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A model of the interplay between leadership styles, culture and digital transformation

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Background: Leaders play a crucial role in driving digital transformation (DT), with their leadership style either facilitating or hindering its successful implementation.

Objectives: This article explores the direct and indirect relationships between transactional, transformational and digital leadership styles, and their impact on DT.

Method: A quantitative approach was used to collect data from 302 managerial and non-managerial participants at a South African utility company via survey.

Results: Analysis using IBM SPSS Amos 26 revealed that while transformational and transactional leadership styles indirectly influence DT, digital leadership has a direct and significant impact. Furthermore, digital culture and digital maturity emerged as critical factors, demonstrating strong positive effects on DT success.

Conclusion: The study concludes that digital leadership, culture and maturity are key predictors of successful DT, while transformational and transactional leadership styles do not have a direct significant impact on DT outcomes.

Contribution: This research provides valuable insights for information systems leaders on the leadership styles and organisational factors that best support DT, offering practical guidance for implementing effective strategies in digital environments.

Keywords: digital transformation; quantitative method; leadership styles; digital leadership; transactional; transformational; maturity; culture.

Introduction

There is no single leadership style universally applicable to all leaders or organisations (Malik, Danish & Munir 2012). Each leadership style offers distinct advantages and challenges, and its effectiveness depends on the organisational context, teams and individuals involved (Amanchukwu, Stanley & Ololube 2015; Nanjundeswaraswamy & Swamy 2015). Leadership styles significantly impact organisational norms and outcomes, particularly in complex transformation projects (Kazim 2019). As digital technologies rapidly evolve, businesses must remain agile and adaptive, with leaders adjusting their styles to meet the demands of the digital era (Goretti & Lejeune 2019). While prior research has recognised the importance of organisational culture in digital transformation (DT), it has often overlooked the specifics of cultural change and its management within this context (Matt, Hess & Benlian 2015). Digital culture (DC), which involves integrating values, leadership, behaviours and experiences to enable organisations to leverage digital opportunities, is increasingly recognised as a critical driver of successful DT (Hashmi & Siddiqui 2020). Similarly, the concept of digital maturity (DM) has gained prominence as organisations assess their digital strengths and areas for growth in their DT journey (Shen, Zhang & Liu 2022). This study aims to examine the relationships between leadership styles and DT, as well as explore how DC and DM influence the success of DT.

Literature review and hypothesis development

This section reviews the literature on key concepts such as leadership styles and DT. It also provides an overview of previous studies by scholars examining leadership, leadership styles and DT.

Leadership

According to Yukl (2011), leadership has been a focal point for scholars exploring its various facets. Weihrich, Cannice and Koontz (2008) classified leadership as a key component of

management. Bass (1995) supported the view that leadership is essential for the progress of civilisation. However, Volckmann (2012) highlighted the challenges in defining leadership, observing that numerous scholars have attempted to articulate its meaning. Dunnagan et al. (2013) observed that definitions of leadership vary depending on the source. Similarly, Kellerman (2012) identified 1400 definitions and 44 theories of leadership. For instance, Hersey and Blanchard (1988) defined leadership as the ability to influence individuals or groups to achieve organisational goals, while Conger (1993) described it as the process of guiding a group to gain commitment.

Leadership styles

Throughout the 20th century, numerous scholars examined various leadership approaches, commonly referred to as leadership styles (Carter & Greer 2013). Nanjundeswaraswamy (2015) defined a leadership style as a consistent behaviour pattern that characterises a leader. Imanzadeh et al. (2012) viewed it as a method employed by leaders to address organisational challenges. Initially, leadership styles were categorised into three main types: visionary, charismatic and inspirational. Over time, this list expanded to include additional styles such as democratic, transformational, paternalistic, participative, bureaucratic, transactional, servant, relationship and laissez-faire. Groves and LaRocca (2011) noticed the diversity of leadership types, while Yukl (2011) highlighted transformational, transactional and laissez-faire as the most significant styles.

Transactional

Transactional leadership (TSL), as described by Odumeru and Ogbonna (2013), involves supervising and monitoring individual, group, and organisational performance and mistakes, with a focus on promoting compliance through rewards or punishments. Kabeyi (2018) found that transactional leaders tend to be rigid, adhering strictly to existing goals, objectives and strategies. Khan and Nawaz (2016) identified three key components of TSL: contingent reward, management-by-exception (active) and management-by-exception (passive). Contingent reward encompasses both positive reinforcement and penalisation; Avolio (2004) described it as a transactional process where leaders and followers agree on what needs to be achieved for remuneration. Management-by-exception is divided into active and passive methods; active management-by-exception involves leaders continuously monitoring and adjusting performance standards, while passive management-by-exception involves addressing issues only after they arise (Khan & Nawaz 2016; Odumeru & Ogbonna 2013).

Transformational

The concept of transformational leadership (TRL), first introduced by Bass (1995), involves inspiring and motivating followers to exceed their own expectations (Donkor & Dongmei 2018). Avolio and Bass (1995) identified four key components of this leadership style: idealised influence, individual consideration, intellectual stimulation and inspirational motivation. Inspirational motivation refers to a leader's ability to use emotional appeal to inspire followers (Northouse 2016). Idealised influence involves leaders acting as role models, earning respect and admiration from their followers, who then seek to emulate them (Prakasa, Raharjo & Wiratama 2020). Intellectual stimulation encourages followers to think creatively and innovatively (Northouse 2016), while individualised consideration involves leaders attending to the personal needs and development of each follower (Maslanka 2004).

Digital leadership

Mihardjo et al. (2019) characterised digital leadership (DL) as the integration of cultural and competence elements to effectively utilise digital technology for generating value within organisations. A digital leader is envisioned as a strategic adviser with a clear vision, adept at analysing environmental changes and technological disruptions, and capable of swiftly responding and allocating resources to facilitate organisational transformation (Vial 2021). Jakubik and Berazhny (2017) similarly contended that while some aspects of leadership should be digitised, it is essential to maintain the human element.

Zhu (2015) outlined six key characteristics of DL: (1) Thought Leader, possessing resilience in facing market and competitive changes; (2) Creative Leader, demonstrating a mindset oriented towards creativity and innovation; (3) Global Visionary Leader, providing direction and orchestrating digital business transformation; (4) Inquisitive Leader, navigating the complexities of a volatile, uncertain, complex and ambiguous (VUCA) environment; (5) Profound Leader, offering deep knowledge and understanding to lead effectively in challenging times; and (6) Collaborative Leader, valuing collaboration to integrate diverse perspectives, expertise and resources.

Digital transformation

The advent of disruptive digital technologies such as artificial intelligence (AI), robotics and automation is not only reshaping industries globally but also creating new dynamics within enterprises of all sizes – large, medium and small. Nowicka (2019) identified several key digital technologies, including automation, digital platforms, mobile technologies, cloud computing, social media, big data analytics, AI, blockchain, the Internet of Things (IoT), the Internet of Everything, 3D and 4D printing, robotics, autonomous vehicles, machine learning and augmented reality. Kotarba (2018) defined DT as the modification or adaptation of business models driven by the rapid pace of technological advancement and innovation, which has led to shifts in social and consumer behaviours. Hess et al. (2016) explored DT and found it to be a complex and multifaceted process. Haffke, Kalgovas and Benlian (2016) similarly found that that the

concept of DT lacks a precise definition. However, common elements in various definitions include changes in business processes, technology, business models, services and products. Consequently, no universally accepted definition of DT exists (Vial 2021).

Digital maturity

To ensure that DT efforts are both purposeful and effective, organisations are recommended to conduct an assessment to identify their digital strengths and areas for development (Remane et al. 2017). The concept of DM has increasingly gained prominence in the consulting sector, likely in response to the practical needs of governments and organisations seeking to implement digital technologies and leverage data to enhance productivity, efficiency and competitive advantage in the global market (Newman 2017). Recently, Weritz, Braojos and Matute (2020) found that while DT continues to be a significant topic in both theory and practice, many companies struggle to achieve DM. Digital maturity reflects the progress of a company's DT efforts (Hess et al. 2016) and is crucial for competitive performance, as evidence shows that firms with higher levels of DM outperform their industry competitors across various financial metrics (Westerman et al. 2012).

Digital culture

According to Hashmi and Siddiqui (2020), DC extends beyond routine digital tasks, encompassing a broader and more nuanced concept. It involves the appreciation, exploration and shared enjoyment of digital tools, environments and artefacts that inform and enhance work processes (Hess et al. 2016). Success in DT is not solely dependent on technology; it also requires various antecedents, such as DC, to enable effective transformation. Shaughnessy et al. (2018) emphasised that cultural changes are essential for successful DT. Leaders must understand and articulate the DC within the context of values and workflows that drive success in the digital age. Furthermore, Hartl (2019) found that managing cultural change is critical for the success of DT. Hess et al. (2016) characterised DC as an organisational culture conducive to successful DT. Similarly, Sadiku et al. (2017) described DC as practices and norms emerging from digital technologies.

Leadership style and digital transformation

Kane et al. (2015) posited that effective leaders in DT share common traits that enhance their ability to guide organisations through digital change. Goretti and Lejeune (2019) noticed that various leadership styles can support an organisation's success during its DT journey, emphasising the importance of aligning the leadership style with the organisation's specific needs.

Hess et al. (2016) investigated the perspectives of leaders in Germany's hospitality industry regarding the impact of digitalisation. Their study revealed that both leadership conditions and the broader context are transformed by digitalisation. Similarly, Sow and Aborbie (2018) found that both transactional and TRL styles could facilitate the DT process, suggesting that a leader's style significantly influences how an organisation navigates the complexities of digital change. However, Vey et al. (2017) revealed that TSL, with its focus on structure and clear objectives, can create bottlenecks in DT, highlighting potential limitations in its ability to drive digital change effectively.

Furthermore, Brunner, Gonzalez-Castañé and Ravesteijn (2021) explored the relationship between DL and DT, concluding that DL competence has the most substantial positive impact on DT. Organisations with strong DL competence were more likely to successfully adopt digital technologies and achieve DT. Based on these findings, the following hypotheses are proposed:

H1: *Transactional leadership style will influence DT.*

H2: *Transformational leadership style will influence DT.*

H3: *Digital leadership style will influence DT.*

Leadership style and digital culture

Although research on DT underscores the need for cultural change and highlights the importance of a robust DC, leaders must possess a thorough understanding of both their own digital skills and capabilities as well as those of their teams (Hartl & Hess 2017). Digital culture is defined as the integration of leadership values, behaviours and experiences that enable organisations to leverage the opportunities offered by DT (Hashmi & Siddiqui 2020). Ruth and Netzer (2020) noticed that in the digital era, managing diverse perspectives often leads to varied cultural dynamics, with the leader's style being crucial for achieving success in this context.

A study by Shin, Mollah and Choi (2023) explored the relationship between DL style and organisational performance, focussing on the mediating roles of DC and employees' digital capabilities. Data were collected from 149 employees across South Korean organisations through a survey examining DL, DC, employees' digital capabilities and organisational performance. The results indicated that DL style positively impacts organisational performance both directly and indirectly. In addition, DC and employees' digital capabilities partially mediated this relationship.

Oberer and Erkollar (2018) also support the idea that leaders play a pivotal role in cultivating a DC essential for navigating the digital landscape and achieving sustainable goals. Based on these insights, the following hypotheses are proposed:

H1a: *Transactional leadership style will influence DC.*

H2a: *Transformational leadership style will influence DC.*

H3a: *Digital Leadership style will influence DC.*

Leadership style and digital maturity

Digital leadership is a leadership style that integrates both transactional and transformational approaches (Kieser 2016).

It is also crucial to recognise that DL significantly enhances digital capabilities within organisations, which in turn impacts DM (Kiron et al. 2016). Notably, Prakasa et al. (2019) conducted a study examining the influence of TRL style on DM. Their research involved 50 employees at Telkomsel GraPARI Malang, a leading telecommunications company in Indonesia, using a saturated sampling technique. Data were collected through questionnaires and the findings indicated that the implementation of TRL style had a significant positive effect on DM. In addition, Effendy and Arquisola (2022) explored the impact of four TRL traits on the DM of Indonesian employees. Their quantitative study involved online questionnaires distributed to 203 information technology (IT) managers in the food and beverage and automotive manufacturing sectors in Indonesia. Based on these findings, the following hypotheses are proposed:

H1b: *Transactional leadership style will influence DM.*

H2b: *Transformational leadership style will influence DM.*

H3b: *Digital leadership style will influence DM.*

Digital culture and digital transformation

While prior research has recognised the significance of organisational culture in DT, it has often neglected the specifics of culture change and its management within this context (Matt et al., 2015). Culture is considered a fundamental human element in DT and is closely linked to Digital Corporate Leadership (Martínez & Mechán 2018). Hashmi and Siddiqui (2020) argued that DC involves the integration of values, leadership, behaviours and experiences that enable organisations to capitalise on the opportunities presented by DT. In a study performed by Weritz et al. (2020), relevant dynamic capabilities and aspects of DC were examined for their influence on DT. Their interpretive and exploratory research, focussing on chief executive officers (CEOs) and chief information officers (CIOs), highlighted that culture is a critical determinant of DT success. Martínez and Mechán (2018) identified cultural issues, outdated IT systems and applications, a lack of digital skills and unclear leadership vision as primary barriers to successful DT. A cultural shift is also necessary, Saputra and Saputra (2020) emphasised that a cultural shift is essential for DT to succeed. Therefore, the following hypothesis is proposed:

H4: *Digital culture will influence DT.*

Digital maturity and digital transformation

To ensure a purposeful and effective DT journey, organisations are advised to first assess their digital strengths and areas for development (Shen et al. 2022). The concept of DM has gained significant traction in the consulting field, especially as governments and organisations seek to implement digital technologies (Newman 2017). Recently, Weritz et al. (2020) noticed that although DT has become a prominent topic both in theory and practice, many companies still struggle to achieve DM.

Salviotti, Gaur and Pennarola (2019) identified key strategic factors of DT and explored their relationship with DM using a survey of 153 digital leaders in Italy. Their findings revealed that DM was higher when top management effectively communicated a shared digital vision within the company. In addition, Saunila et al. (2021) investigated the impact of three antecedents of DT – digital orientation, digital intensity and DM – on the financial success. Their survey of 500 of Finland's largest companies found that DM mediated the relationship between digital orientation and financial success, as well as between digital intensity and financial success. Based on these insights, the following hypothesis is proposed:

H5: *Digital maturity will influence DT.*

Conceptual framework

Based on the literature reviewed and the hypotheses formulated in the preceding sections, Figure 1 illustrates the proposed conceptual framework.

Research methods and design

This section describes the methodology employed for data collection, sampling and analysis. A quantitative approach was utilised, with IBM SPSS Amos 26.0 (Armonk, NY, US) software used to conduct descriptive statistics, correlations and structural equation modelling (SEM) analysis.

Sample and data collection

The study's population consisted of employees at the managerial and executive levels from the core business units of an energy utility in South Africa, excluding those in support functions such as finance. A purposive sampling approach was used to select 302 executives and non-managerial staff, focussing specifically on individuals with relevant experience in the drafting and implementation of DT (Yin 2009).

The demographic information of the participants is as follows: Gender distribution shows that 65% of the sample is male, while females account for 35%. The largest age group is 41–50 years old, comprising 39% of the sample, followed by 51-age group at 29%. In terms of organisational division, IT is the most represented at 19%, followed by generation (18%) and distribution (16%).

Regarding organisational level, middle management is most common, representing 35% of participants, with senior management comprising 25%. Participants with a bachelor's degree and those with an honours degree are equally represented at 26% each, with those holding master's degrees also at 26%. Most of the participants report being two levels below the head of department, making up 30% of the sample. In addition, most heads of departments have held their leadership positions for 5–8 years, accounting for 36% of the sample.

These details offer a comprehensive overview of the study sample's composition, aiding in the interpretation of the demographic characteristics and their potential impact on the study's findings.

Instruments and measures

Section A: This section gathered demographic information from the respondents, focussing on their tenure with the organisation, departmental location, level of seniority and gender. The primary objective was to provide a comprehensive overview of the organisation's demographic profile.

Section B: The Multifactor Leadership Questionnaire (MLQ) Form 6S, adapted from Avolio and Bass (2004), was used to assess the leadership styles present within the organisation, excluding the laissez-faire style. The questionnaire demonstrated a Cronbach's alpha of 0.70. Responses were measured on a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5).

Section C: This section used a survey instrument adapted from Abhari et al. (2021) comprising 12 dimensions and 37 statements. It aimed to evaluate the prevalence of DC within the organisation and its impact on DT success, with a reliability coefficient of 0.84. A 5-point Likert scale was used, where 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree.

Section D: This section utilised a survey adopted from Mihardjo et al. (2019), which included 6 dimensions and 25 statements. It was designed to assess the prevalence of DL and its influence on DT success, with a Cronbach's alpha of 0.83. A 5-point Likert scale was employed, with response options ranging from strongly disagree (1) to strongly agree (5).

Section E: The survey used in this section was adapted from (Berghaus & Back 2016). It featured 9 dimensions and 58 statements focussed on evaluating the organisation's DM across various critical aspects of the maturity model, with an internal reliability of 0.95. Responses were recorded on a 5-point Likert scale, with options from strongly disagree (1) to strongly agree (5).

Section F: This section adopted the survey from Sánchez (2017), consisting of 5 dimensions and 28 statements to evaluate the organisation's readiness for DT. It addressed key aspects such as strategy, platforms, partners and digital platforms, and required resources and capabilities, demonstrating a reliability of 0.907 across all dimensions. The 5-point Likert scale was used, with response options ranging from strongly disagree (1) to strongly agree (5).

Data analysis and results

Descriptive statistics and correlation test

This study sought to examine the relationships proposed in the conceptual framework, which includes transformational, transactional and DL styles, along with DC, DM and DT. Accordingly, the study tested 11 hypotheses (H1a, H2a, H3a, H1b, H2b, H3b, H1c, H2c, H3c, H4 and H5) that were developed from this framework.

Data analysis

The statistics software IBM SPSS Amos 26 was used to conduct descriptive statistics, correlation analyses, and SEM. The following Results section outlines the results of these analyses.

Ethical considerations

Ethical approval to conduct this study was obtained from the University of South Africa (UNISA) School of Business Leadership (SBL) Ethics Committee (No. 2023_SBL_DBL_013_FA_054).

Results

Descriptive and correlation test

Table 1 presents the means, standard deviations, reliabilities and correlations among the study variables. All reliability coefficients exceed the acceptable threshold of 0.70, indicating strong internal consistency. Notably, the Pearson correlation coefficients reveal small correlations between leadership styles (transformational and transactional) and DL, DM and DC. The strongest correlation is between TRL and TSL at 0.881. Significant correlations are also observed between DL and DM, and between DM and DT. A moderate correlation exists between DC and DL, while DT shows a high correlation with DC. Correlations among the remaining variables range from low to moderate in magnitude.

Model assessment

Model testing using Structural Model Assessment

A SEM was developed using Amos to evaluate the relationships among variables. A model is considered to have good fit if the value of Chi-square Minimum Discrepancy (CMIN)/degrees of freedom (*df*) is less than 5, and the goodness-of-fit indices, including the goodness-of-fit index (GFI), Tucker-Lewis's index (TLI) and confirmatory fit index (CFI), are greater than 0.90 (Bentler 1990; Hair, Ringle & Sarstedt 2010; Tucker & Lewis 1973).

TABLE 1: Mean, standard deviation, Cronbach's alpha and correlations.

Construct	Mean	SD	Cronbach's alpha	TRL	TSL	DL	DM	DC	DT
TRL	3.597	0.740	0.943	1.000	-	-	-	-	-
TSL	3.587	0.686	0.833	0.881*	1.000	-	-	-	-
DL	2.989	0.793	0.949	0.377*	0.336*	1.000	-	-	-
DM	2.849	0.793	0.965	0.283*	0.268*	0.755*	1.000	-	-
DC	2.989	0.958	0.958	0.452*	0.360*	0.689*	0.613*	1.000	-
DT	2.957	0.838	0.971	0.246*	0.204*	0.644*	0.735*	0.572*	1.000

SD, standard deviation; TRL, transformational leadership; TSL, transactional leadership; DL, digital leadership; DM, digital maturity; DC, digital culture; DT, digital transformation.
*, Correlation is significant at the 0.01 level (2-tailed).

In addition, an acceptable model fit is indicated if the standardised root mean square residual (RMSR) is less than 0.05 and the root mean square error of approximation (RMSEA) falls between 0.05 and 0.08 (Hair et al. 2010).

In Model 1 (Table 2), the structural model predicted DT using leadership styles, DC and DM, as outlined in the conceptual framework. While the RMSEA was within the acceptable range (< 0.08), other indices indicated poor model fit: the TLI was below the acceptable threshold of 0.95, the CFI was also below 0.95 and the Chi-square value (χ^2 = 514.8) was excessively high and thus unacceptable.

In Model 2 (Table 2), non-significant paths were removed to improve the model fit. Although the RMSEA improved to less than 0.05, the TLI remained low at 0.231 and the CFI increased slightly to 0.590, but both indices were still below acceptable levels (CFI > 0.95).

In Model 3 (Table 2), all non-significant structural paths were eliminated, and interactions among exogenous variables and intermediate endogenous variables were added. This resulted in a model that adequately fit the data, as evidenced by the improved fit indices: RMSEA < 0.05, TLI > 0.95, CFI > 0.95, and a significantly reduced Chi-square value (χ^2 = 2.085).

Hypotheses testing

The squared multiple correlation for DT was 0.57, indicating that 57% of the variance in DT is explained by TRL, TSL, DL, DM and DC. The study examined the relationships between these variables and their collective impact on DT. The effects of leadership styles varied: while the influence of TRL on DT was positive, it was statistically insignificant (b = 0.045, t = 0.472, p = 0.637), leading to the rejection of H1a. Conversely, DL had a positive and significant impact on DT (b = 0.144, t = 2.117, p = 0.034), supporting H3c. Digital maturity also showed a positive and significant effect (b = 0.580, t = 9.333, p = 0.000), confirming H5b, while the impact of DC was similarly positive and significant (b = 0.147, t = 2.737, p = 0.006), supporting H4a. The model fit indices and the results of the 11 hypotheses tested are detailed in Table 3.

In short, the results indicate that DL is the most effective leadership style for fostering DT, culture and maturity, with strong positive effects across all dimensions. Transformational leadership contributes positively to DC but does not significantly impact DT or maturity. In contrast, TSL does not support DT and has a negative effect on DC. In addition, DC and maturity are crucial enablers of DT, with DM having the strongest influence.

Figure 1 shows the original conceptual framework, developed based on the literature, illustrating the expected relationships between leadership styles, DM, DC and DT. The model proposed that transactional, transformational and DL styles each have a direct and positive impact on DT, DC and DM. In addition, the framework suggested that both DC and DM directly enhance DT. These hypothesised direct relationships

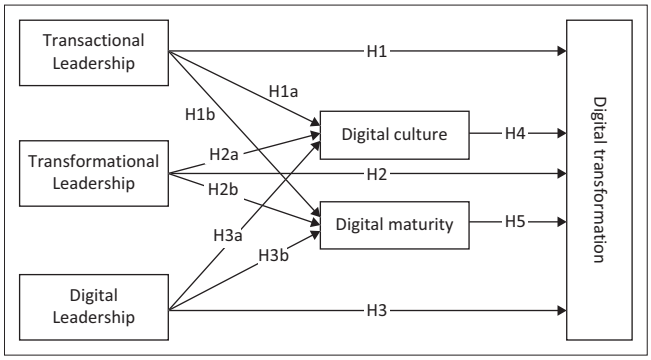

FIGURE 1: Proposed conceptual framework for leadership styles, digital maturity, digital culture and digital transformation.

TABLE 2: Models 1, 2 and 3.

Model number	χ^2	p	df	CFI	TLI	RMSEA	$\Delta\chi^2$	Δdf
Model 1	514.8*	0.000	4	0.588	-0.544	0.648	-	-
Model 2	517.0*	0.000	8	0.590	0.231	0.457	2.2	-
Model 3	2.085	0.555	3	1.000	1.004	0.000	-514.915	4

df, degrees of freedom; CFI, confirmatory fit index; TLI, Tucker–Lewis Index; RMSEA, root mean square of approximation.
**, p < 0.01.*

TABLE 3: Summary of hypotheses results.

H#	Hypothesis	Standard coefficient	p	Result
H1a	Transactional leadership style has a positive impact on DT	-0.078	0.332	Rejected
H1b	Transactional leadership style has a positive impact on DC	-0.176	0.033	Accepted
H1c	Transactional leadership style has a positive impact on DM	0.071	0.370	Rejected
H2a	Transformational leadership style has a positive impact on DC	0.377	*	Accepted
H2b	Transformational leadership style has a positive impact on DT	0.040	0.637	Rejected
H2c	Transformational leadership style has a positive impact on DM	-0.064	0.421	Rejected
H3a	Digital Leadership style has a positive impact on DC	0.600	*	Accepted
H3b	Digital Leadership style has a positive impact on DM	0.752	*	Accepted
H3c	Digital Leadership style has a positive impact on DT	0.136	0.034	Accepted
H4	Digital Culture has a positive impact on DT	0.155	0.006	Accepted
H5	Digital Maturity has a positive impact on	0.554	*	Accepted

DT, digital transformation; DC, digital culture; DM, digital maturity.
**, p < 0.01.*

were represented with solid lines in the conceptual framework.

In contrast, Figure 2 depicts the revised model, refined based on the SEM results. This updated model introduces dotted lines where no significant or negative impact was found. Specifically, transactional and TRL styles no longer show a direct positive impact on DT and are now represented with dotted lines. Similarly, both leadership styles also failed to show a direct positive influence on DC and DM, leading to these relationships also being revised to dotted lines. Meanwhile, the solid lines remain for relationships confirmed by SEM, reaffirming the strong influence of DL on DT, DC and DM, as well as the direct impact of DC and DM on DT.

Discussion

The findings of this study highlight the complex interplay between leadership styles and DT, providing critical insights into the leadership qualities that should be nurtured in the digital era. Firstly, the research reveals that both TFL and TSL styles have an indirect influence on DT. These results stand in contrast to the conclusions of Sow and Aborbie (2018), who found that both leadership styles could speed up DT. This divergence underscores the complexity of leadership's role in the digital context, suggesting the need for a more nuanced understanding that incorporates both TFL and TSL approaches. Also, they align with the study by Vey et al. (2017), which revealed that TSL, with its focus on structure and clear objectives, can create bottlenecks in DT.

Secondly, the study identifies an important distinction: while transactional and TRL does not exert a direct influence on DT, DL emerges as a key driver, directly affecting the DT process. This finding is consistent with the work of Brunner et al. (2021), who discovered that DL significantly enhances the likelihood of successful DT, with organisations exhibiting DL capabilities being more adept at adopting digital technologies.

Thirdly, the research highlights the critical role of DC and DM in achieving favourable outcomes in DT initiatives. Both factors are shown to have a strong positive impact on the success of DT, emphasising the need for organisations to prioritise the cultivation of a strong DC and continuous

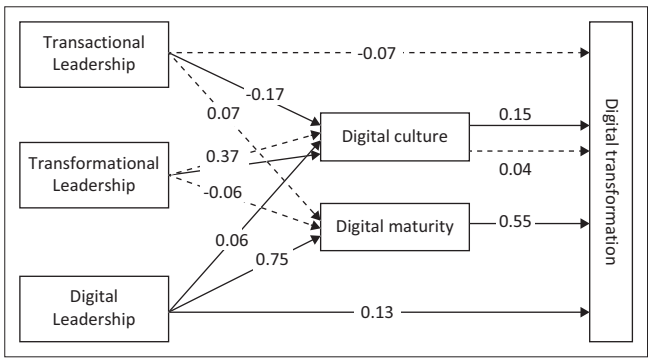

FIGURE 2: Revised model of the relationship between transactional, transformational, digital leadership styles and digital transformation.

improvement in DM. These findings are supported by Weritz et al. (2020), who identified DC as a pivotal factor in DT success, while the results on DM align with Salviotti et al.'s (2019) research, which demonstrated that higher levels of DM are achieved when top management shares a clear digital vision. Overall, the study indicates that DL, DC and DM are key predictors of DT, whereas TRL and TSL do not significantly account for the variance in DT outcomes.

Managerial implications for research and practice

The findings of this study highlight several key managerial implications for organisations undergoing DT. Firstly, cultivating DL is crucial, as leaders with strong digital proficiency are better equipped to guide transformation efforts. Secondly, managers should also prioritise fostering a strong DC that promotes innovation, collaboration and learning, while simultaneously working to enhance their organisation's DM by investing in technology and skills development. Thirdly, although TRL and TSL styles do not directly influence DT, they still offer complementary benefits, and leaders should balance both approaches to motivate teams and manage change effectively. Finally, leadership styles should be tailored to the organisation's specific context, ensuring agility in response to both internal dynamics and external pressures. By focussing on these factors, managers can drive more successful DT initiatives and create a culture of continuous adaptation.

Limitations and recommendations for the future research

This study has several limitations that should be acknowledged. Firstly, it was confined to a single energy utility, which limits the generalisability of the findings to other industries or sectors. Future research should consider expanding the scope to include multiple utilities or sectors to provide a more comprehensive understanding. Secondly, the study employed a quantitative approach, which, while valuable, missed the opportunity to capture the deeper insights that qualitative methods could provide. Engaging directly with leaders through interviews or case studies could offer a richer understanding of how DT impacts leadership. Thirdly, the cross-sectional nature of the study prevented the observation of how the relationship between leadership styles and DT evolves over time. Longitudinal studies are recommended to track these changes and provide more dynamic insights. Lastly, future research should focus on evaluating specific leadership style components and their individual impacts on DT, to further refine our understanding of the complex interplay between leadership and digital change.

Conclusion

In conclusion, this study highlights the complexity and variability in the relationship between leadership styles and DT. The findings demonstrate that while TRL and TSL styles play indirect roles, it is DL that exerts a direct and significant

influence on DT. This supports the notion that leadership in the digital era requires adaptability, with leaders who are digitally adept being more likely to drive transformation successfully. In addition, DC and DM emerge as crucial factors in determining the success of DT efforts, emphasising the need for organisations to prioritise cultivating these elements. The results underline the importance of a multifaceted approach that integrates leadership styles with organisational readiness for the digital age, contributing to both academic literature and practical applications in leadership and DT. Further research should explore these dynamics across different contexts, including a deeper examination of how leadership styles interact with organisational culture and maturity during transformation processes.

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Authors' contributions

T.M. was responsible for all aspects of the article, including identifying the research problem, formulating research objectives, the research design, execution of the research and completing the article. T.S. played a mentoring role, assisted with the critical comments and provided guidance in drafting the article.

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Data availability

The data that support the findings of this study are available from the corresponding author, T.S., upon reasonable request.

Disclaimer

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