sagung and Sri Darma, 2020). With the proliferation of modern technologies, leaders are tasked with strategically using digital assets to achieve business goals and attain a high level of performance (Persson and Manas, 2021). Extant literature suggests that digital leadership can act as a support system for encouraging and equipping organizational members to contribute their thoughts and take ownership of digital efforts, potentially accelerating the adoption of digital tools and technology.

3. Literature review and hypotheses development

3.1 The impact of digital leadership capabilities on digital transformation and firms' financial performance

The success of the digitization process often depends on the leader's capabilities and leadership style. Previous literature demonstrates a positive relationship between the leader's capabilities and the success of the digitization process (Chen and Hao, 2022). Leader capabilities can facilitate the development of employee skills and strategic plans, thereby influencing the organization's production, development and overall performance (Ladkin and Patrick, 2022). Depending on the competencies a leader cultivates, leadership can either directly or indirectly affect organizational performance. A leader is expected to possess essential digital leadership capabilities and skills (e.g. social intelligence, emotional intelligence, cognitive intelligence, interpersonal intelligence and intrapersonal intelligence) to guide the team toward the organization's objectives. Prior debates suggest that the successful deployment of digital leadership capabilities is a prerequisite for a firm's digital transformation and a positive predictor of increased firm performance (Persson and Manas, 2021). Therefore, we hypothesize that:

H1a. Digital leadership capabilities have a positive influence on digital transformation.

H1b. Digital leadership capabilities have a positive influence on a firm's financial performance.

3.2 Impact of digital leadership experience on digital transformation and firms' financial performance

Studies argue for a positive relationship between a leader's digital experience and a firm's performance (Lyman *et al.*, 2021). To implement a digital transformation, firms may leverage diverse skills and experiences captured within their dynamic digital capabilities. However, achieving an increase in financial performance can depend on the wealth of knowledge and depth of understanding in deploying set digital leadership experiences (Azevedo and Almeida, 2021). Firms undergoing digital transformation must have the experiential capacity to carry out such extensive change, as well as the technical experience to ensure its success. Leaders must be adaptable and encourage their team members to commit to digital initiatives before and after a digital transformation to understand what digital resources firms have to offer and the nature of their digital transformation contributions in the long run (Sonmez and Adiguzel, 2020). Therefore, we hypothesize that:

H2a. Digital leadership experience has a positive influence on digital transformation.

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H2b. Digital leadership experience has a positive influence on a firm's financial performance.

3.3 Impact of digital leadership predictability on digital transformation and firms' financial performance

Studies contend that there is a positive relationship between a leader's digital predictability and organizational performance (de Araujo *et al.*, 2021; Soon and Salamzadeh, 2021; Wanasida *et al.*, 2021). A leader who can efficiently use data to predict and make decisions can achieve higher levels of performance. In organizations, forecasting processes based on accurate data and analysis are part of decision-making efforts that impact the organization and its performance (Awan *et al.*, 2021). The concept of leadership in the digital age continues to undergo tremendous changes, demanding an equivalent transformative change in the behaviors and responses of overall organizational members to digitalization (Temelkova, 2019).

Effectively deploying the predictive capacity of digital leadership might enable firms to improve their workflow and productivity and determine imminent or probable long-term strengths, weaknesses, opportunities, or threats of their digitalization initiatives (Lyman *et al.*, 2021). Debates in existing research theorize a nexus between the presence of digital leadership predictability within the firm and digital transformation, further supported by works contending that the tenets of digital leadership predictability can act as a push factor toward enhancing firm performance. Therefore, we hypothesize that:

H3a. Digital leadership predictability has a positive influence on digital transformation.

H3b. Digital leadership predictability has a positive influence on a firm's financial performance.

3.4 The impact of digital leadership vision on digital transformation and firms' financial performance

Prior debates advocate that firms with high levels of digital leadership vision find it less challenging to support their digitalization strategies, which is essential for reinforcing their competitive advantages, driving revenue growth and enhancing financial performance. As a key underpinning digital vision, big data management can help organizations discover new insights to improve performance (Bengtsson and Johansson, 2021). By efficiently leveraging the benefits of digital leadership vision, firms may be able to increase performance efficiency by reducing costs, migrating relevant onsite operations processes online and using resources effectively in production. Digital leadership vision can also help increase profit by improving customer experience or revealing new customer needs (Gurumurthy *et al.*, 2020). Likewise, the precondition and initial steps of digital transformation are debated to be a strategic vision and action. Extant debates captured by the work of Katsaros *et al.* (2020) relate that digital leadership vision is a critical factor needed to guide the different processes of planning, strategizing and implementation of digital transformation objectives and financial performance goals. Therefore, the following has been hypothesized.

H4a. Digital leadership vision has a positive influence on digital transformation.

H4b. Digital leadership vision has a positive influence on a firm's financial performance.

3.5 The influence of green organizational culture on digital transformation and firms' financial performance

A solid digital culture serves as a competitive advantage, as understanding how to leverage modern technology and integrate it into the work environment is crucial for a company's

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survival in a complex, dynamic environment (Bengtsson and Johansson, 2021). Digital culture seeks to spread knowledge and know-how, adapt to the digital work environment and employ the best practices to efficiently and effectively harness the benefits of modern technology (Martínez-Caro *et al.*, 2020). Research indicates that when independent board members actively engage in educating company owners about the value of environmental, social and governance (ESG) disclosure, it enhances credibility with stakeholders, demonstrating their awareness of the significance of bolstering legitimacy (Al Amosh and Khatib, 2022). The importance of ESG can be seen during the COVID-19 pandemic; the findings by Al Amosh and Khatib (2023) indicate that the pandemic had a large negative impact on financial performance, although this impact was substantially mitigated by ESG performance. ESG-focused businesses are, therefore, among those least impacted by the pandemic. Meeting stakeholder expectations improves a company's performance amid a crisis and corporate directors often prioritize sustaining ESG performance as one of the most effective crisis management measures to lessen the impact of COVID-19 on financial performance. Therefore, we hypothesize that:

H5a. Green organizational culture has a positive influence on digital transformation.

H5b. Green organizational culture has a positive influence on a firm's financial performance.

3.6 The impact of digital transformation on firms' financial performance

Recent research argues that the implementation processes of digital transformation can help organizations create innovative opportunities relevant to bolstering their financial performance. Thus, by deploying digital tools to reinforce customer satisfaction, organizations can foster increased customer patronization, sales and return on investments (Verhoef *et al.*, 2021). A vast amount of big data and information can guide decision-makers regarding the nature and projected expectations of financial performance (Llopis-Albert *et al.*, 2021). Digital transformation, especially the use of cloud services, can help firms reduce costs. Firms applying digital transformation have witnessed increased profits and bolstered competitive advantage in the market due to the optimal use of modern technologies. Accelerated workflow and improved productivity can be achieved by firms when employing modern technologies and using them efficiently. Besides, digital transformation technologies allow customers to buy and communicate with the firm anytime, anywhere, - ultimately influencing customer satisfaction (Feroz *et al.*, 2021). Therefore, we hypothesize (Figure 1) that:

H6. Digital transformation has a positive influence on firms' financial performance.

4. Methodology

4.1 Sampling and data collection

Convenience sampling was employed in this study, due to its practicality and accessibility, involving the distribution of 400 questionnaires to respondents. However, the acknowledged limitation of potential selection bias in this sampling method was addressed in the subsequent section on study limitations. The implications of this bias on the study's findings were emphasized, underlining the need for caution when interpreting and generalizing results. The target population comprised a diverse range of Malaysian business stakeholders, including owners, managers and industry players involved in digital leadership and transformation. A purposive sampling technique was used to select individuals with relevant expertise. The sample size was determined using Krejcie and Morgan's formula, resulting in

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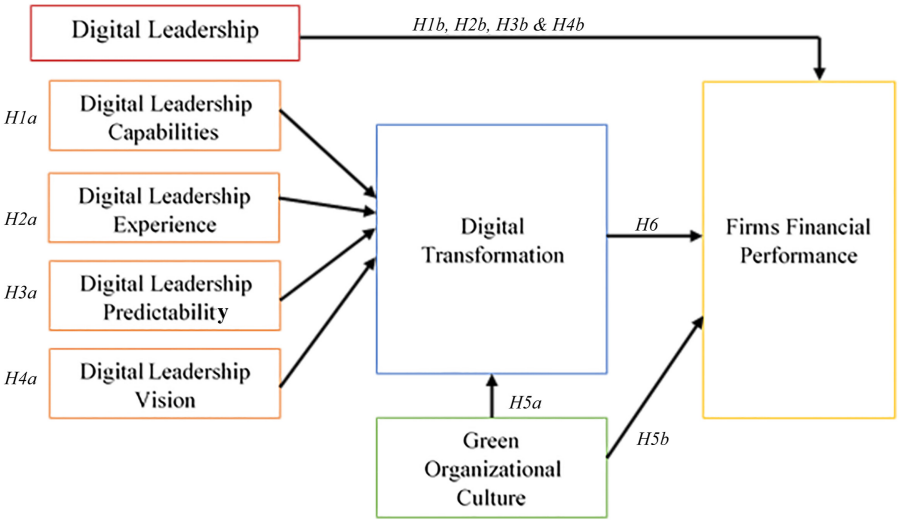

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Figure 1. The research framework

164 respondents (41% response rate), justified by contextual factors and research goals. This is justified as Daikeler *et al.* (2022) demonstrate a response rate of 36%. In addition, Fosnacht *et al.* (2017) show that data from the National Survey of Student Engagement remain reliable with 5–10% response rates.

Data collection utilized a meticulously crafted online questionnaire, employing a 5-point Likert-type scale to capture respondents' perspectives on digital leadership, digital transformation and their impact on financial performance. Google Forms facilitated online distribution, ensuring accessibility and convenience while maintaining anonymity and confidentiality. Informed consent was obtained, outlining the study's objective, procedures and participants' right to withdraw, adhering to ethical guidelines. Data collection through an online platform minimized barriers and biases associated with in-person surveys, promoting accessibility and convenience. Participants were reassured of the confidentiality of their information and informed about the study's duration and procedures.

4.2 Questionnaire development, validity and reliability

The construction of the survey instrument was a meticulous process aimed at capturing the multifaceted dimensions of the study's constructs. The questionnaire encompassed seven key domains, each meticulously curated from authoritative sources to ensure construct validity and alignment with the research objectives. The questionnaire development involved distinct aspects of digital leadership and organizational performance. Each variable (digital leadership capabilities (Yang *et al.*, 2023; Wang *et al.*, 2022; Ahn *et al.*, 2014), experience (Lundin *et al.*, 2021; Lundin *et al.*, 2016), predictability (Temelkova, 2019; Awan *et al.*, 2021), vision (Ruvio *et al.*, 2010; Luthans, 2002), financial Performance (Shi and Yu, 2013), GOC (Martínez-Caro *et al.*, 2020; Hadi and Baskaran, 2021) and digital transformation (Teng *et al.*, 2022; Kontić and Vidicki, 2018) comprises 6–7 items sourced from various studies, offering a comprehensive assessment of essential facets in the domain.

The validity of the data collection instruments was established through consultation with subject matter experts in business performance and digitalization. Two professionals

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provided feedback, promoting revisions to enhance clarity, alignment with industry-specific terminology and accuracy in representing the measured concepts. Additional items were included based on expert recommendations and redundant or unclear items were refined or removed for questionnaire coherence. A pilot test with 30 questionnaires ensured participant comprehension. Reliability analysis using Cronbach's alpha during the pilot test phase demonstrated internal consistency, with a value exceeding 0.70 considered adequate for the items to measure a latent construct. The data analysis and hypothesis testing utilize SmartPLS (Statistical Software for Structural Equation Modeling), a procedure enabling the examination of data and answering research questions through appropriate statistical techniques.

4.3 Data analysis

The SmartPLS analysis reveals that all measurement model components have adequate measurement loading. According to Hair *et al.* (2016), to ensure that factor loadings meet the minimum criterion of 0.70, items with loadings below this threshold are carefully removed following a series of partial least squares (PLS) algorism tests, resulting in the elimination of three items from various constructs. The remaining values for all items are between 0.706 and 0.874%. Convergent validity is assessed for reflective constructs, including the firm's financial performance, digital transformation, GOC and digital leadership components (capabilities, experience, predictability and vision). Various reliability measures, such as Cronbach's alpha, Rho A, construct reliability and average variance extracted (AVE), are examined for each item to determine reliability. The results in Table 1 meet established cutoffs for reliability, with acceptable values (>0.70) for test categories across all constructs. Additionally, the AVE values, all exceeding (0.50), further confirm construct reliability. This analysis affirms the convergent validity of the measurement scale for all constructs.

The analysis further reveals that the heterotrait-monotrait ratio (HTMT) values between digital transformation and digital leadership capabilities, digital leadership experience and digital leadership vision are relatively high (0.748, 0.796 and 0.733, respectively). This trend is mirrored in other constructs, such as green organization culture, digital leadership experience and leadership predictability (0.602, 0.796 and 0.689). These values indicate the level of discriminant validity between different constructs. Each correlation component adequately accounts for the measurement variance of the constructs, thus establishing the model's discriminant validity. Results from the HTMT analysis indicate that all the constructs have values below 0.85. All values below 1.00 are within the confidence interval. This suggests that all constructs exhibit high discriminant validity (Hair *et al.*, 2016). Additionally, the inner and indicator-level variance inflation factor (VIF) values are analyzed for signs of multicollinearity, ranging from 1.475% to 4.951% (Table 1), all below the threshold level of 5. In other words, this provides evidence of adequate construct validity.

Statistically speaking, the R-square value of 0.790 for the firm's financial performance is relatively high. The digital transformation has an R-square value of 0.745, indicating a large degree of variance explained in the target construct by other exogenous constructs (see Table 1). The results of the *p*-values in Table 1 suggest that apart from digital leadership capability, experience and predictability, all other exogenous constructs exert a positive influence on firms' financial performance. Moreover, the results show that digital transformation, GOC and digital leadership vision exert small, large and small effects on a firm's financial performance, respectively (Sarstedt *et al.*, 2021). Equally, the results suggest that while all other predictors of digital transformation exert positive small effect sizes, digital leadership vision demonstrates a positive and large size of effect on digital transformation. The magnitude of their respective influences in Table 1 is classified based on the criteria of a small effect (0.02–0.15), a medium effect (0.15–0.35), or a high effect (>0.35). Thus, most of the

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	Reliability, validity and overall model fit					
	Cronbach's alpha	*rho_a*	*Composite Reliability (CR)*	*AVE*	*VIF (DT)*	*VIF (FFP)*
Digital transformation (DT)	0.921	0.923	0.937	0.679	–	4.951
Firm financial performance (FFP)	0.859	0.861	0.899	0.641	–	–
Green organizational culture (GOC)	0.912	0.917	0.932	0.695	1.475	1.575
Digital leadership capabilities (LCs)	0.897	0.900	0.919	0.619	3.301	3.310
Digital leadership experience (LE)	0.917	0.919	0.935	0.707	3.931	3.938
Digital leadership predictability (LP)	0.914	0.916	0.933	0.700	3.390	3.807
Digital leadership vision (LV)	0.932	0.933	0.947	0.747	3.393	4.933

Hypotheses	*Coefficient*	*VAF*	*p-values*	f^2	R^2	Q^2	*RMSE*	*MAE*
DT > FFP	***0.317	–	0.002	0.079	0.790	0.687	0.568	0.406
GOC > FFP	***0.510	–	0.000	0.547				
LC > FFP	0.014	–	0.834	0.020				
LE > FFP	0.048	–	0.568	0.020				
LP > FFP	0.130	–	0.347	0.110				
LV > FFP	0.235	–	0.169	0.044				
GOC > DT	***0.142	–	0.001	0.068	0.745	0.783	0.474	0.340
LC > DT	***0.420	–	0.000	0.030				
LE > DT	***0.380	–	0.000	0.020				
LP > DT	***0.290	–	0.002	0.077				
LV > DT	***0.558	–	0.000	0.454				

Mediation effect			
GOC > DT > FFP	**0.450	46.87%	0.017	–
LE > DT > FFP	***0.120	71.42%	0.000	–
LC > DT > FFP	***0.130	90.27%	0.000	–
LV > DT > FFP	***0.177	42.96%	0.004	–
LP > DT > FFP	**0.092	70.76%	0.026	–

Note(s): (**) and (***) denote significance levels at 5 and 1% respectively
Source(s): By authors

Table 1. Measurement and structural model analysis result

constructs have medium to large effect sizes on the firm's financial performance, as shown in the analysis (see Table 1). Furthermore, the result shows that the f-square loadings are statistically significant at the *p*-value of 0.05 for most of the constructs (Sarstedt *et al.*, 2021). As an analogy, Sarstedt *et al.* (2017) argue that Q^2 values greater than 0 for a given endogenous construct indicate an adequate route model's prediction accuracy for that construct (Table 1).

Table 1 shows a *p*-value less than 0.05, indicating a statistically significant relationship between a firm's digital transformation and its financial performance. A *p*-value below 0.05 reveals a significant relationship between the independent variables, namely GOC, digital leadership predictability, digital leadership vision, digital leadership capacity, digital leadership experience and the mediator variable, digital transformation. The findings in Table 1 suggest that digital transformation serves as a complementary mediator in the

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associations between the independent variables (GOC, digital leadership predictability, digital leadership capacity, digital leadership experience and digital leadership vision) and the dependent variable (financial performance). This demonstrates that digital transformation plays a positive role and consequently, enhances the impact of all the independent constructs on firm financial performance.

5. Results and discussion

Existing research has been used to support the *H1a* hypothesis, indicating that digital leadership capabilities have a positive influence on digital transformation. AlNuaimi *et al.* (2022) affirm this by asserting that firms with digitally capable leadership have greater access to capital and technology, leading to more rapid and effective digital transformation processes that enhance their financial performance. Another factor promoting the growth of later stages of digital transformation is the digital capacity of leaders to instill coherence principles toward the company's digitization (Borah *et al.*, 2022). These principles are linked to the ability to disseminate digital leadership models suitable for the digital age, foster greater managerial cohesion toward the company's digital transformation objective and cultivate a more positive view of strategic management's efficacy (Jackson and Dunn-Jensen, 2021).

Furthermore, *H2a* is empirically supported. This research also supports the idea that leaders' digital experience can significantly influence the success of an organization's digital transformation in various ways (Fernandez-Vidal *et al.*, 2022). Digitally experienced leaders are not only innovative themselves but also possess the digital know-how and motivation to help their employees become more digitally competent (Abhari *et al.*, 2021). In today's volatile and ever-changing digital landscape, companies need the kind of experience that encourages digitalization and innovation to thrive. Seasoned digital leaders can often suggest and drive further digitalizing and personalizing of their firms' products or services, thereby increasing digital transformation and implementation processes. This research highlights that such leaders, by fostering innovation and empowering employees, contribute significantly to adaptation in today's dynamic digital landscape (Ferraris *et al.*, 2022).

The empirical results support hypothesis H3a in the context of digital leadership's role in predicting a firm's future direction of digital transformation. This study finds a positive relationship between digital leadership predictability and digital transformation. The work of Bhatia *et al.* (2021) aligns with prior empirical debates, emphasizing the significance of digital leadership's ability to anticipate and forecast the trajectory of a company's digital transformation. Furthermore, Chen and Hao (2022) also contribute to this discourse by reinforcing the notion that a leader's capability to foresee the future of digital transformation is crucial. The implications of these findings underscore the pivotal role that digital leadership plays in shaping an organization's successful digital transformation journey. By analyzing extensive amounts of natural language data, the study by Bhatia *et al.* (2021) suggests that certain inherent qualities or behaviors exhibited by digital leaders contribute to their aptitude in foreseeing the future direction of the firm's digital transformation efforts. This predictive ability holds substantial promise, guiding strategic decision-making and resource allocation, to ensure that the company remains adaptable and competitive in an increasingly digital landscape. The alignment of these findings with earlier empirical research implies a degree of consistency and reliability in the link between digital leadership and digital transformation predictability.

Furthermore, *H4a* is empirically supported in this study, indicating that digital leadership vision exerts a large positive influence on digital transformation. This is in line with the work of Bousdekis and Kardaras (2020), who emphasize four major challenges for digital transformation: a lack of a citizen-centered strategy, a lack of a timeless and clear vision for digital transformation, a lack of technology infrastructure and a low level of digital skills

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among personnel. Likewise, Kuhlmann *et al.* (2021) provide complementary explanations for the lack of success of digital transformation in German local governments, referring to governance, legal, technological, usability and resource-related constraints. Specifically, the authors highlight that the lack of digital leadership vision has led to weak incentives to make progress toward digital transformation and a general absence of strategic orientation or targets in this area (Gasco-Hernandez *et al.*, 2022).

Similarly, both H5a and H5b are empirically supported, in line with previous empirical studies. Previous research establishes that a GOC significantly affects digital transformation and, by extension, the financial performance of businesses. The evidence implies that GOCs can aid in shaping the transformations those organizations seek to implement. To achieve a green organizational change, firms need to disrupt their conventional ways of doing business in terms of process, structure and management (Darvishmotevali *et al.*, 2020). Better knowledge management techniques and organizational learning can help businesses better support sustainable and environmentally friendly ways of life (Menon and Suresh, 2021). To be nimbler in a digital setting, businesses must also implement "green" information and communication technology systems and "green" human resources strategies. The present study's recommendation of adopting "green" information and communication technology systems to enhance agility within a digital context is consistent with the broader discourse on environmentally conscious business strategies. The alignment with existing literature underscores the importance of synchronizing digital transformation efforts with environmentally responsible practices, promoting a cohesive and holistic approach to organizational change.

Similarly, *H6* is also confirmed in this study, demonstrating that digital transformation exerts a positive small influence on firms' financial performance. Based on the review of relevant literature, this study typifies that transformational organizations are better able to manage organizational change, particularly in a digital context, which in turn improves their financial performance (Zhai *et al.*, 2022; Singh *et al.*, 2021). By adopting a digital transformation strategy, a company signals its intent to increase shareholder value through the strategic application of digital technology across the enterprise. Thus, a company's digital transformation strategy can improve financial performance and contribute to value maximization. This is because, along the path of integrating digital strategies and technologies, customer happiness rises as a company adopts digital transformation and begins offering highly personalized products and services (Yu *et al.*, 2022). The overall digital transformation process helps reduce resources spent on marketing and selling products and services. Businesses that have adopted embedded digital technology processes have seen an uptick in productivity. The new digital transformation aids in the development of shared ideals and the establishment of stable organizational practices (Nyagadza, 2022).

The results also show that the relationship between digital leadership and financial performance is positively mediated by digital transformation. This is such that digital transformation amplifies the positive influences that the distinct components of digital leadership exert on firms' financial performance. Data investigation verifies the link between digital leadership components (capabilities, experience, predictability and vision) and firm financial performance. These findings corroborate past studies (Weber *et al.*, 2022), suggesting that transformational leaders might boost organizational financial performance through digital transformation. This is plausible via leaders-employee's collective efforts to create the environment needed to execute things effectively and efficiently. Employees would be more likely to innovate and take measured risks in the face of difficulties and opportunities if their digital leaders possess the requisite capabilities, experience, predictability and vision (Wanasida *et al.*, 2021).

Contrary to the study's initial hypotheses, this study fails to establish a direct and significant link between distinct digital leadership components (digital leadership

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capabilities (H1b), digital leadership experience (H2b), digital leadership predictability (H3b) and digital leadership vision (H4b)) and a firm's financial performance. This highlights a critical point: possessing digital leadership skills alone is inadequate to boost financial performance. The research emphasizes that digital leadership should be viewed in the broader context of an organization's culture, vision, direction and resources. Digital transformation requires a holistic transformation of strategies, processes and culture. While strong digital leadership skills do not directly guarantee financial performance improvement, they indirectly influence financial outcomes by shaping digital transformation.

6. Conclusion and policy implications

This research investigates the impact of digital leadership on firms' digital transformation and financial performance, utilizing the TLT framework. It also explores the mediating role of digital transformation in the relationship between digital leadership components and financial performance. Based on Malaysian data and employing PLS statistical analysis, the study reinforces the theoretical assumptions of TLT, emphasizing the complementary role of digital transformation and strengthening the link between leadership components, GOC and financial performance. The findings support organizations seeking to embark on digitalization initiatives for improved financial performance, emphasizing the roles of digital transformation, digital leadership and GOC.

6.1 Theoretical implications

This research makes a valuable theoretical contribution by emphasizing the importance of digital leadership as a driving force for digital transformation. It challenges prior empirical assertions by revealing that digital leadership does not have a significant direct impact on firm financial performance. However, it emphasizes the critical roles of digital transformation and GOC in improving financial performance, advancing the understanding of TLT. The study encourages further research into distinct leadership components and their effects in a similar context, expanding the theoretical and empirical scope in the realm of digital leadership. These findings call for a critical examination, refinement and evolution of TLT, providing valuable insights for leaders and managers navigating challenges related to digitalization, financial performance and digital leadership within organizations.

6.2 Policy implications

This research significantly contributes to the understanding of digital leadership and its impact on firms' performance, presenting a framework applicable not only to Malaysia but also to similar emerging economies. The insights gained offer practical value to practitioners seeking to enhance their digital transformation efforts. Firms can benefit from strategically allocating resources and investing in Industry 4.0, ultimately improving their financial performance. This research also highlights the importance of selecting capable digital leaders who can expedite digital transformation, giving firms a competitive edge in the digital age. Furthermore, this study offers insights for Malaysian businesses contemplating digital adoption. These findings support government initiatives to accelerate digitalization and Industry 4.0 implementation. Collaboration between the government and private organizations is essential to create policies and practices that facilitate broad participation in digital transformation programs. Policymakers must adopt a proactive approach to address issues related to Internet accessibility, trade barriers, financing access, and resource reallocation. These policies aim to ensure a high quality and affordable digital infrastructure, cultivate trust in digital technologies and equip organizational leaders with the necessary digital skills.

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Additionally, market demand for digital transformation can be increased through policies like government procurement of digital services and adjustments to market entry conditions. These policies enhance the economic, social and institutional environment necessary for digital transformation. Encouraging innovative business models can help foster a GOC supportive of digital initiatives and financial performance. The government should also promote economic activity and creative ventures aimed at increasing awareness and knowledge of various digital leadership components. Collaboration between governments and businesses to devise action plans is vital for the effective implementation of these policies. However, leaders need to understand that long-term investments in digital technologies are required, as government financial support may not be sustainable. In an era of digital transformation, leaders play a central role in building a psychologically safe environment and nurturing digitally skilled teams capable of managing technological changes. Leaders should possess the digital capabilities, experience, vision and predictability necessary to drive digital transformation, mitigate potential threats and adapt to the dynamic digital landscape.

6.3 Limitation

Limited digital transformation stages among Malaysian firms impact the research, with some entities being cautious about data disclosure and exhibiting limited cooperation with researchers. Gathering data from diverse sources would have strengthened the findings and methodological rigor of this multilevel study. Despite these limitations, the research offers fresh insights into the role of GOC, different facets of digital leadership and their influence on digital transformation and financial performance. This enhances existing knowledge and challenges assumptions of the TLT framework.

6.4 Future direction for research

While the current quantitative approach and respondent sample offer valuable insights, there is potential for enriching these findings with qualitative research. This invites further exploration of digital leadership, GOC and how their effects evolve in the dynamic digital landscape. Additional variables such as digital workforce capabilities, technological skills and external factors like market pressures could be explored to broaden insights into Malaysia's digital transformation journey. Overcoming regional and temporal boundaries, future research may engage in cross-country and cross-sector studies with a longitudinal focus.

6.5 Contribution of the research

Prior research has emphasized the need for adept digital leaders in managing digitalization. However, the significance of knowledge-based communication and relationship-building in strengthening absorptive capacity and supporting digital leadership has been underexplored. This study sheds light on the importance of leveraging digital transformation, including leadership capabilities, experience, predictability and vision and how they influence firms' performance. It enhances the understanding of transformational leadership by highlighting the roles of GOC and specific digital leadership components in driving financial outcomes. The research uncovers direct and mediating relationships among variables, offering new insights into achieving financial performance.

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