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The double-edged effects of digital leadership on employee innovation performance: the role of technology self-efficacy and technostress

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Abstract

Rapid advances in digital technology have profoundly reshaped organisational leadership and management, intensifying the complexity and uncertainty of digital transformation. As a pivotal competency in the technological era, digital leadership is instrumental in promoting employee innovation, a cornerstone of sustained competitiveness. Grounded in the Cognitive–Affective Personality System (CAPS) framework, this study examines the paradoxical influence of digital leadership on employees' innovation performance by tracing both cognitive and affective pathways. Empirical findings reveal a distinctive double-edged sword effect: digital leadership enhances employees' confidence in using technology, thereby stimulating innovation through cognitive mechanisms of technology self-efficacy. Yet, it simultaneously heightens technostress, an affective strain that can suppress creativity and hinder innovation. Moreover, the analysis demonstrates that organisational technology transformation support (OTTS) moderates these dual processes—strengthening the positive cognitive link between digital leadership and self-efficacy while alleviating technostress's negative affective impact. By integrating cognitive and affective mechanisms into a unified model, this research advances theoretical understanding of how digital leadership shapes innovative behaviour in technology-intensive workplaces. It further expands discourse on organisational support during digital transformation, offering actionable guidance for leaders seeking to balance empowerment and emotional well-being in the digital era.

1. Introduction

The accelerating pace of digital transformation is reshaping how organizations operate, innovate, and manage their workforce, creating both unprecedented opportunities and complex challenges for leadership in contemporary workplaces. Within this context, **digital leadership** has emerged as a decisive capability, enabling leaders to navigate multifaceted digital environments while fostering innovation. Building on established conceptualizations (Claassen et al., 2021; Cortellazzo et al., 2019), we define digital leadership as *the capacity to combine expertise in technological trends with data-driven decision-making skills, while effectively guiding virtual or hybrid teams toward shared strategic objectives*. At its best, digital leadership accelerates technology adoption, facilitates seamless collaboration across digital platforms, and empowers employees to contribute novel ideas.

A substantial body of research has examined the outcomes of digital leadership. On the positive side, it has been linked to stronger innovation performance, enhanced organizational adaptability, and more effective problem-solving in technology-rich settings (Pandey et al., 2023; Reni et al., 2024). On the negative side, persistent digital demands and constant connectivity can generate technostress, encourage risk aversion, and erode employees' creative energy (Salam, 2023; Thomson et al., 2017). These two streams of research—whether celebrating benefits or diagnosing pitfalls—have, however, evolved largely in isolation, employing disparate constructs and theoretical lenses. As a result, our understanding remains incomplete: we still know little about how digital leadership can simultaneously enable and inhibit innovation, and under what conditions these opposing effects occur.

Emerging evidence suggests that positive outcomes often operate through **cognitive mechanisms**—such as enhanced technology self-efficacy and improved access to resources—whereas negative outcomes tend to arise via **affective mechanisms**, including heightened stress and emotional exhaustion. Yet, in the absence of an integrated theoretical framework, prior studies have struggled to capture the full complexity of these dual effects. To address this gap, we adopt the **Cognitive–Affective Personality System (CAPS)** framework (Mischel & Shoda, 1995), which emphasizes the interplay between cognitive and affective units in shaping individual behavior. This perspective enables us to conceptualize digital leadership's influence along two interrelated pathways: a *cognitive pathway*, in which leadership strengthens employees' technology self-efficacy to enhance innovation; and an *affective pathway*, in which leadership heightens technostress and may suppress creative performance. By embedding both mechanisms within a unified theoretical model, we reconcile fragmented findings and advance a more coherent understanding of digital leadership's double-edged nature.

This study offers four key contributions. **First**, it integrates previously separate lines of inquiry on the positive and negative effects of digital leadership into a single, empirically validated dual-pathway model, providing a nuanced theoretical account of its paradoxical impact on innovation. **Second**, by applying the CAPS framework, it rigorously links digital leadership to both cognitive and affective processes, moving beyond linear accounts that emphasize only benefits or drawbacks. **Third**, it foregrounds the dual role of technology—as both a catalyst for creativity and a potential source of strain—within leadership contexts, prompting a reassessment of established leadership theories in highly digitalized environments. **Finally**, it incorporates organizational technology transformation support as a moderating factor, underscoring that digital leadership's effectiveness depends not only on leader capability but also on robust organizational structures that amplify positive outcomes while mitigating psychological costs. Collectively, these contributions respond to recent calls for balanced, evidence-based strategies for leading effectively in digitally intensive workplaces.

2. Theoretical Background

2.1 Digital Leadership

Digital leadership has emerged as a decisive capability, enabling leaders to navigate multifaceted digital environments while fostering organizational adaptability and creative performance. Early scholarly responses to this phenomenon included the concept of *e-leadership*, introduced to describe leadership processes mediated by advanced information and communication technologies (Avolio & Kahai, 2003; Avolio et al., 2000). Subsequent research has sought to delineate the specific competencies required in the digital age. For instance, Westerman et al. (2012) identified adaptability, technological literacy, and data-driven decision-making as critical capabilities. Consulting firms such as Deloitte and Korn Ferry have reinforced these themes in practitioner models that emphasize strategic agility, cross-functional collaboration, and technological vision (Misra et al., 2019; Kane et al., 2015; Korn Ferry International Research Institute, 2018). Promsri (2019) offered further synthesis, distilling cross-sectoral insights into six foundational attributes of effective digital leaders.

While these perspectives have advanced understanding, much of the prevailing discourse remains anchored in practitioner-oriented frameworks and isolated case accounts, with comparatively limited empirical and theoretical integration in the academic literature. Building on our team's prior, as yet unpublished, grounded theory research, we derived the four dimensions adopted in this study from a **classical grounded theory analysis** (Glaser & Strauss, 1967). This qualitative investigation examined autobiographical and interview-based materials from five globally recognized organizational leaders across diverse industries—selected via theoretical sampling to ensure relevance to technology-driven transformation. Through systematic open, selective, and theoretical coding, 508 initial concepts were refined into four robust, interrelated facets of digital leadership, achieving theoretical saturation and confirming conceptual stability.

The four dimensions are defined as follows: **Digital innovation** reflects a leader's capacity to adopt and champion frontier technologies while fostering a culture of creativity and experimentation (Newman et al., 2020). **Uncertainty management** denotes the ability to steer organizations decisively through volatile, ambiguous, or rapidly changing environments, aligning with adaptive leadership theory in VUCA contexts (Duong et al., 2023). **Shared value creation** entails empowering stakeholders by distributing authority, information, and resources—an approach rooted in the principles of collaborative governance and service-dominant logic (Vargo & Lusch, 2008). **Integration of diverse perspectives** underscores the inclusion and synthesis of varied viewpoints—cross-disciplinary, cross-functional, and cross-cultural—into strategic decision-making, a practice demonstrated to enhance innovative outcomes via cognitive diversity (van Knippenberg et al., 2004). Collectively, these four dimensions position digital leadership as a multi-dimensional leadership competency capable of aligning technological strategy with human dynamics, enabling organizations to navigate transformation while managing the inherent tensions of the digital era.

Conceptualizing these four dimensions as complementary facets of a single capability allows for a coherent theoretical treatment of digital leadership across this study. Each dimension interacts with both technological and human factors, equipping leaders to orchestrate transformation, capture innovation opportunities, and manage the complexity of digital-era

competition. In practice, leaders adept in these competencies can integrate digital tools seamlessly into workflows, strengthen interdepartmental collaboration, and create sustained competitive advantage (Bellis et al., 2024; Memon & Ooi, 2023).

Yet, the same leadership capabilities that drive innovation can also intensify demands on employees. Continuous technological upgrades, persistent digital connectivity, and real-time performance monitoring may elevate technostress—a technology-related strain arising from information overload, constant change, and high performance pressure. Within the CAPS framework, technostress is best understood as an affective response: it consumes emotional resources, triggers anxiety or frustration, and erodes psychological safety. These emotional states, in turn, dampen employees' willingness to explore novel ideas, experiment, or take the interpersonal risks inherent in creative work. Accordingly, digital leadership should be examined as a double-edged construct—simultaneously operating through cognitive pathways that enhance innovation (e.g., by increasing technology self-efficacy) and through affective pathways that may inhibit it. This duality provides the conceptual rationale for our investigation of the conditions under which digital leadership's enabling mechanisms outweigh, or are outweighed by, its constraining emotional effects.

2.2 CAPS

The Cognitive–Affective Personality System (CAPS) framework explains how individual behavior arises from dynamic interactions between cognitive and affective units triggered by situational cues (Mischel & Shoda, 1995, 2008). Rather than treating personality as a fixed set of traits, CAPS conceptualizes behavior as the product of reciprocal activation among **cognitive elements** (e.g., beliefs, expectations, knowledge structures) and **affective components** (e.g., emotions, moods, psychological states). This perspective emphasizes that individuals' interpretations and emotional reactions to their environment critically shape subsequent actions (Kell, 2018).

Within leadership research, CAPS offers a valuable lens for examining how leaders' mental frameworks and emotional dispositions influence their actions and, in turn, affect followers' cognitive and affective responses (Krishnan, 2023; Yuan et al., 2019). Leadership is inherently social, requiring navigation of both the intellectual demands of strategic decision-making and the emotional complexities of interpersonal influence. In the present study, **digital leadership is conceptualized as a leadership capability that functions as a behavioural manifestation of both cognitive and affective units**: it embodies leaders' technological knowledge and strategic thinking (cognitive unit) as well as their capacity to regulate emotions, convey vision, and manage stress in digital contexts (affective unit).

Applying CAPS to the phenomenon of digital leadership yields a **dual-pathway model**. The **cognitive pathway** involves evidence-based analysis, strategic technology adoption, and effective resource deployment to build employees' skills and problem-solving capacity—processes that reinforce *technology self-efficacy*. The **affective pathway** operates through emotional cues: leaders' enthusiasm and optimism about digital transformation may inspire employees to experiment and collaborate, whereas urgency, anxiety, or overly high performance demands may amplify *technostress*, diminishing psychological safety and dampening creativity.

Understanding how these pathways operate in tandem is essential to explain the double-edged nature of digital leadership's impact on innovation. Cognitive mechanisms expand employees' capabilities and confidence, while affective mechanisms influence their willingness and motivation to leverage these capabilities for innovative outcomes. By explicitly incorporating both technology self-efficacy and technostress as mediators, this study operationalizes CAPS in a way that integrates positive and negative leadership effects into a single theoretical framework, providing a foundation for hypotheses and subsequent empirical testing.

2.3 Technology self-efficacy

Within the framework of the CAPS, technology self-efficacy represents a **cognitive unit**—a belief structure that shapes how individuals interpret and respond to digital work demands. Drawing on Bandura's (1978, 1989) original notion of domain-specific self-efficacy, we define technology self-efficacy as *employees' confidence in their ability to effectively utilise digital*

technologies to accomplish work tasks, solve problems, and generate innovative solutions. This conceptualisation positions technology self-efficacy as a pivotal cognitive resource that underpins adaptive behaviour in technology-rich environments.

Empirical research consistently demonstrates that higher levels of technology self-efficacy enhance employees' capacity to adopt and exploit new digital tools, engage proactively with digital platforms, and contribute meaningfully to organisational innovation (Compeau & Higgins, 1995; Thatcher & Perrewe, 2002; Marakas et al., 2007). Individuals with strong confidence in their technological abilities tend to view technological challenges as opportunities for learning and growth rather than as threats, thereby fostering continuous improvement and creative problem-solving at work (Hertel et al., 2003).

In the context of this study, technology self-efficacy is a core mechanism through which digital leadership exerts its **positive, innovation-enhancing effects**. Leaders who model effective technology use, provide access to training, and remove barriers to digital adoption strengthen employees' beliefs in their own digital competence. This bolstered self-efficacy, in turn, encourages experimentation with new tools and processes, reduces apprehension toward digital change, and promotes sustained engagement in innovation initiatives. Viewed through the CAPS lens, digital leadership influences employees' **cognitive pathway** by enriching their knowledge base, reinforcing successful mastery experiences, and shaping positive expectations about their ability to innovate in digitally mediated work settings.

We therefore conceptualise technology self-efficacy as a key mediator in our research model, translating the cognitive stimulation provided by digital leadership into tangible innovation performance. By fostering strong self-beliefs in technological competence, organisations can amplify the benefits of digital leadership and create an environment conducive to continuous, technology-driven innovation.

2.4 Technostress

The widespread integration of digital technologies into organizational workflows has produced a distinctive form of occupational strain known as *technostress*—the adverse emotional reaction experienced when individuals perceive technology-related demands as exceeding their adaptive capacity (Tarafdar et al., 2007; Ayyagari et al., 2011). Rather than a monolithic construct, technostress comprises multiple dimensions long recognized in the literature. *Techno-overload* arises when digital tools intensify the pace and volume of work to an unsustainable level (Tarafdar et al., 2011). *Techno-invasion* refers to the erosion of boundaries between work and personal life through constant connectivity (Ragu-Nathan et al., 2008). *Techno-complexity* captures frustration and emotional fatigue associated with mastering increasingly complex and rapidly evolving systems (Maier et al., 2015). *Techno-insecurity* reflects anxiety about diminished job relevance or potential job loss following the introduction of new technology (Ragu-Nathan et al., 2008), while *techno-uncertainty* denotes discomfort caused by frequent technological changes whose outcomes remain unclear (Tarafdar et al., 2011).

Within the Cognitive–Affective Personality System (CAPS) framework, technostress constitutes an **affective-unit activation**—a negative emotional state elicited by environmental cues tied to leaders' technology adoption strategies (Lin et al., 2013). Elevated technostress signals that the emotional demands of the digital work environment are tipping into strain, manifesting in heightened anxiety, frustration, and emotional exhaustion (Califf et al., 2020). Such conditions have been empirically linked to reduced team knowledge sharing (Song et al., 2023) and diminished willingness to engage in creative risk-taking (Elsayed, et al., 2023), even when employees possess adequate technical resources. Sustained technostress not only erodes intrinsic motivation (Salanova et al., 2013) but also weakens collaborative energy (Fuglseth & Sørebø, 2014)—two emotional preconditions vital for innovation to flourish.

In the context of digital leadership, this affective mechanism is particularly significant. Although digital leadership seeks to enhance organizational agility and innovation through rapid technology integration (Benitez et al., 2022), the same emphasis on continuous upgrades, relentless performance monitoring, and inter-platform collaboration can inadvertently exacerbate *techno-overload*, *techno-invasion*, and *techno-complexity* (Tarafdar et al., 2019; Spagnoli et al., 2020). Empirical studies show that such pressures can counteract the motivational climate leaders aim to build, suppressing employees' innovative engagement (Carleton et al., 2018). This reinforces digital leadership's double-edged nature: technological empowerment

expands the opportunity space for innovation, yet simultaneously heightens emotional demands that may inhibit creative outputs.

In our model, technostress is therefore positioned explicitly within the affective pathway of CAPS as a mediator that transmits the potentially adverse emotional consequences of digital leadership into reduced innovation performance. Recognizing this mechanism underscores the need for evidence-based mitigation strategies—such as workload balancing (Tarafdar et al., 2015), digital literacy interventions (Zheng et al., 2025), and clear boundary-management policies (Vayre & Vonthron, 2017)—that protect employees' emotional well-being while preserving the innovation-enabling potential of digital leadership.

2.5 Organizational Technology Transformation Support

In the context of rapid digital transformation, the degree to which an organization actively supports technology adoption is a critical determinant of the success of digital initiatives and the sustainability of innovation capabilities. *Organizational Technology Transformation Support* (OTTS) refers to the combined infrastructure, policies, and strategic practices that enable the effective integration of digital tools and processes across all domains of business activity (Matt et al., 2015; Susanti & Ardi., 2022). This support extends beyond the provision of hardware and software: it encompasses cultivating a technology-positive culture (Kane et al., 2015) and embedding leadership practices that guide employees through technological transitions with clarity and confidence (Cortellazzo et al., 2019).

From a CAPS framework perspective, OTTS constitutes a situational cue that can shape both cognitive and affective processes in employees. On the **cognitive pathway**, strong organizational support equips employees with access to relevant technologies, opportunities for skill development, and structured problem-solving environments (Marakas et al., 2007). These factors enhance *technology self-efficacy* (Compeau & Higgins, 1995), enabling employees to confidently exploit digital tools for creative tasks. On the **affective pathway**, support mechanisms such as mentorship (Hertel et al., 2003), peer collaboration networks (van Knippenberg et al., 2004), and reinforcement of psychological safety (Edmondson & Lei, 2014) help to mitigate *technostress*, buffering employees against the emotional strain of constant technological change (Tarafdar et al., 2011).

Empirical evidence underscores that organizations committed to facilitating technological adaptation—through mentorship, digital literacy initiatives, and responsive technical assistance—reduce resistance to change (Venkatesh & Bala, 2008) and foster a climate where innovation can flourish (Cortellazzo et al., 2019; Ragu-Nathan et al., 2008). Conversely, insufficient support can exacerbate the *resource depletion* and emotional strain described in Section 2.4, thereby weakening or even reversing the beneficial impact of digital leadership on innovation performance. In this study, OTTS is therefore conceptualized as a key contextual moderator that can **amplify the positive cognitive effects** of digital leadership while simultaneously **dampening its potential negative affective consequences**, providing a crucial environmental condition for sustaining innovation in technology-intensive contexts.

2.6 Innovation Performance

Innovation performance refers to an individual's capacity to generate, implement, and refine novel ideas that contribute meaningfully to the achievement of organizational objectives(Hughes et al., 2018). In today's highly competitive and fast-changing market environment, sustained innovation is widely regarded as a critical determinant of competitive advantage (Mumtaz & Parahoo, 2020). Organizations that embed a culture of ongoing experimentation and improvement are better positioned to adapt to technological shifts and evolving customer expectations, thereby safeguarding long-term resilience and strategic relevance (Tidd & Bessant, 2020).

Importantly, innovation encompasses more than breakthroughs in products or services. It also includes improvements in processes, organizational structures, and stakeholder engagement practices, all of which enhance agility and business sustainability(Jun et al., 2022). When employees actively pursue innovative initiatives, they contribute not only to immediate

operational success but also to the future viability of the organization by anticipating emerging trends and proactively addressing nascent challenges (Shaalan et al., 2023).

Leadership has consistently been recognized as a central catalyst for innovation. Leaders shape organizational culture, articulate strategic priorities, and ensure resource allocation that can either stimulate or stifle creative endeavour. Traditional leadership paradigms—such as transformational, transactional, and servant leadership—have been empirically linked to greater employee innovation through their emphasis on empowerment, supportive climates, and the encouragement of calculated risk-taking (Elkins & Keller, 2003; Hale & Fields, 2007; Naseer et al., 2016; Rickards et al., 2001; Tepper, 2007).

In digitally intensive settings, leadership that effectively leverages advanced technologies can further amplify innovation performance (Tramontano et al., 2021). By enabling employees to access real-time intelligence, collaborate seamlessly across geographical boundaries, and experiment with frontier solutions, such leadership fosters a fertile context for creative achievement. However, the same digital intensity also introduces potential constraints: constant communication flows can lead to information overload; persistent connectivity can blur work–life boundaries; and continuous performance monitoring may heighten pressure and decision fatigue (Ragu-Nathan et al., 2008). These conditions risk undermining psychological safety and intrinsic motivation—key prerequisites for sustained creative engagement.

Viewed through the lens of the Cognitive–Affective Personality System (CAPS), innovation performance in the digital era is shaped by dual pathways. Digitally adept leadership can stimulate innovation via **cognitive mechanisms**, such as strengthening employees' technology self-efficacy. Conversely, heightened **affective strain**, as exemplified by technostress, may attenuate willingness to explore novel solutions or take the interpersonal risks inherent in collaborative creativity. Recognizing and managing this interplay of enabling and constraining forces is essential for leaders seeking to maximise innovation outcomes in technology-driven environments.

3. Hypothesis Development

3.1 Cognitive Pathway: Positive Effect via Technology self-efficacy

Within the CAPS framework, technology self-efficacy operates as a core cognitive unit, shaping how employees interpret and respond to the digital demands of their work environment. Effective digital leadership strengthens this cognitive resource by cultivating a technology-driven workplace in which employees acquire the skills and confidence needed to leverage digital tools and systems for task completion and innovation (Compeau & Higgins, 1995). Self-efficacy—defined as an individual's belief in their ability to successfully accomplish specific tasks—is particularly relevant in digital transformation contexts, where employees' confidence in using advanced technologies directly influences their capacity for innovative performance (Bandura, 1997; Chen et al., 2001).

By equipping employees with essential tools, resources, and training, digital leaders foster a sense of technological mastery. As employees become more proficient in digital platforms, their ability to leverage these tools for innovation strengthens (Avolio et al., 2014). This enhanced confidence is especially critical in digital transformation environments, where innovation depends on employees' ability to effectively navigate technological advancements (Hertel et al., 2003).

Digital leadership also fosters a culture of exploration, encouraging employees to experiment with new technologies. By creating a psychologically safe workplace where individuals feel comfortable testing emerging digital tools without fear of failure (Wang et al., 2022), digital leaders reinforce employees' belief in their ability to innovate. Leaders who prioritize digital skill development and support technological experimentation further enhance employees' technology self-efficacy (Hertel et al., 2003).

Social Cognitive Theory (Bandura, 1978, 1989) provides theoretical support for this relationship, proposing that actions are shaped by the interplay among personal attributes (including self-efficacy), behaviors, and environmental influences (for example, leadership). SCT proposes that leadership behaviors that provide learning opportunities, structured support, and

access to necessary tools can significantly enhance technology self-efficacy. Digital leadership, as a key environmental factor, facilitates employee growth by offering digital training programs, real-time feedback, and collaborative platforms, all of which contribute to building confidence in digital tool utilization.

As technology self-efficacy increases, employees become more engaged in creative problem-solving and innovation-related tasks (Avolio et al., 2014). Therefore, technology self-efficacy acts as a crucial mediator between digital leadership and innovation outcomes, shaping both employee productivity and their perception of their innovative potential in the digital workplace.

Hypothesis 1

Technology self-efficacy mediates the positive relationship between digital leadership and innovation performance.

3.2 Affective Pathway: Negative Effect via Technostress

Despite the numerous benefits of digital leadership, its affective pathway may yield unintended negative consequences, most notably *technostress*—a form of psychological strain arising from the continuous implementation and utilisation of evolving technological advancements (Tarafdar et al., 2007). Technostress manifests when employees face excessive demands from digital tools, rapidly advancing technological systems, and persistent expectations to upgrade technical expertise to match organisational requirements (Salanova et al., 2014). Such conditions are especially prevalent in dynamic digital transformation environments, where employees are expected to continuously develop new competencies.

Although digital leaders seek to strengthen organisational technological capabilities, they may inadvertently foster a high-pressure climate in which employees feel compelled to keep pace with the relentless cadence of digital change (Srivastava et al., 2015). The recurrent need to adapt to new digital platforms and processes can heighten frustration, mental fatigue, and anxiety, particularly among individuals with low confidence in their technological proficiency (Ayyagari et al., 2011). Within the affective pathway, these emotional strains reduce psychological safety and willingness to engage in the experimentation and risk-taking vital to innovation, thereby attenuating employees' creative engagement (Bunjak et al., 2021).

In our dual-path model, technostress operates as a core affective mechanism that may inadvertently undermine innovation performance. While digital leadership equips employees with tools and resources capable of enhancing creativity, it can simultaneously trigger emotional burdens when technological change is frequent or disruptive. Without adequate organisational support, the resultant strain may override potential gains in creative capacity (La Torre et al., 2020). For example, although digital tools can extend the scope for idea generation, continual updates and sustained digital connectivity may diminish employees' openness to novel problem-solving and calculated risk-taking—behaviours integral to innovation (Tarafdar et al., 2019).

Drawing on the Transactional Theory of Stress (Lazarus & Folkman, 1984), stress emerges when perceived external demands surpass an individual's coping resources. In the digital leadership context, rapid technological change coupled with high expectations for adaptability can lead employees to experience overwhelm, resulting in stress-induced declines in innovation performance (Tarafdar et al., 2007).

To reduce technostress and fully leverage the advantages of digital leadership, managers should adopt targeted interventions that alleviate emotional pressure from digital demands (Srivastava et al., 2015). Effective measures include defining clear and realistic expectations for technology usage, providing comprehensive training to enhance digital competence, and offering psychological support mechanisms to help employees manage ongoing technological transitions (Maier et al., 2015; Maier et al., 2012). Such practices can sustain both digital adoption and employee well-being, thereby enabling innovation to flourish in a technology-intensive environment.

Hypothesis 2

Technostress mediates the negative relationship between digital leadership and innovation performance.

3.3 The Moderating Role of Organizational Technology Transformation Support

While digital leadership can strengthen employees' technology self-efficacy, it may also heighten technostress when accelerated digital demands are not accompanied by appropriate organizational support mechanisms. In this study, organizational technology transformation support (OTTS) refers to the provision of targeted resources, structured training, and accessible assistance that enable employees to adjust efficiently to ongoing digital changes (Ragu-Nathan et al., 2008). Within the CAPS framework, OTTS operates as a contextual factor that interacts with both cognitive and affective pathways —enhancing capability development while alleviating emotional strain.

From the cognitive perspective, OTTS amplifies the positive influence of digital leadership on technology self-efficacy by equipping employees with the necessary tools, clear instructional guidelines, and ongoing technical mentorship. When employees have access to structured training programs and well-integrated digital resources, they develop a stronger sense of competence in navigating digital systems, enabling more effective engagement in innovation-focused work (Claassen et al., 2021; Zeike et al., 2019). Such capability-building support reinforces digital leadership's enabling mechanisms and strengthens individuals' readiness to contribute to creative problem solving.

In the affective domain, OTTS serves as a buffer against technostress, particularly in environments characterized by frequent technological changes and high adaptation requirements. By providing flexible learning opportunities, on-demand technical assistance, and psychologically safe channels for addressing technological difficulties, organizations can reduce employees' anxiety, frustration, and emotional fatigue associated with digital transformation (La Torre et al., 2019). As demonstrated by Ragu-Nathan et al. (2008), perceived organizational backing reduces stress responses, allowing employees to direct their emotional energy toward innovation rather than coping with technological challenges.

Accordingly, OTTS is expected to moderate the relationship between digital leadership and innovation performance by strengthening the positive effects of enhanced technology self-efficacy and dampening the negative effects of technostress. This dual-enhancement and mitigation role is captured in *Hypothesis 3*:

Hypothesis 3

Organizational technology transformation support moderates the relationship between digital leadership and innovation performance, amplifying the positive effects of technology self-efficacy while reducing the negative impact of technostress.

The conceptual framework is illustrated in Fig. 1.

4. Methodology

4.1 Research design and data collection

To empirically test the hypothesised relationships in the proposed CAPS-based dual-path model, we employed a cross-sectional survey design. Given the study's focus on digital leadership, participants were purposively sampled from organisations that integrate digital technologies into their daily operations. Eligible respondents were full-time employees whose work routinely involved the use of digital tools (e.g., desktop computers, enterprise software, mobile work applications) and their immediate supervisors. Data were collected via Credemo, a professional online survey platform that has been widely utilised in individual behavioural and psychological research in China for its high data quality, reliable participant recruitment, and rigorous multi-factor verification processes (e.g., Yang, 2022; Jin et al., 2020; Feng et al., 2025; Chen et al., 2024).

The data collection occurred in two phases. In Phase 1, employees completed measures of digital leadership, technostress, technology self-efficacy, and organisational technology transformation support. Upon completion, each employee nominated their immediate supervisor, who was then invited to participate in Phase 2, conducted 20 working days later. Supervisors in Phase 2 assessed the nominated employee's innovation performance. This time lag was introduced to help mitigate common method bias (Podsakoff et al., 2003).

Initial recruitment yielded 500 employee–supervisor dyads from diverse sectors. After eligibility screening and attention-check validation, 394 matched dyads from 394 distinct enterprises located in 68 cities across 25 provinces in China remained for analysis(for descriptive statistics, see Table 1). Each organisation contributed only one dyad to ensure independence of observations. Two embedded attention-check items were used—one within the digital leadership scale (requesting "Completely agree" as the answer) and one within the self-efficacy scale (requesting the number "6" as the answer). Participants failing either check were excluded.

Table 1
Employee Sample Characteristics (N = 394)

Category	Items	#	%
Gender	Male	163	41.37
	Female	231	58.63
Age	0–20 years	7	1.78
	21–30 years	220	55.84
	31–40 years	123	31.22
	41–50 years	28	7.11
	51–60 years	14	3.55
	Above 60 years	2	0.51
Highest Education	Elementary school or below	0	0.00
	Middle school	7	1.78
	High school/Technical school/Vocational school	20	5.08
	Associate degree	47	11.93
	Bachelor's degree	276	70.05
	Master's degree	40	10.15
	Doctoral degree	4	1.02
Type of Organization	State-owned enterprise	84	21.32
	Public institution	56	14.21
	Government agency	12	3.05
	Private enterprise	215	54.57
	Foreign enterprise	27	6.85
Total			100.00

The resulting sample size (n = 394) exceeds the conventional threshold of 200 cases recommended for stable model estimation in structural equation modelling (Kline, 2023), ensuring statistical robustness and satisfactory coverage for the

study objectives (see Fig. 2).

4.2 Measures and variables

Digital leadership was measured using a previously validated scale, described in Section 2.1, which assesses four dimensions: digital innovation, uncertainty management, shared value creation, and integration of diverse perspectives. This scale was originally developed from earlier grounded theory research on leadership in technology-driven enterprises and captures behaviours critical to navigating digital transformation. Participants evaluated their immediate supervisor's digital leadership behaviours on a seven-point Likert scale, with higher scores indicating stronger leadership capabilities in digital contexts.

Innovation performance was evaluated using an instrument developed by Han, Liao, and Long (2007), which assesses employees' engagement in innovative activities encompassing both product and process innovation. Participants rated their performance on a seven-point Likert scale. Sample items included: "The employee actively seeks ways to enhance work efficiency" and "The employee explores new techniques, processes, or tools to improve work outcomes."

Technology self-efficacy was evaluated using the scale developed by Tramontano, Grant, and Clarke (2021), which measures employees' confidence in using digital technologies effectively. In line with Bandura's (2006) recommendations, this scale was contextualized by incorporating workplace-specific digital tools. For example, one item was revised to: "At work, even when deeply engaged in tasks, I recognize that digital tools (such as WeChat for work and remote meetings) impact my overall well-being."

Technostress was evaluated using the scale developed by Tramontano, Grant, and Clarke (2021), which assesses the psychological strain caused by digital work environments. Participants responded on a five-point Likert. Sample items included: "Due to digital tools at work (e.g., work-related WeChat, remote meetings), I often feel overloaded with tasks" and "The increasing complexity of workplace technologies has made my job more demanding", rating each item on Likert scale.

Organizational technology transformation support was measured using the scale developed by the Ragu-Nathan, Tarafdar, Ragu-Nathan, and Tu (2008) scale, which measures extent to which organizations facilitate employees' digital adaptation through resources, training, and infrastructure. Sample items included: "Our company provides pre-implementation training before introducing new technologies" and "Our organization incentivizes employees to adopt new digital tools through various reward mechanisms."

To account for potential confounding factors, the study controlled for variables such as gender, age, educational level, and organization type, as these demographic characteristics have been identified in prior research as potential influences on innovation performance (Axtell et al., 2000; Magadley & Birdi, 2012).

5. Results

5.1 Measurement model

The reliability of the five variables was evaluated using SPSS 24.0. Each construct demonstrated strong internal consistency, with Cronbach's α values exceeding 0.9 (Table 2).

Table 2
Reliability Coefficients of Variables

Variable	Number of Items	Sample Size	Cronbach's α
Digital Leadership	17	394	0.952
Technology Self-Efficacy	15	394	0.944
Technostress	13	394	0.949
Employee Innovation Performance	8	394	0.930
Organizational Technology Transformation Support	10	394	0.945

To assess the construct validity of the multi-item scales employed in this study, **separate confirmatory factor analyses (CFAs)** were conducted for each construct prior to estimating the full measurement model. Model fit was evaluated using multiple indices, including the chi-square/degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), goodness of fit index (GFI), comparative fit index (CFI), normed fit index (NFI), Tucker–Lewis index (TLI), and incremental fit index (IFI). Following conventional guidelines ($\chi^2/df < 3$, RMSEA < 0.08, and CFI/TLI/NFI/GFI/IFI > 0.90; Hu & Bentler, 1999; Kline, 2023), each construct demonstrated satisfactory fit (Table 3). These results confirm that the measurement instruments exhibit strong structural validity and are suitable for subsequent SEM analysis.

Table 3
Confirmatory Factor Analysis Fit Indices for Individual Measurement Models

Construct	χ^2/df	*RMSEA*	*GFI*	*CFI*	*NFI*	*TLI*	*IFI*
Judgment Criteria	< 3	< 0.10	> 0.9	> 0.9	> 0.9	> 0.9	> 0.9
Digital Leadership	1.452	0.034	0.953	0.987	0.958	0.985	0.987
Technology Self-Efficacy	2.769	0.067	0.925	0.954	0.931	0.947	0.955
Technostress	2.149	0.054	0.950	0.979	0.961	0.974	0.979
Innovation Performance	1.260	0.026	0.985	0.997	0.988	0.996	0.997
Organizational Technology Transformation Support	2.453	0.061	0.957	0.982	0.970	0.977	0.982

Note: Fit indices for each construct are derived from single-factor CFA models. All values meet or exceed recommended thresholds, indicating good construct validity.

Convergent validity was confirmed through standardized factor loadings (0.669–0.824), AVE values (0.507–0.653), and CR values (0.755–0.930), all surpassing accepted thresholds (Table 4).

Table 4
Convergent Validity Test Results (N = 394)

Construct	Items	Standardized Factor Loadings	AVE	CR
Digital Leadership	DL1-1	0.753	0.541	0.876
	DL1-2	0.724		
	DL1-3	0.710		
	DL1-4	0.750		
	DL1-5	0.770		
	DL1-6	0.705		
	DL2-1	0.741	0.513	0.840
	DL2-2	0.669		
	DL2-3	0.681		
	DL2-4	0.727		
	DL2-5	0.759		
	DL3-1	0.768	0.587	0.810
	DL3-2	0.757		
	DL3-3	0.773		
	DL4-1	0.710	0.507	0.755
	DL4-2	0.692		
	DL4-3	0.734		
Technology Self-Efficacy	MSE1-1	0.722	0.553	0.788
	MSE1-2	0.742		
	MSE1-3	0.766		
	MSE2-1	0.697	0.516	0.762
	MSE2-2	0.729		
	MSE2-3	0.730		
	MSE3-1	0.747	0.558	0.791
	MSE3-2	0.773		
	MSE3-3	0.720		
	MSE4-1	0.745	0.568	0.798
	MSE4-2	0.753		
	MSE4-3	0.763		
	MES5-1	0.748	0.514	0.760
	MES5-2	0.711		

Note: DL = Digital Leadership, MSE = Technology Self-Efficacy, MTS = Technostress, OS = Organizational Technology Transformation Support, YIP = Innovation Performance.

Construct	Items	Standardized Factor Loadings	AVE	CR
	MES5-3	0.691		
Technostress	MTS1-1	0.782	0.639	0.876
	MTS1-2	0.824		
	MTS1-3	0.818		
	MTS1-4	0.772		
	MTS2-1	0.774	0.583	0.875
	MTS2-2	0.740		
	MTS2-3	0.775		
	MTS2-4	0.779		
	MTS2-5	0.749		
	MTS3-1	0.705	0.571	0.842
	MTS3-2	0.743		
	MTS3-3	0.777		
	MTS3-4	0.795		
Innovation Performance	YIP1	0.784	0.624	0.930
	YIP2	0.773		
	YIP3	0.772		
	YIP4	0.770		
	YIP5	0.789		
	YIP6	0.798		
	YIP7	0.818		
	YIP8	0.812		
Organizational Technology Transformation Support	OS1-1	0.790	0.633	0.838
	OS1-2	0.809		
	OS1-3	0.788		
	OS2-1	0.784	0.619	0.830
	OS2-2	0.794		
	OS2-3	0.782		
	OS3-1	0.817	0.653	0.883
	OS3-2	0.811		
	OS3-3	0.806		
	OS3-4	0.799		

Note: DL = Digital Leadership, MSE = Technology Self-Efficacy, MTS = Technostress, OS = Organizational Technology Transformation Support, YIP = Innovation Performance.

Discriminant validity was assessed for digital leadership, technology self-efficacy, technostress, organizational technology transformation support, and employee innovation performance. The five-factor model exhibited superior fit indices (χ^2/df = 1.274, RMSEA = 0.026, CFI = 0.969, TLI = 0.968, SRMR = 0.036), confirming good discriminant validity (Table 5).

Table 5
Confirmatory Factor Analysis Results of Model Variables

Model	χ^2/df	RMSEA	CFI	TLI	SRMR
Judgment Criteria	< 3	< 0.08	> 0.9	> 0.9	< 0.1
Five-Factor Model (DL、MSE、MTS、OS、YIP)	1.274	0.026	0.969	0.968	0.036
Four-Factor Model (DL + MSE、MTS、OS、YIP)	1.882	0.047	0.899	0.896	0.052
Four-Factor Model (DL + MTS、MSE、OS、YIP)	3.054	0.072	0.765	0.757	0.127
Four-Factor Model (DL + OS、MSE、MTS、YIP)	2.345	0.059	0.846	0.841	0.080
Four-Factor Model (DL、MSE + OS、MTS、YIP)	2.443	0.061	0.835	0.829	0.082
Four-Factor Model (DL、MSE + MTS、OS、YIP)	3.061	0.072	0.765	0.756	0.127
Four-Factor Model (DL、MSE、MTS + OS、YIP)	2.775	0.067	0.797	0.790	0.152
Three-Factor Model (DL + MSE + OS、MTS、YIP)	2.990	0.071	0.772	0.764	0.092
Three-Factor Model (DL + MTS + OS、MSE、YIP)	4.138	0.089	0.641	0.628	0.141
Three-Factor Model (DL、MSE + MTS + OS、YIP)	4.245	0.091	0.629	0.616	0.144
Two-Factor Model (DL + MSE + MTS + OS、YIP)	4.771	0.098	0.568	0.554	0.147
Single-Factor Model (DL + MSE + MTS + OS + YIP)	5.774	0.110	0.453	0.435	0.162

Note: DL = Digital Leadership, MSE = Technology Self-Efficacy, MTS = Technostress, OS = Organizational Technology Transformation Support, YIP = Innovation Performance.

5.2 Descriptive Statistics

Positive correlations were found between digital leadership and technology self-efficacy ($r = 0.683$, $p < 0.01$) as well as digital leadership and technostress ($r = 0.153$, $p < 0.01$). Furthermore, technology self-efficacy exhibited a positive relationship with

innovation performance (r = 0.249, p < 0.01), while technostress showed a negative relationship (r = -0.100, p < 0.01). These results offer preliminary support for the study's hypotheses (Table 6).

Table 6
Means, Variances, and Correlation Coefficients of Variables(N = 394)

	1	2	3	4	5	6	7	8	9
1. Gender	1.000								
2. Age	0.030	1.000							
3.Highest Education Level	0.001	-0.158***	1.000						
4. Type of Organization	-0.059	-0.130***	-0.137***	1.000					
5.Digital Leadership	-0.059	0.097*	0.063	-0.098*	1.000				
6.Organizational Technology Transformation Support	-0.079	0.044	0.020	-0.064	0.485***	1.000			
7.Technology self-efficacy	-0.083*	0.097*	0.063	-0.030	0.683***	0.410***	1.000		
8.Technostress	-0.100**	-0.066	0.044	0.039	0.153***	-0.184***	0.132***	1.000	
9.Innovation Performance	-0.106**	-0.011	-0.002	-0.008	0.229***	0.153***	0.249***	-0.100**	1.000
Mean value	1.586	2.563	4.848	3.114	5.823	5.302	5.566	4.057	5.624
Standard Deviation	0.493	0.836	0.776	1.344	0.600	0.980	0.633	1.206	0.719
Note: * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$									

5.3 Mediation Effect Test

Table 7 summarizes the mediation analysis. Digital leadership (β = 0.158, p < 0.05) and technology self-efficacy (β = 0.203, p < 0.01) were found to positively impact innovation performance, while technostress exhibited a negative influence (β = -0.093, p < 0.01). When compared to Model 1, the regression coefficient for digital leadership dropped from 0.273 to 0.158, indicating partial mediation by technology self-efficacy and technostress, thus supporting H1 and H2.

Table 7
Regression Results for Mediation Effects (N = 394)

Variables	Innovation Performance				Technology self-efficacy	Technostress	Innovation Performance
	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	5.95***	4.413***	4.482***	6.234***	1.205***	2.456***	4.397***
Control Variables							
Gender	-0.156**	-0.134*	-0.125*	-0.172**	-0.054	-0.210*	-0.142**
Age	-0.009	-0.029	-0.033	-0.014	0.032	-0.098	-0.045
Highest Education Level	-0.006	-0.02	-0.024	-0.002	0.027	0.046	-0.021
Type of Organization	-0.009	0.001	-0.007	-0.007	0.021	0.04	0.001
Independent Variables							
Digital Leadership		0.273***			0.716***	0.316***	0.158**
Mediating Variables							
Technology self-efficacy			0.281***				0.203***
Technostress				-0.067**			-0.093***
R^2	0.012	0.062	0.071	0.024	0.472	0.04	0.101
Adjusted R^2	0.001	0.05	0.059	0.011	0.46	0.028	0.085
F	1.144	5.151***	5.946***	1.914*	69.326***	3.245***	6.203***
Note: * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$							

A bootstrap analysis (5,000 iterations) confirmed these indirect effects (Table 8). Technology self-efficacy significantly mediated the relationship (Indirect Effect = 0.145, 95% CI = [0.032, 0.216]), supporting H1. Technostress exhibited a significant negative mediation effect (Indirect Effect = -0.029, 95% CI = [-0.050, -0.006]), further supporting H2.

Table 8
Bootstrap Results for Mediation Effects

Effect Type	Path	Effect Size	95% Bootstrap CI
Total Effect		0.273***	0.156 ~ 0.390
Direct Effect	Digital Leadership→Innovation Performance	0.158***	0.001 ~ 0.314
Mediation Effect	Digital Leadership→Technology self-efficacy→Innovation Performance	0.145***	0.032 ~ 0.216
	Digital Leadership→Technostress→Innovation Performance	-0.029***	-0.050 ~ -0.006
Note: * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$			

5.4 Moderation Effect Test

Table 9 demonstrates that organizational technology transformation support moderated the relationships between digital leadership and both technology self-efficacy (β = 0.079, p < 0.01) and technostress (β = -0.159, p < 0.05), supporting H3.

Table 9
Regression Results for Moderation Effects(N = 394)

Variables	Innovation Performance	Technology self-efficacy	Technostress
	Model 1	Model 2	Model 3
Constant	4.397***	3.308***	-1.445
Control Variables			
Gender	-0.142**	-0.052	0.116**
Age	-0.045	0.028	0.07
Highest Education Level	-0.021	0.022	0.076
Type of Organization	0.001	0.023	0.044
Independent Variables			
Digital Leadership	0.158**	0.302***	1.374***
Mediating Variables			
Technology self-efficacy	0.203***		
Technostress	-0.093***		
Moderating Variable			
Organizational Technology Transformation Support		-0.403**	0.515
Interaction Term			
Digital Leadership*Organizational Technology Transformation Support		0.079***	-0.159**
R2	0.101	0.489	0.14
Adjusted R2	0.082	0.478	0.122
F	6.203***	52.734***	8.999***
Note: * p < 0.1 ** p < 0.05 *** p < 0.01			

Figures 3 and 4 illustrate these moderating effects. Higher organizational support strengthened digital leadership's impact on technology self-efficacy and weakened its influence on technostress.

A further bootstrap test confirmed that digital leadership's indirect effect on innovation performance via technology self-efficacy was consistently positive across support levels (Indirect Effects: **low support** = 0.131, **high support** = 0.162, overall = 0.146), while its indirect effect through technostress remained negative (Indirect Effects: **low support** = -0.064, **high support** = -0.035, overall = -0.05), see Table 10 for details. These findings confirm that organizational support mitigates technostress while amplifying technology self-efficacy, reinforcing H3.

Table 10
Moderated Mediation Path Analysis Results

Dependent Variable	Mediating Variables	Moderating Variable	Effect	BootSE	BootLLCI	BootULCI
Innovation Performance	Technology self-efficacy	Low Organizational Technology Transformation Support	0.131	0.054	0.036	0.247
		Average Organizational Technology Transformation Support	0.146	0.058	0.041	0.268
		High Organizational Technology Transformation Support	0.162	0.063	0.045	0.295
	Technostress	Low Organizational Technology Transformation Support	-0.064	0.025	-0.117	-0.022
		Average Organizational Technology Transformation Support	-0.05	0.021	-0.094	-0.015
		High Organizational Technology Transformation Support	-0.035	0.02	-0.079	-0.004

5.5 Summary of Findings

The influence of digital leadership on employee innovation performance is shaped by two contrasting forces: enhancing self-efficacy, which fosters innovation, and increasing technostress, which can hinder it. The overall positive influence of digital leadership (β = 0.273) suggests its effectiveness in driving innovation, especially when supported by strong organizational technology transformation strategies.

6. Conclusion and discussion

6.1 Conclusion

The results shed light on the dual impact of digital leadership on employee innovation performance within the environment of digital transformation. Using the Cognitive-Affective Personality System (CAPS) framework, the analysis reveals both its positive and negative dynamics. On the one hand, digital leadership enhances innovation through cognitive activation—by strengthening employees' technology self-efficacy and enabling confident use of digital tools for creative problem-solving. On the other hand, it intensifies technostress, the psychological strain triggered by continuous technological change, which may ultimately inhibit innovation. Framing digital leadership as a "double-edged sword," this study deepens the theoretical understanding of leadership in the digital era and underscores the necessity of balancing cognitive empowerment with emotional stability.

6.2 Theoretical implications

Our research advances theory in several ways.

First, it enriches the literature on leadership in digitalised workplaces by offering a nuanced, paradox-focused account of digital leadership. While prior studies predominantly emphasise its innovation-enhancing role (e.g., Brunner et al., 2023; Fang, 2023; Syarifuddin, 2023), our findings reveal that it can also induce detrimental affective states that suppress innovation. This duality explains previously inconsistent empirical results.

Second, by embedding digital leadership within the CAPS framework, the study illustrates how cognitive mechanisms (technology self-efficacy) and affective mechanisms (technostress) jointly transmit leadership influence. This bidirectional

pathway model moves beyond linear cause–effect assumptions and provides an explanatory structure for the coexistence of enabling and constraining outcomes.

Third, the findings extend leadership and innovation theory by emphasising technology's dual role: as both an enabler of innovative behaviour and a potential source of psychological strain (Claassen et al., 2021). Our results suggest that leadership theories in highly digitalised contexts must explicitly account for these competing forces.

Finally, the research underscores the importance of contextual moderators, particularly organisational technology transformation support. By showing that such support amplifies positive cognitive effects and mitigates negative affective effects, we provide evidence for incorporating supportive digital infrastructures into leadership models to capture real-world contingencies.

6.3 Practical implications

The findings of this study also generate concrete implications for organisational practice, showing how the dual effects of digital leadership can be managed constructively. To begin with, organisations should focus on strengthening employees' **cognitive resources**, particularly their technology self-efficacy. Continuous access to updated digital tools, structured and progressive training programmes, and a culture that supports experimentation will equip employees to use technology confidently and creatively. Initiatives such as "digital sandbox" sessions—designated time for testing emerging tools without performance pressure—can visibly enhance digital competence and innovation readiness.

Equally important is managing the **affective strain** that arises as technostress. Leaders need to recognise the emotional demands created by rapid technological change and alleviate them through practical interventions, such as realistic timelines for technology implementation, temporary opt-out periods during major system transitions, and embedded stress-management provisions including mindfulness workshops or workload-balancing tools. Periodic pulse surveys allow early detection and response to digital fatigue, helping maintain well-being and sustained creativity.

A further implication concerns **organisational technology support**. Firms should invest in comprehensive infrastructures—24-hour IT assistance, peer technology champions, and intuitive, user-friendly digital interfaces—to facilitate adaptation and minimise resistance (Cascio & Montealegre, 2016; Junça Silva & Pinto, 2024). For instance, on-demand microlearning modules for new systems help employees acquire necessary skills without interrupting productivity.

Finally, **digital leadership development** should adopt a holistic approach. Training programmes must combine technical proficiency with emotional intelligence and well-being management capabilities, enabling leaders to balance innovation imperatives with workforce sustainability. Organisations that cultivate such balanced digital leaders will be better positioned to harness technology's potential while safeguarding employee resilience.

6.4 Limitations and Future Research

Although this research offers valuable insights into the intricate connection between digital leadership and innovation performance, certain limitations should be acknowledged as they may affect the generalisability of the results.

First, the cross-sectional design precludes conclusions about causal or time-varying effects. Longitudinal studies could capture how the influence of digital leadership evolves over different stages of technological implementation.

Second, the sample was drawn exclusively from organisations in China. While this offers insights into a rapidly digitalising economy with unique institutional and cultural attributes, comparative research across national and cultural contexts is needed to enhance generalisability. Cross-cultural designs may also reveal contextual moderators—such as power distance or collectivism—that alter the balance between cognitive and affective pathways.

Third, innovation performance was assessed at the individual level. Given that innovation is often collaborative (Paulus & Nijstad, 2003), future studies should adopt multi-level modelling to assess digital leadership effects at team and

organisational levels, thus capturing collective creativity dynamics.

Fourth, the model focused on two mediators—technology self-efficacy and technostress—as proxies for cognitive and affective mechanisms. Other factors, such as psychological safety, intrinsic motivation, and organisational culture, may also be key mediators or moderators. Including these in future research would provide a more comprehensive account of the conditions under which digital leadership fosters or dampens innovation.

Addressing these limitations through future longitudinal and cross-cultural studies will refine theory, strengthen causal claims, and inform the design of interventions to optimise digital leadership performance.

Declarations

Ethics Approval

All materials used in this research were reviewed and approved by the Academic Committee of the Hilton College of Hospitality Management, Chengdu, China (equivalent to an Institutional Review Board in American universities) on 3 April 2025, prior to distribution to participants. Participants were clearly informed of their right to withdraw at any time without penalty or loss of benefits. The surveys were conducted solely for academic purposes, and all collected data have been securely archived by the university to ensure confidentiality and prevent any unauthorised use.

Consent to Participate

All participants provided written informed consent before taking part in the study. Data collection was conducted between April and May 2025 via an online platform. An information sheet outlined the study's purpose, procedures, potential risks, and the voluntary nature of participation, with assurance of the right to discontinue participation at any stage without adverse consequences.

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Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contribution

The theoretical model and the first draft of the manuscript were developed and written by BZ. LZ was responsible for data collection and processing. BW supervised the final version of the manuscript and coordinated the revision process, including responses to reviewers' comments. All authors read and approved the final manuscript.

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Figures

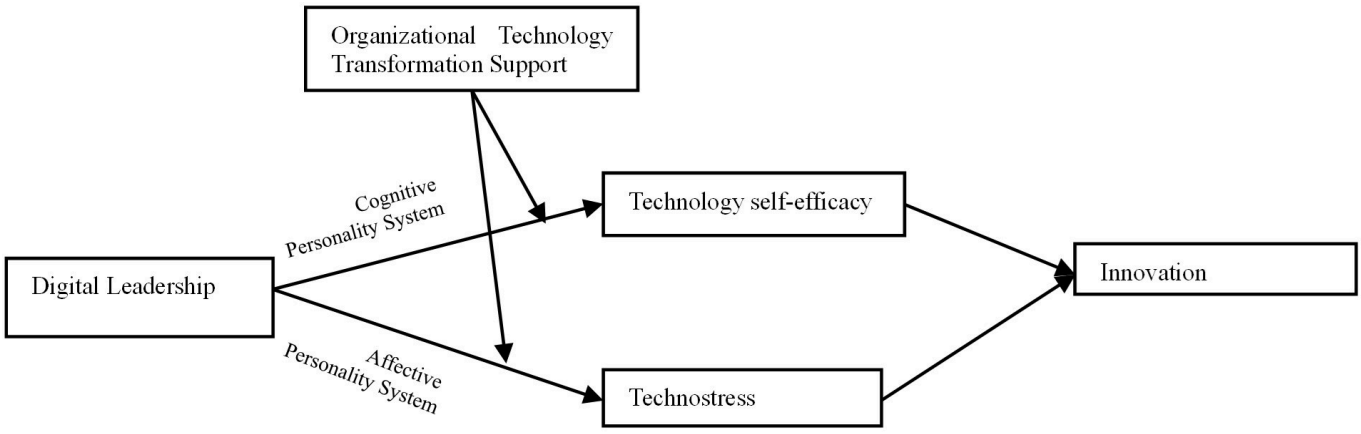


Figure 1

Conceptual framework

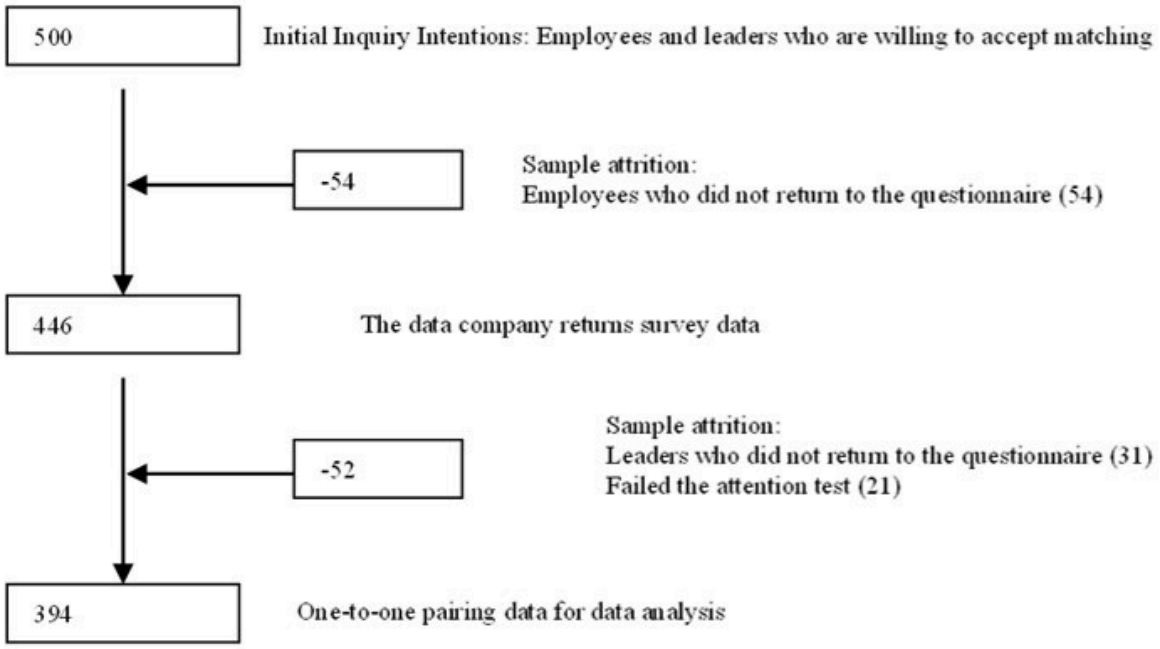


Figure 2

Flowchart of Sample Data Collection Process

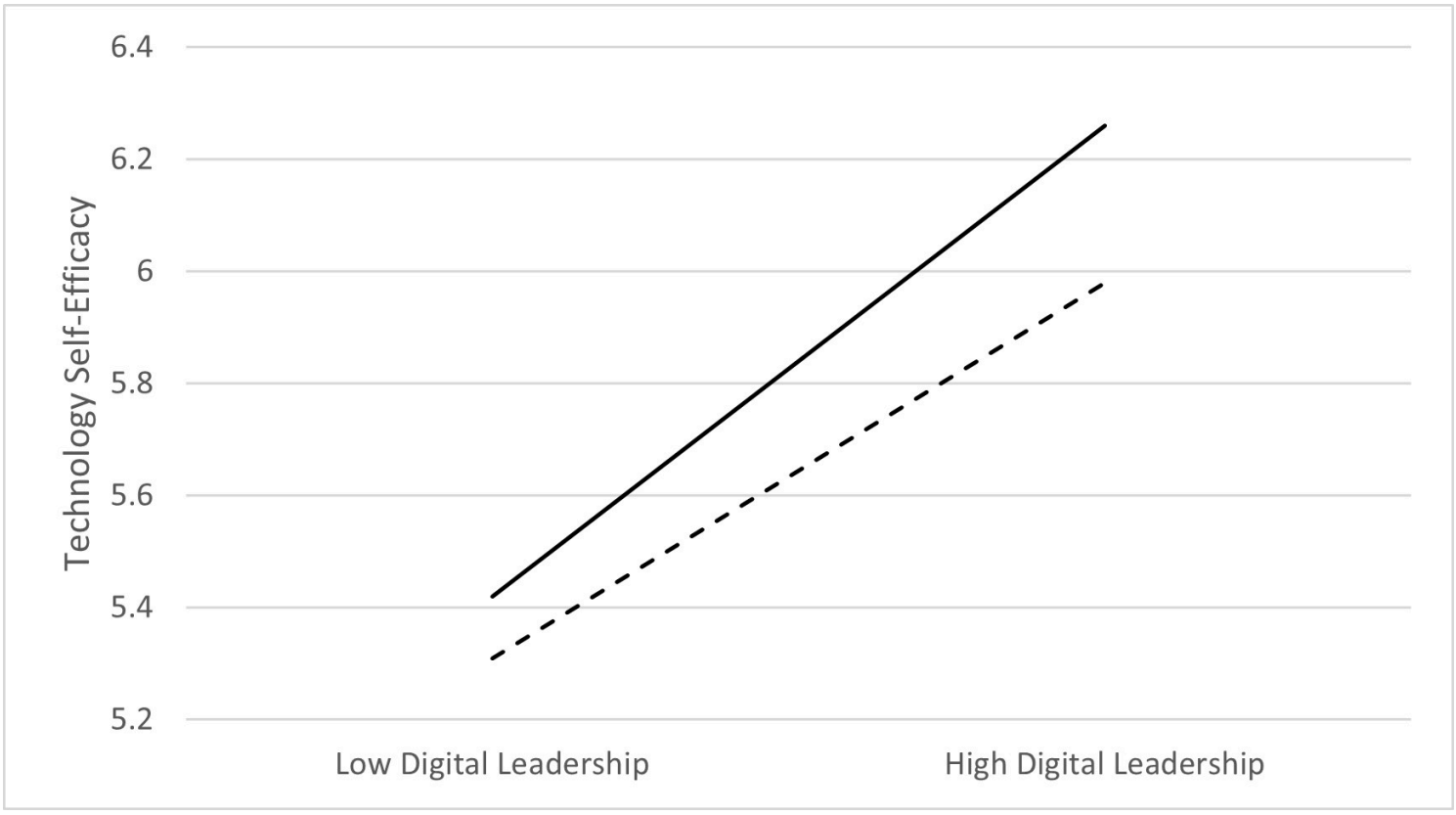


Figure 3

Moderating Effect of Organizational Technology Transformation Support on the Relationship between Digital Leadership and Employee Technology Self-Efficacy

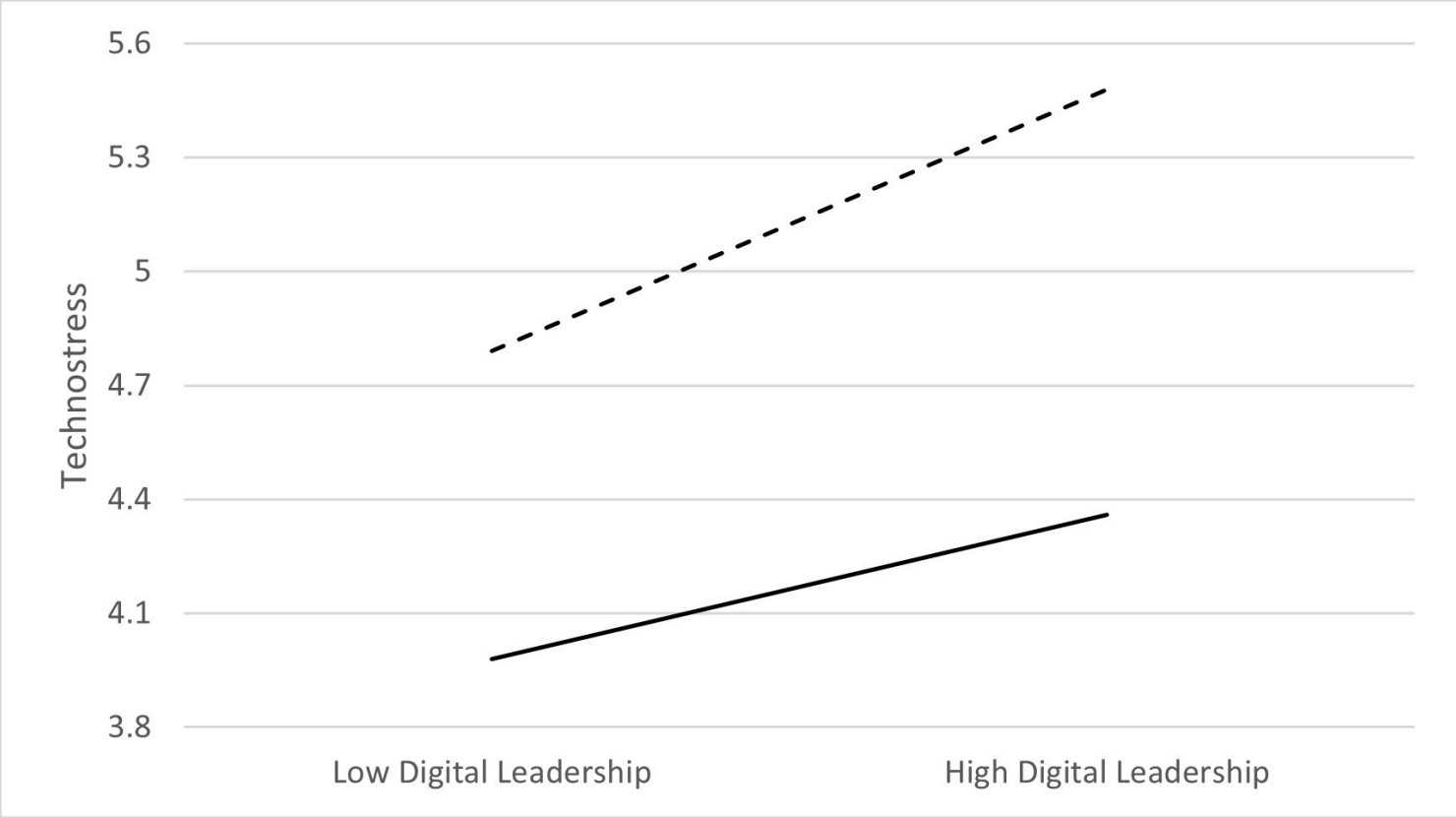


Figure 4

Moderating Effect of Organizational Technology Transformation Support on the Relationship between Digital Leadership and Employee Technostress