

Digital innovation drivers in retail banking: the role of leadership, culture, and technostress inhibitors

Digital
innovation
drivers

19

Hussein-Elhakim Al Issa

HEC Montreal, Quebec, Canada and RMIT University, Hanoi, Vietnam, and

Mohammed Mispah Said Omar
University of Bahrain, Manama, Bahrain

Received 11 August 2023
Revised 26 November 2023
8 January 2024
Accepted 8 January 2024

Abstract

Purpose – The empirical study of factors related to digital transformation (DT) in the banking sector is still limited, even though the importance of the topic is universally evident. To bridge that gap, this paper aims to explore the role of digital leadership (DL), innovative culture (IC) and technostress inhibitors (TI) to support engagement for improved digital innovation (DI). Based on the literature, these variables are crucial aspects of digitalisation, even though there is no agreement on their conclusiveness.

Design/methodology/approach – This quantitative study tested a new conceptual model using survey data from five major banks in Libya. Partial least squares structural equation modelling was used to analyse the data from the 292 usable responses.

Findings – The results showed that DL and IC positively affect DI. Techno-work engagement (TE) mediated the relationship between leadership, culture and innovation. TI played a significant moderating role in leadership, culture and engagement relationships.

Practical implications – The research findings highlight critical issues about how leadership style and fostering organisational support in the banking sector can enhance DT. Leaders must demonstrate a commitment to long-term resource allocation to avoid possible negative effects from digital stress while pursuing DI through work engagement.

Social implications – The study suggests that fostering organisational support can enhance DT in retail banks, potentially leading to improved customer experiences and increased access to financial services. These programs will help banks contribute to societal and economic development.

Originality/value – This timely study examines predictor mechanisms of innovation in retail banking that resonate within the restrictions of organisational and DI frameworks and the social exchange theory. Exploring the intervening effect of TE in the leadership, culture and innovation associations is unprecedented.

Keywords Digital innovation, Digital leadership, Innovative culture, Techno-work engagement, Technostress inhibitors

Paper type Research paper



© Hussein-Elhakim Al Issa and Mohammed Mispah Said Omar. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

International Journal of
Organizational Analysis
Vol. 32 No. 11, 2024
pp. 19-43
Emerald Publishing Limited
1934-8835
DOI 10.1108/IJOA-08-2023-3905

Introduction

The fast changes due to digital transformation (DT) technologies have made business operations challenging (Vial, 2021). It is easy to get lost in the available advanced technologies, but the focus must remain on achieving better business outcomes through innovations. Technology has disrupted many aspects of our personal lives and business operations. The web, personal computers, mobile phones and smartphones are examples of disruptive technologies that have impacted our lives in many positive ways (Sultan, 2015). The concept of disruptive innovation suggests that innovations do not come so often and tend to serve consumers who cannot consume them due to either price, convenience or skill. Those innovations tend to be of low quality initially but, once established, tend to improve in quality with time and eventually disrupt the leading innovations and result in the demise of their companies (Christensen, 1997).

Currently, financial institutions like banks are being disrupted by FinTech companies (Citi, 2016). If banks do not take steps to use technology to automate their services in every aspect of their operations, they could potentially lose out to FinTech companies that promise customers convenience, savings and speed. Presently, the Libyan banking sector has 20 commercial banks that have contributed remarkably to increasing lending to the private sector while improving financial intermediation. The intense rivalry in this industry makes survival very tough for ineffective banks. This has been compounded by the Libyan currency crisis that began in 2014 and has damaged public confidence and trust in the sector. To restore customer relations, banks have since accelerated digital offerings like electronic payment systems and accessible travellers' cheques to help manage liquidity issues (Ramali, 2018). Thus, this makes questions on determinants of digital innovation (DI) in the banking sector very timely and critical.

Grand challenges are significant national or global problems that can be addressed through DI, requiring new approaches (Davidson *et al.*, 2023). Yet banking was selected for the current study for several reasons. Firstly, there is an unprecedented rise in DI in the banking sector. Around the globe, banks offer services to align with customer demands and in tandem with the fourth industrial revolution (Schwab, 2017). Secondly, the advent of COVID-19 accelerated using digital capabilities in processes, products and assets to improve productivity, increase customer value, manage risk and manoeuvre through new income-generating activities (Satell *et al.*, 2021). Thirdly, a remarkable increase in DT investment appears in all sectors. In 2018 alone, about US\$1.3tn was invested in DT. The cornerstones of DT are disruption and innovation. Specifically, banks are making significant strides in that respect by expanding services, re-configuring delivery channels, integrating payments and using technologies like robotic process automation, blockchain, big data analytics and cloud provider outsourcing (Backbase, 2022), and people are facing more than ever before sophisticated technology innovations like high-frequency trading and algorithmic trading (Cziesla, 2014). Finally, innovative digital leadership (DL) concepts are under-studied (Gierlich-Joas *et al.*, 2020).

For several reasons, studying the current study's constructs is significant in the banking sector within the Libyan context. Primarily, DI represents the way for banks' ability to rise to the occasion and assert themselves by restoring customer relations following the 2011 revolution aftermath. As a result, banks can now help customers drive value and productivity to compete at a global level.

Organisations must support their workforce to overcome digital disruptions, as the constant pressure to update technology hardware and software can sometimes backfire in the form of technostress. Organisations can counterbalance the undesirable effects of technostress by affording support mechanisms to rally the technology capabilities for

digital solutions through literacy facilitation, technical support and facilitating additional involvement, thereby changing perceptions of the availability of resources (Ragu-Nathan *et al.*, 2008; Schaufeli, 2015; Tarafdar *et al.*, 2015).

Work engagement is a widely accepted factor with a strong positive impact on work outcomes, including innovation (Mulligan *et al.*, 2021; Orth and Volmer, 2017). Digital leaders influence techno-work engagement (TE) through emotional contagion, role modelling and exchanging attention, favours and resources. Past research has verified the leadership engagement and the engagement-innovation associations (Garg and Dhar, 2017; Orth and Volmer, 2017). Despite the evidence for the relationship between leadership, engagement and innovation, to the researcher's knowledge, little research examined technology-related work engagement as a mediator between DL and innovation.

Furthermore, an innovative culture (IC) encourages openness to new ideas and cultivates capabilities to embrace technologies behind product or service development. A solid, IC provides a consistent innovative orientation as a compass for members facing technological innovation challenges. An IC stimulates regular technological changes, serious precursors to leadership, stress and engagement.

In the modern world, especially in the banking sector, innovation and the inclusion of technology are crucial components. As a result, there have been studies that concentrate on DT. Still, very few have examined the interaction between the essential elements of DI, DL, IC, technological work engagement and technological stress inhibitors. Therefore, to further the literature on management in general and DT in banking in particular, the current research aims to offer a model of the impact of leadership and culture on DI. TE was theorised to play a mediating role in the relationships mentioned. This research contributes by offering new theoretical foresight to the scant research on leadership for DI in retail banking in a developing country. The study is novel in answering calls for research that explores culture, leadership and work engagement across industry sectors and in differing occupations (Bakker and Albrecht, 2018; Benitez *et al.*, 2022; Khaola and Coldwell, 2019; Kraus *et al.*, 2021; Li *et al.*, 2021).

The research introduces an innovative model integrating DL, creative culture and technostress inhibitors (TI), offering a comprehensive view of their collective impact on DI. This contribution is twofold: addressing theoretical gaps and guiding practical strategies for navigating DT complexities in the banking sector. The study's significance lies in filling a literature gap by examining DL, IC and their effects on DI in developing country banking sectors, responding to cross-sector calls for research and secondly, providing a nuanced understanding of how TI moderate the link between engagement and innovation, enhancing comprehension of factors fostering work engagement amid digital stress. Thirdly, it offers context-specific insights into post-COVID-19 DT challenges and opportunities in developing country banking, guiding strategies for enhanced competitiveness. Fourthly, it supplies actionable recommendations for managers, emphasising resource allocation for work engagement development and organisational support to mitigate digital stress, thus, proposing digital stress management as a dynamic capability for organisational effectiveness in the DT era.

Literature review

Retail banking digital dynamics

In the evolution of retail banking, banks must modernise their agencies, using digital design to foster positive affective responses and establish personalised relationships with consumers (Reydet and Carsana, 2017). Technological advances, encompassing blockchain, cryptocurrencies, biometrics and AI, are poised to reshape the industry. Blockchain holds potential for transaction processing and data management revolution, while biometrics and

AI promise enhanced security, streamlined authentication, improved customer service and automated banking processes (Coetzee, 2018). Simultaneously, FinTech start-ups are disrupting traditional banks' value chains, ushering in a cashless world and increasing mobile payments, necessitating traditional institutions to adapt to competitive schemes and holistic customer understanding (Gupta and Xia, 2018). This transformative landscape prompts a complex DT in retail banking, impacting organisational outcomes and requiring knowledge of the intricate relationships between technology, culture and institutional change within regulatory frameworks (Krasnikolakis *et al.*, 2020). The FinTech influence, meanwhile, is fundamentally altering the retail banking model, fostering disintermediation, collaboration and co-option among banks and FinTech firms, urging strategic decisions on operational simplification and product range optimisation (Ferrari, 2016). The challenge lies in successfully navigating this dynamic interplay of technology, disruption and customer experience to thrive in the digitised future of retail banking.

Theoretical foundation

This study's model is supported by the social exchange theory (SET) (Blau, 1964), organisational innovation framework (Crossan and Apaydin, 2010), DI framework (Wiesböck and Hess, 2020) and disruptive innovations theory (Christensen, 1997) and so aims to keep with suggestions to integrate theories (Schilke *et al.*, 2018) (Figure 1).

SET suggests that people respond in kind to initiating actions, and a string of reciprocal exchanges may convert an economic exchange into a high-quality social exchange relationship. Employees become more committed to their organisations or more trusting

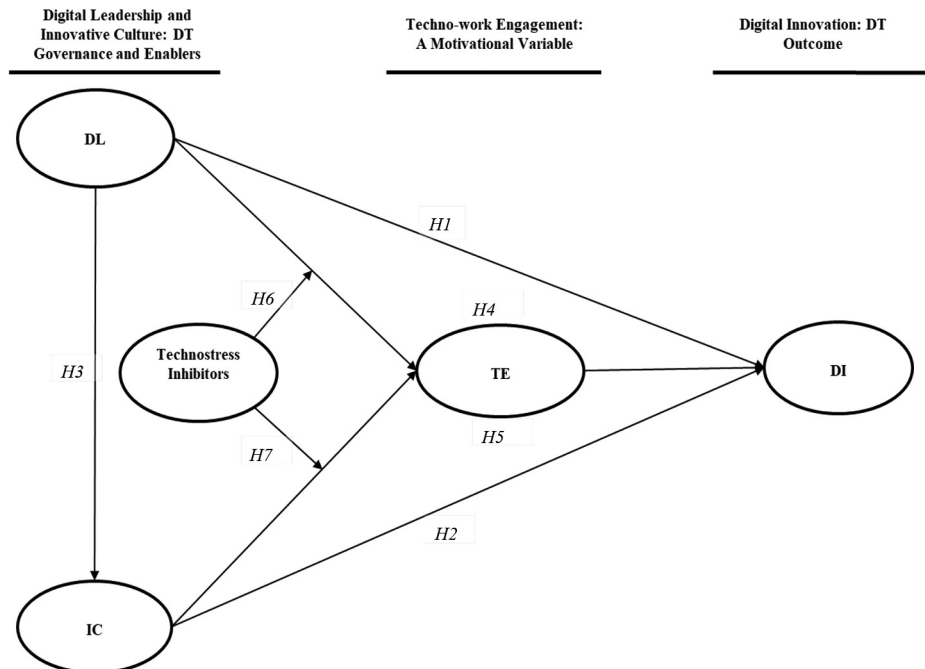


Figure 1.
Research model

Source: Figure by authors

(Cropanzano *et al.*, 2017) when they feel a level of equity from their employers that drives them to do their very best at work and enhances organisational effectiveness. Accordingly, work engagement entails exchanging benefits with the bank that will have them devise innovative solutions.

The organisational innovation framework integrates innovation determinants into three meta-constructs: leadership, managerial levers (culture) and business processes. Leaders promote innovative efforts at the initial stages, in effective group interactions and in their proficiency to build conditions for innovation execution (Mumford and Licuanan, 2004). An IC is one of the managerial levers that enable innovation. Leaders create ICs by clarifying a vision and promoting autonomy, calculated risk-taking and motivation.

Similarly, the DI framework suggests organisations can use digital technologies for innovation categories through enablers (culture) under a dedicated governance approach (leadership). The importance of leadership in maintaining the survival and progression of their companies is articulated by Christensen (1997). According to the theory of disruptive innovations, successful leaders can fall prey to the forces of disruptive innovations. They can sometimes become the cause of the demise of their organisations by failing to act and respond to those forces in time. For example, technological innovations overthrew Camillo Pane as CEO of Coty due to the turbulent impact of social media (Instagram and YouTube) that swept most dramatically the beauty industry. Conversely, good or innovative leaders can foster a culture that recognises the importance of the dynamic nature of their companies' capabilities in terms of resources, processes or values.

Digital leadership and digital innovation

The pursuit of DT is about acquiring technology to enhance value creation by shifting towards digital solutions (Shiuma, 2021). It involves combining several DIs and bringing new actors, structures, practices and cultures that threaten the existing rules of the game (Gierlich-Joas *et al.*, 2020). In a literature review by Crossan and Apaydin (2010), leaders were found to impact innovative efforts by having sufficient technical and professional expertise, creative skills and abilities to process complex information.

DL is "doing the right things for the strategic success of digitalisation for the enterprise and its business ecosystem" (Bresciani *et al.*, 2021a, 2021b, p. 98). DL puts the organisation in motion early by encouraging employees to identify new practices and opportunities to advance the organisational vision. An example is L'Oreal executives sending clear messages about digital initiatives for country brands and Sainsbury staff panel for monthly feedback on critical issues (Westerman *et al.*, 2012).

Banks find it hard to transition fast to new ways for several reasons. Firstly, they have grown into massively complex international technology firms that operate a highly sophisticated network of financial markets, credit markets and payment systems (Shaikh *et al.*, 2017). Secondly, the challenges and rivalry in the banking sector are intensifying due to lower profits, increased regulation and FinTech competition (Cziesla, 2014). Thirdly, DT and related technology development have a 50% failure rate, costing the global economy trillions of dollars (Weisman, 2019). Therefore, the main issue that banks are now facing is developing new leadership competencies and not the lack of availability of technology (Eberl and Drews, 2021). Since leaders are vital in advancing innovation (Denti and Hemlin, 2012), the current study explores the value of DL and IC in nurturing engaged employees to foster innovation.

While there is general agreement on the impact of leadership on the deployment of DT processes (Schwarzmueller *et al.*, 2018), strategies for DT are not very structured, typically lacking the breakdown of the effect of digitally focused leadership and mediating factors on

innovation (Li *et al.*, 2021). Using technologies must be coupled with new management, leadership and structures that help workers become more engaged and change their working practices while leaping (Larjovuori *et al.*, 2016). Leadership has been suggested as one of the prime influences that can help employees attain high innovation (Gerlach *et al.*, 2020). DIs can take the form of technical or concept solutions that demand the support needed to make the transition, and so it is not enough for leaders to have good digital literacy; they must have “a clear and meaningful vision for the digitalisation process and the capability to execute strategies to actualise it” (Larjovuori *et al.*, 2016, p. 1144).

DI combines digital solutions driven by opportunities for new technologies and the needs of applications. An example is the evolutionary path realised by the first enterprise resource planning systems from relational database systems, mobile application stores from smartphones and media companies using content platforms to produce and distribute content further (Wiesböck and Hess, 2020).

Many organisations apply solutions without concepts (Khatri and Samuel, 2019), but the organisational side must also be innovated. The innovation here is viewed as an economic or social rather than a technical term (Drucker, 2014). At this point, DL most essential because it can help the firm keep its values and culture while modernising structures and processes. Therefore, digital leaders communicate their beliefs of how the future rests in leaps of faith as they are not simply content with analysing empirical data and deductive thinking. Such leaders stay well-informed of digital expertise and support processes to search, select and structure innovation capabilities. They focus on generating innovative ideas that help create value for customers, design digitally enabled services quickly using advanced technologies and build organisational capability to deliver services that meet and often exceed customer expectations (Tanniru, 2018). During DT, the role of DL to inspire and effect innovation is imperative, and numerous past studies supported the positive impact of leadership on innovation in different contexts (Gerlach *et al.*, 2020; Khosravi *et al.*, 2019; Magesa *et al.*, 2021). A recent bibliometric analysis (Tigre *et al.*, 2023) highlighted an evolving DL paradigm emphasising fostering innovation and adaptability as essential for success in a digital landscape. Based on the above logic, we propose the following hypothesis:

H1. DL is positively and significantly related to DI.

Innovative culture and digital innovation

An IC represents members' shared values and beliefs about creating and developing innovative solutions. It encourages openness to new ideas and cultivates capabilities to embrace complicated technologies underlying new products or service development (Ali and Park, 2016). DT requires continuous innovation, with new digital solutions quickly becoming obsolete. An IC helps determine innovative events and influences how people interpret and respond to these events. Thus, a solid, IC provides a consistent perception of innovative orientation that serves members well when facing technological innovation challenges.

ICs are shared values and beliefs facilitating innovation by leveraging internal-based competencies, leading to competitive advantage (Martín-de Castro *et al.*, 2013). For example, Chen *et al.* (2012) found that a more robust IC facilitates technological innovation by continuously building norms and routines to invest in innovation efforts.

Past studies have found some support for the relationship between culture and innovation in different settings (Durcikova *et al.*, 2011; Naveed *et al.*, 2022; Slater *et al.*, 2014). For example, Kohli and Melville (2019) found in their literature review that a learning culture promotes opportunities for DI. However, Santos-Vijande *et al.* (2021) found in a sample of 502 hotels and knowledge-intensive business service firms in Spain that IC does not ensure the

exploitation of organisational skills and resources but affects the management style of service innovation. Given these arguments, this hypothesis is proposed:

H2. IC is positively and significantly related to DI.

Digital leadership and innovative culture

The DI framework suggests that leadership is associated with organisational factors and guides IC as an enabler that facilitates DI. Scholars have asserted the role played by leadership in an understanding culture, which includes the values and assumptions of members and vice versa (Al Issa, 2019; Schein, 2004). For example, Chen *et al.* (2012) found in a study involving 102 senior managers and 258 employees in Taiwanese strategic business units transformational leadership behaviours stimulated technological innovation while an IC substituted leadership in enabling technological innovation. Although some past studies have been carried out to determine the effects of leadership on organisational outcomes, limited studies have paid attention to assessing DL's influence on IC within the banking sector (Damanpour, 1991; Sattayaraksa and Boon-itt, 2016). Based on these arguments, this hypothesis is formulated:

H3. DL is positively and significantly related to an IC.

The mediating role of techno-work engagement

TE refers to the level of motivation at work and typically includes vigour, dedication and absorption, as Schaufeli *et al.* (2002) indicated. Research showed that work engagement mediates between several job resources and employees' outcomes, for example, between leadership and service innovation and performance (Özsungur, 2019). Work engagement includes an attitude that makes employees capable of "thinking out-of-the-box" and ready to entertain new ideas and generate innovative solutions (Eldor, 2017). High-performing organisations boost employees' experience by adopting two digital workplace factors: TE and responsive DL. The focus on work experience is vital to delivering outstanding customer-focused DI (Mäkiniemi *et al.*, 2020). Furthermore, DL effectively communicates an articulated vision that links innovation strategy with crucial workplace factors like technological engagement and culture.

Fostering TE in the digital workplace is critical because of its widely accepted impact on innovation (Kassa, 2021; Orth *et al.*, 2020; Schaufeli *et al.*, 2017). The connection of engagement with innovation can be substantiated if we analyse its dimensions. Firstly, vigour is persistently feeling energetic, which stems from an intrinsic motivation to pursue pursuits with relentless vitality. Secondly, dedication is propelled by positive feelings that expand the cognitive and behavioural range, creating a sense of pride and meaning in our actions. Thirdly, absorption generates an urge to become fully immersed in what we do by losing the sense of time, which is an essential component for the frequent failures typical of innovative undertakings. Note that all dimensions tap into intrinsic motivation, positive affect and psychological resilience (Madrid *et al.*, 2014; Orth and Volmer, 2017). Empirical findings also support engagement's significant positive influence on innovation (Bakker and Demerouti, 2007; Kim and Koo, 2017; Orth *et al.*, 2020; Trabucchi *et al.*, 2021).

The SET has found strong evidence that supports its explanation of the direct influence of leadership on engagement through the exchange of attention, favours and resources (Decuyper and Schaufeli, 2020; Garg and Dhar, 2017; Kassa *et al.*, 2021). For example, a study by Amor *et al.* (2020) showed that transformational leaders foster work engagement

directly and through empowerment. If the leader successfully provides job resources through social exchange or as part of the DT strategy of resource allocation, then leadership would drive work engagement (Bakker and Demerouti, 2007).

In general, culture exercises its effect by shaping the behaviour of members and is, thus, vital for improving work engagement and performance (Schein, 2004). Since culture paves the way for resources and working conditions by creating suitable work environments, different culture types can influence work engagement (Crawford *et al.*, 2014). Furthermore, a recent study by Meng and Berger (2019) found a positive significant relationship between culture and engagement. They also found engagement to mediate the relationship between culture and overall job satisfaction.

When employees feel they have certain economic and social benefits and control over their jobs, that correlates positively with their engagement in innovative work behaviours (Parzefall *et al.*, 2008). Furthermore, previous research found work engagement to be a viable mediator, especially in the leadership–innovation association (Agarwal *et al.*, 2012; Mulligan *et al.*, 2021; Özsungur, 2019). For instance, Tian and Zhang (2020) studied a sample of 318 employees and found that work engagement partially mediated the relationship between empowering leadership and innovative behaviour. In the current study, it is proposed that the effective operation of banks results from leadership qualities that echo a culture that inspires engaged employees. Given the discussion above, the following hypotheses are put forth:

H4. TE significantly mediates the relationship between DL and DI.

H5. TE significantly mediates the relationship between IC and DI.

The moderating role of technostress inhibitors

TI reduce employee information and communication technology levels and job-related strain outcomes. Examples include end-user training, technical support and user participation in the planning and implementing of new ICT solutions (Fuglseth and Sørebo, 2014). Based on the DI framework, the guidance of a dedicated governance approach represented in DL must allocate resources like TIs to help employees cope with the fast and constant changes produced by DT. Leadership is vital for leveraging organisational support by allocating desperately needed resources in the DT quest (Rohwer *et al.*, 2022).

Technostress is any toxic effect on people's minds owing to technology usage (Nisafani *et al.*, 2020). According to the cognitive evaluation theory (Ryan *et al.*, 1983), people become less innovative when extrinsically oriented due to perceived externally controlled conditions, increased dependency on technology, reduced self-efficacy and changing technology culture (Ragu-Nathan *et al.*, 2008). The dimensions of technostress tell the story in more detail. Techno-overload lessens the time to adapt to new technologies (Tarafdar *et al.*, 2015). Techno-invasion imposes constant connectivity and diminishes feelings of being free (Brown, 2014). Techno-complexity requires time and effort to learn new technologies (Fitzgerald *et al.*, 2014). Techno-insecurity makes employees fear losing their jobs (Sweeney, 2015). Lastly, techno-uncertainty lowers motivation as employees focus on routines to avoid endless upgrades and pressure to keep current (Chandra *et al.*, 2019).

To counter these adverse effects, organisations extend support with TIs that sustain technology work conditions and restore the balance for a DI environment (Fuglseth and Sørebo, 2014). Firstly, TIs provide literacy facilitation which encourages sharing technology-related knowledge. Secondly, technical support provision saves employees time and effort by addressing technical problems. Thirdly, TIs facilitate involvement,

enabling end users to participate in the technology introduction and implementation (Ragu-Nathan *et al.*, 2008).

The effect of leadership on technostress has been well documented (Bauwens *et al.*, 2021; Fieseler *et al.*, 2014; Larjovuori *et al.*, 2016). For example, 129 information technology managers surveyed concluded that a statistically significant relationship exists between transactional and *laissez-faire* leaders and technostress (Boyer-Davis, 2019). Likewise, an IC stimulates frequent technological changes, which are severe precursors to technostress; therefore, it is anticipated that TIs will strongly moderate the relationship between IC and techno work engagement.

Mixed results have been noted regarding the influence of techno stressors on job outcomes (Srivastava *et al.*, 2015). Some research found that technostress is negatively related to various work-related outcomes (Alam, 2016; Shu *et al.*, 2011), yet some studies showed a positive influence (Chandra *et al.*, 2019). For example, Wang *et al.* (2008) found that highly innovative organisations have the highest levels of technostress. Still, past studies emphasised the importance of TIs and their likely powerful relationship with several outcomes in various contexts (Hwang *et al.*, 2021; Li and Wang, 2021; Nisafani *et al.*, 2020; Ragu-Nathan *et al.*, 2008). The current study fills the gap in limited studies that explore TIs' effect on the DT of the banking sector. From the above discussion, this study sought to put forth the following hypotheses:

H6. TIs significantly moderate the relationship between DL and TE.

H7. TIs significantly moderate the relationship between IC and TE.

Methods

The population and sample

A complete data list of banks was obtained from the Central Bank of Libya (2022) with an established focus on the largest five banks in Libya for data collection convenience and lower cost. The listing showed 19 banks comprising almost 600 branches across the nation.

Due to the practical challenges, time constraints and specific characteristics of the population under study, purposive sampling was chosen as a suitable method, offering flexibility and efficiency in participant selection. Firstly, the researchers encountered difficulties obtaining a list of the target population of bank managers. Secondly, the target population are notorious for having hectic schedules requiring selection participants based on specific characteristics, ensuring a more efficient data collection process. Therefore, the researchers used expert judgment to identify and choose hard-to-reach managers in closer proximity, providing ease, speed and affordability in the sampling process. As purposive sampling allows for the selection of elements that represent a cross-section of the population, the questionnaires were administered to executives and experts considered active in the decision-making and with unique knowledge of their bank's operations and strategy (Lavrakas, 2008). Out of 700 surveys distributed between September and December 2022, 305 were returned, and 292 met the criteria for inclusion, resulting in an acceptable response rate of 41.7%, given the data collection challenges in Libya. Recognising the inherent bias among surveyed managers presents an avenue for research improvement. Future studies could explore diversifying the sampled managerial pool, implementing data triangulation and incorporating comparative analyses. These strategies serve as practical approaches to address and mitigate biases associated with sampling managers.

Measures

The measures used (Appendix) were adapted from instruments used in previous studies using the five-point Likert-like scale from “strongly disagree” to “strongly agree.” Researchers controlled for enterprise size and age since prior studies reported their association with innovation (Cheng *et al.*, 2012).

DL. DL comprised six items based on Zeike *et al.* (2019), with an internal consistency of 0.872. The DL instrument represents capabilities to communicate and inspire a transformative vision of the enterprise’s digital future, including eliciting collaboration, involvement and development of all members in digitalisation (Larjovuori *et al.*, 2016).

DI. DI comprised six items adapted from Paladino (2007) and an internal consistency of 0.93. DI represents the enterprise’s ability to successfully adopt new ideas, products and processes.

TI. TI comprised 10 items adopted from Ragu-Nathan *et al.* (2008) with an internal consistency of 0.925. TI embodies the mechanisms that reduce stress by using information and communication technologies.

TE. TE comprised three items based on Schaufeli *et al.* (2017) and had an internal consistency value of 0.702. TE expresses “a positive experience of well-being regarding the use of technology at work” (Mäkiniemi *et al.*, 2020, p. 1).

IC. IC comprised three items based on Chen (2012) and had an internal consistency value of 0.781. IC represents a lasting and implied set of values, beliefs and assumptions that embrace innovation, growth and new resources while valuing flexibility, adaptability, creativity, risk-taking and entrepreneurship, distinguishing an enterprise and its members (Cameron and Quinn, 2011).

Results

Statistical procedures in the current study were handled by SPSS v20 and partial least squares structural equation modelling (PLS-SEM). The choice for structural equation modelling using PLS for hypotheses testing was made because of its robust variant analysis. PLS-SEM modelling of first- and second-order constructs is easily achieved, and latent variable scores are attained to make predictions while building higher-order constructs (Al Issa and Abdelsalam, 2021). PLS-SEM was chosen to explain variance in internal constructs and predictive models, especially for non-normal data and complex models. Despite biases, it predicts outcomes in quantitative research contexts (Sarstedt *et al.*, 2017). The current study included data coding and cleaning, reliability assessment, missing data, outliers’ detection and assessment of normality, linearity, multicollinearity, homoscedasticity and CMV. No signs of non-response bias were identified, as evidenced by an independent sample *t*-test assessing the study’s variables. The *t*-test results revealed no significant difference between early and late responders during the two-month data collection period (Pallant, 2013), with all *p*-values exceeding 0.05. Descriptive statistics were analysed about the respondents’ demographic profiles (Table 1).

The initial analysis showed significant correlations between corporate frugality, entrepreneurial orientation and crisis preparedness (Table 2). The current study originated from a single source and adopted several procedural remedies to minimise the effects of common method variance (CMV) (MacKenzie and Podsakoff, 2012). Firstly, this was done by protecting the respondents’ anonymity and reducing evaluation apprehension. Secondly, an improved understanding of items was achieved by being available to explain questionnaire items further. Thirdly, Harman’s single-factor test was carried out as recommended by Podsakoff and Organ (1986). The measured variables did not load to a single factor that accounted for the variance below the cut-off value of 50%. This indicated that the data was accessible from common bias. Normality was determined for all variables

Table 1. Distribution of respondents

| Gender | Occupation | Tenure | Firm age | Size | Firm ownership |
|--------------------|---|------------------------------------|------------------------------------|--|----------------------------|
| Male 174 (59.6%) | Chief executive officer 26 (8.9%) | Less than 3 years 58 (19.9%) | Less than 10 years 59(20.2%) | Less than 50 employees 92 (31.5%) | State-owned 119 (40.8%) |
| Female 118 (40.4%) | Executive 36 (12.3%) | Between 3 and 5 years 43 (14.7%) | Between 10 and 20 years 54 (18.5%) | Between 50 and 250 employees 33 (11.3%) | Non-state-owned 44 (15.1%) |
| | Middle management 62 (21.2%) | Between 6 and 10 years 70 (24%) | Between 21 and 30 years 37 (12.7%) | Between 251 and 500 employees 94 (32.2%) | Public 59 (20.2%) |
| | Other leadership/supervisory 168 (57.5) | Between 11 and 20 years 78 (26.7%) | Between 31 and 40 years 51 (17.5%) | More than 500 employees 73 (25%) | Non-public 70 (24%) |
| | | More than 21 years 43 (14.7%) | More than 40 years 91 (31.2%) | | |

Source: Table by authors

Table 2. Descriptive statistics and correlation matrix

| Constructs | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------|------|-------|--------|---------|---------|--------|---------|---------|---------|---------|---|
| Gender | 1.40 | 0.492 | | | | | | | | | |
| Tenure | 3.01 | 1.343 | -0.099 | | | | | | | | |
| Firm age | 3.22 | 1.542 | 0.105 | 0.392** | | | | | | | |
| Size | 3.45 | 1.91 | 0.12 | 0.067 | 0.107 | | | | | | |
| DI | 3.55 | 0.99 | 0.053 | 0.160** | 0.136* | 0.087 | | | | | |
| DL | 3.56 | 0.884 | -0.023 | 0.128* | 0.172** | 0.086 | 0.661** | | | | |
| TI | 3.63 | 0.914 | 0.09 | 0.143* | 0.174** | 0.134* | 0.773** | 0.611** | | | |
| TE | 3.69 | 0.707 | 0.028 | 0.114 | 0.157** | 0.110 | 0.770** | 0.714** | 0.860** | | |
| IC | 3.67 | 0.935 | 0.050 | 0.158** | 0.133* | 0.014 | 0.726** | 0.648** | 0.605** | 0.595** | |

Notes: DI = digital innovation; DL = digital leadership; TI = technostress inhibitors; TE = techno-work engagement; IC = innovative culture; N = 290; *p < 0.05; **p < 0.01

Source: Table by authors

using the Q-Q plot, which was very close to a straight line, and the histogram was near a bell shape. Multicollinearity was not an issue, with variance-inflated factor (VIF) below 5, showing a peak for an engagement at 4.804, while tolerance was above 0.20, the lowest for the TE at 0.208. Constructs' correlations are displayed in Table 2, revealing the significance between variables and other descriptive statistics.

Measurement model assessment

In this section, authors evaluated convergent validity through higher than 0.5 average variances extracted (AVE). Also, composite reliability thresholds were acceptable from 0.833 to 0.945. The cross-loadings were assessed for discriminant validity, demonstrating loadings more than cross-loadings. Finally, Fornell and Larcker's (1981) criterion revealed that square roots for all AVEs were more than inter-construct correlations (Table 3). Discriminant validity is confirmed when measures assessing different constructs show a low correlation after considering measurement error. The researchers found cross-loading and the Fornell-Larcker criterion methods suitable due to sufficient indicators per construct,

minimal correlations and the constructs' distinctiveness in a sizable sample. While alternative methods like the HTMT index were deemed less effective – shown not to outperform modern CFA techniques – the researchers acknowledge the limitations of these approaches in providing a comprehensive view of discriminant validity. They emphasise the importance of considering context, theory and empirical results in the interpretation of evidence, suggesting opportunities for future research to explore recommended techniques for discriminant validity assessment like CI_{CFA} (sys) and χ^2 (sys) (Hair *et al.*, 2017; Rönkkö and Cho, 2022).

Structural model assessment

Next, the predictive precision of the model was assessed by R^2 value for innovation at 0.711 while for engagement R^2 was 0.805, which is considered substantial if above 0.75 and moderate if above 0.5 as per Hair *et al.* (2017) (Table 4 and Figure 2). Then, the effect sizes (f^2) were considered large, medium and small between innovation and TE, IC and DL 0.350, 0.278 and 0.014, respectively (Cohen, 1988). The Q^2 was medium at 0.519 (omission distance $D = 7$) for innovation and TE at 0.502, and small at 0.291 for IC, which means the model has predictive relevance. Last of all, relative predictive relevance from q^2 on innovation was 0.516 (TI), 0.445 (TE), 0.516 (DL) and 0.459 (IC), indicating a sizeable predictive relevance for all constructs.

Discussion

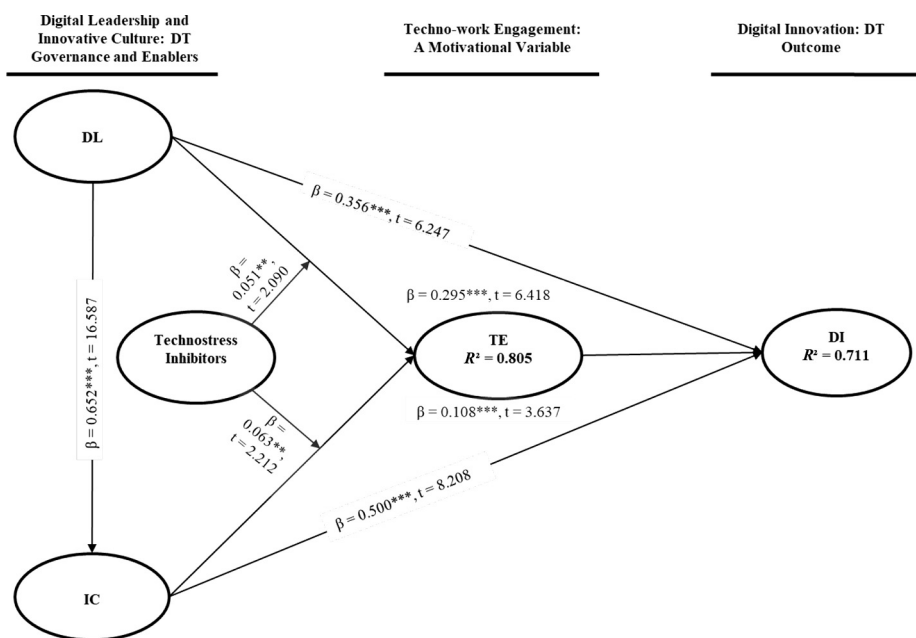
The results show a positively significant direct impact of leadership on innovation. This supported the organisational innovation framework, which posits that leaders must have technical and professional expertise and creative skills to process complex information to

| Constructs | DI | DL | IC | TE | TI |
|------------|-------|-------|-------|-------|-------|
| DI | 0.861 | | | | |
| DL | 0.682 | 0.783 | | | |
| IC | 0.732 | 0.651 | 0.835 | | |
| TE | 0.775 | 0.752 | 0.616 | 0.791 | |
| TI | 0.773 | 0.614 | 0.611 | 0.738 | 0.774 |

Table 3. Discriminant validity (Fornell–Larcker’s criterion)
Notes: DI = digital innovation; DL = digital leadership; TI = technostress inhibitors; TE = techno-work engagement; IC = innovative culture
Source: Table by authors

| Hypothesis | Standard beta | t-statistics | p-values | Decision |
|------------------|---------------|--------------|----------|----------|
| H1. DL → DI | 0.356*** | 6.247 | 0.000 | Accept |
| H2. IC → DI | 0.500*** | 8.208 | 0.000 | Accept |
| H3. DL → IC | 0.652*** | 16.587 | 0.000 | Accept |
| H4. DL → TE → DI | 0.295*** | 6.418 | 0.000 | Accept |
| H5. IC → TE → DI | 0.108*** | 3.637 | 0.000 | Accept |
| H6. DL * TI → TE | 0.051** | 2.090 | 0.037 | Accept |
| H7. IC * TI → TE | 0.063** | 2.212 | 0.027 | Accept |

Table 4. Structural estimates
Notes: DI = digital innovation; DL = digital leadership; TI = technostress inhibitors; TE = techno-work engagement; IC = innovative culture; $N = 290$; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$
Source: Table by authors



Notes: DI = digital innovation; DL = digital leadership; TI = technostress inhibitors; TE = techno-work engagement; IC = innovative culture; $N = 290$; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Source: Figure by authors

Figure 2.
Model estimates

influence innovation. This aligns with past studies that showed a positive and significant relationship between leadership and innovation (Benitez *et al.*, 2022; Bresciani *et al.*, 2021a, 2021b; Fu *et al.*, 2018; Vaccaro *et al.*, 2012). For example, a recent paper by Magesa and Jonathan (2021) revealed four digital leaders' characteristics: promoting innovation by being anticipatory, digitally savvy and a risk taker.

The DI framework theorises that organisations must develop a governance style that lets them deploy digital enablers like culture and capabilities to achieve DI. In the current model, IC urges openness to new ideas and cultivates capabilities to embrace complicated technologies underlying new product or service development (Ali and Park, 2016). The $H2$, which proposed IC is positively related to DI, was supported. This is consistent with previous research that found a positive association between culture and innovation in different settings (Durcikova *et al.*, 2011; Naveed *et al.*, 2022; Slater *et al.*, 2014). For example, Sareen and Pandey (2021) found that a culture for innovation stimulated innovation in a sample of 151 senior executives at knowledge-intensive business services firms.

The $H3$ found that DL is positively and significantly related to an IC. This finding aligns with the claim about the entangled nature of culture and leadership, with leaders shaping culture and then being shaped soon by culture (Schein, 2004; Bass and Avolio, 1993). However, most research favours a leader's influence on culture (Sarros *et al.*, 2008) because to become more transformational, leaders must articulate the changes required while their behaviour becomes symbols of the new culture (Bass and Avolio, 1994). Past research also found a strong association between leadership and culture (Sattayaraksa and Boon-itt, 2016).

The *H4* was also accepted, and according to the SET, employees respond in kind to initiating actions by leaders. This work engagement response is an exchange of benefits with the organisation, which leads engaged workers to look for ways of adding value to processes, leading to innovation. Furthermore, past research found leadership associated with work engagement (Amor *et al.*, 2020; Decuyper and Schaufeli, 2020) and work engagement with innovation (Bakker and Demerouti, 2007; Kim and Koo, 2017) and found work engagement a viable mediator in several models (Agarwal *et al.*, 2012; Mubarak *et al.*, 2021).

Equally, the *H5* was accepted and in line with past conceptualising about how culture shapes members' behaviour to improve work engagement. Past studies found a positive culture-engagement association (Meng and Berger, 2019), but to the researcher's knowledge, studies examining the mediation role of engagement between culture and innovation are non-existent.

The third research objective was to evaluate the moderating effect of TI on the relationship between DL, IC and TE. The corresponding final hypotheses, *H6* and *H7*, were accepted. As such, a moderator such as TI might modify the connection's strength and direction. Based on the DI framework, the guidance of a dedicated governance approach represented in DL must allocate resources like TI to help cope with the fast and constant changes produced by DT. As a supporting mechanism, TI reduce the harmful effects of wasted time on continuous upgrades and routine work to keep current with constantly changing technologies, depriving employees of the time and energy needed for innovation. The present study results show that TI can moderate IC effects to render heightened techno work engagement. Consistent with previous studies, the current results revealed a strong association between TI and their moderation with stressors, strain and various organisational outcomes (Nisafani *et al.*, 2020; Ragu-Nathan *et al.*, 2008).

Furthermore, we can analyse the moderating effect's slope by looking at the upper line in Figure 3, which represents a high level of the moderator construct TI with a steeper slope than the lower line, which means a low level of the moderator construct TI. Thus, this makes sense that the simple slop plot confirms the positive interaction term: Higher TI levels entail

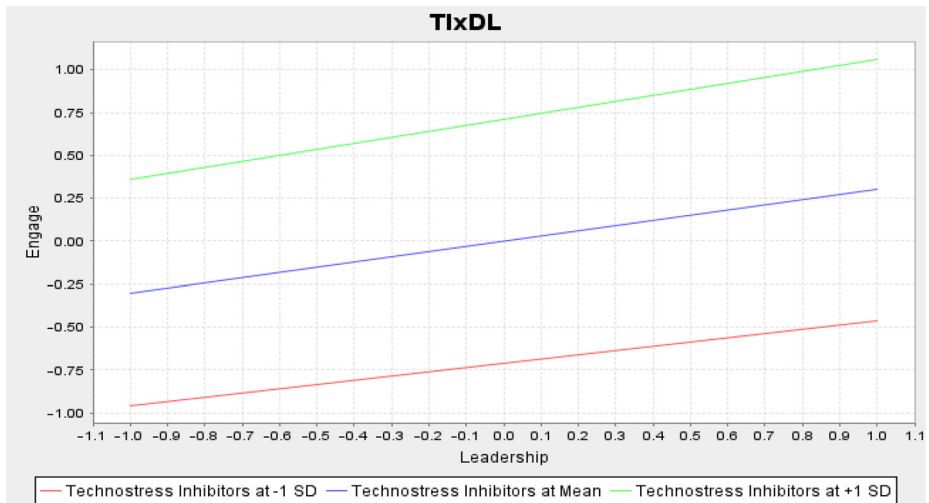


Figure 3.
Interaction effect of
technostress
inhibitors on digital
leadership-work
engagement
association

Source: Figure by authors

a stronger relationship between DL and work engagement, while lower levels of TI lead to a slightly weaker relationship between leadership and work engagement.

The moderation effect of TI is more pronounced in the IC–TE association. The interpretation of the interaction in the graph shown in Figure 4 is such that, for low TI moderation, there appears to be a slight and negative effect with a percentage decrease in slope from culture on work engagement. However, during high TI, IC had a more robust impact on work engagement. The logic is the bigger the difference between the two slopes (low TI and high TI), the stronger the moderator’s interaction effect on the independent and dependent variables is.

Conclusion

The current study examined the influence of DL, IC, TE and TI on Libyan banks’ DI in their DT endeavours. TE was proposed to mediate the relationship between DL and innovation and between IC and innovation. While the SET underpinned the research framework, several other supporting theories, namely, the organisational and DI frameworks, provided additional understanding of the theorised relationships.

As suggested by the social exchange theory, the current study found that people respond in kind to initiating behaviours that arise from the leadership process and a cultural stance. Reciprocal high-quality exchanges expressed in work engagement and innovation will most likely follow. The organisational innovation and DI frameworks also prefigured leadership, culture and business processes as determinants of innovation. A key inference from this study is that fostering organisational support will enhance DT in retail banks. The importance of this topic encourages researchers to investigate other critical predictor mechanisms of DI in banks, especially in developing countries that desperately need to keep up with organisational development for DT.

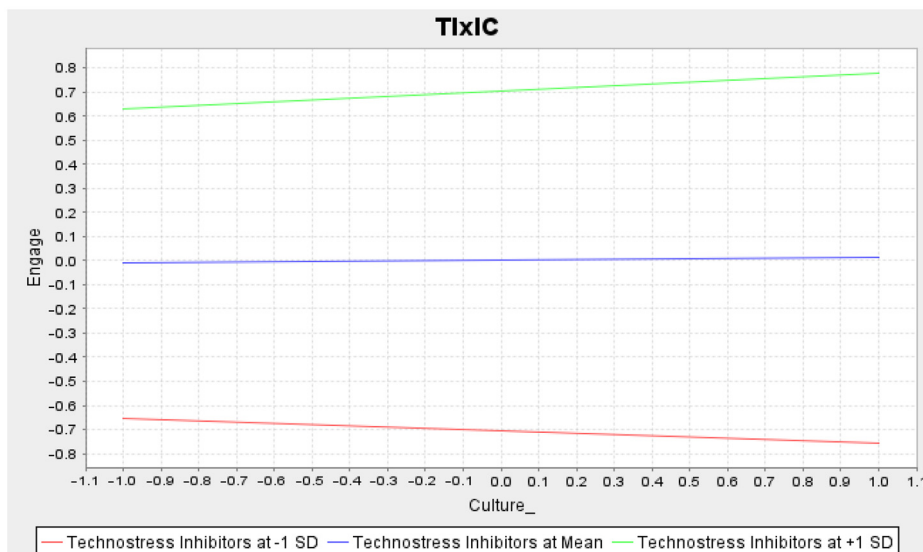


Figure 4. Interaction effect of technostress inhibitors on innovative culture–work engagement association

Source: Figure by authors

Theoretical and practical implications

This research intended to shed light on factors in the contemporary DT reality rife with disruptive forces that quickly render new digital solutions obsolete. The study explains the association between leadership and innovation in the digital world by incorporating engagement as a viable mediating factor. DT is part of a new imperative for organisational development to survive and reap superior performance. As a source of competitive advantage, DI must be coupled with a new kind of leadership and support structures that help workers become engaged to make the leap. It turns out that adopting appropriate strategies can lead to the innovations desired.

The study's main contribution is to the management field and DT in banking, particularly in developing countries. The research offered a model that conceptualised the impact of DL and IC on DI, and TE was theorised to play a mediating role in the relationships (Porfirio *et al.*, 2021). The moderating role of TI was also explored as a support mechanism for work engagement to improve DI. These nascent theoretical insights also answer calls for research investigating culture, leadership and work engagement across industry sectors and in differing occupations (Kraus *et al.*, 2021; Bakker and Albrecht, 2018). Furthermore, this study answers calls to investigate DT in the banking sector in developing countries to redesign and reengineer their lagging services from the ground up to increase their competitiveness (Tsendeliani *et al.*, 2022), especially post-COVID-19 (Wu and Olson, 2020).

The current study contributes to the ignored matter regarding the shortage of practical implications in management research (Salminen *et al.*, 2014). The findings guide decision makers and managers to focus their resources on developing work engagement and providing the organisational support necessary to reduce the adverse effects of digital stress, which can be a dynamic capability that improves organisational effectiveness through DT momenta. Moreover, the findings suggest that DT is a drastic formal change that disrupts culture by adopting new technological infrastructure and digital skills that strain the shift for employees and the whole organisation. Thus, leadership must not stress technology implementation without seeing the presence of the right leadership skills and attributes to make an effective change. So, in addition to digital knowledge, leadership characteristics, such as creating trust, team development, altruism and role modelling, are better suited for change towards DT.

Another practical implication is linked to industry pragmatism in the financial services industry. This explains how technostress engagement can be anticipated to promote DL efforts and IC for innovation. Technostress engagement is a manageable variable conceivable to cultivate by banking leaders and so can be tailored to develop pertinent digital influence and culture for DT pursuits. The present research also indicates that while DL and IC individually were related to DI, when combined in a complete model, IC was not found related to engagement and so not vital unless moderated by TI.

The commitment to TI as a resource is a valuable undertaking in DT. However, managerial relevance requires this to be viewed with future timing for optimal impact (Jaworski, 2011). A definite piece of advice to managers is to allocate the TI as a resource resolutely. By doing this, leaders show faith in their communication and resource allocation to employees. DT strategies can help organisations evade delays or failure if extended digital stress is wearing away silently at key factors of DI.

The present study identifies crucial concepts, theories and research gaps in the domain, paving the way for future research and enriching the empirical understanding of DL. It explores how DL tackles distinctive challenges posed by digital technologies, adeptly handling a firm's dynamic capabilities and embracing a market orientation to thrive in the swiftly changing and intricate digital landscape (Tigre *et al.*, 2023). The analysis of

leadership's impact on innovation contends that leadership plays a pivotal role in data governance and DT, providing valuable insights for addressing challenges associated with the adoption and utilisation of technology. This contribution can potentially enhance discussions about the broader landscape of digital advancements (Davidson *et al.*, 2023).

Study limitations and research future directions

A limitation in the present research is related to the smaller sample size, and future research should be carried out with a larger sample to make the study's cross-sectional nature more generalisable. Therefore, future replication of the study should include a larger sample size in a longitudinal approach. Another suggestion for future direction is to examine other leadership styles as predictors of different configurations of innovative outcomes with other potential mediators like coping strategies that help ease the transition of concurrently increased demands from DT efforts with limited resources. Exploring the impact of digital culture and innovation on bank performance, risk-taking and lending decisions could also be worthwhile.

References

- Agarwal, U.A., Datta, S., Blake-Beard, S. and Bhargava, S. (2012), "Linking LMX, innovative work behaviour and turnover intentions: the mediating role of work engagement", *Career Development International*, Vol. 17 No. 3, pp. 208-230, doi: [10.1108/13620431211241063](https://doi.org/10.1108/13620431211241063).
- Alam, M.A. (2016), "Techno-stress and productivity: survey evidence from the aviation industry", *Journal of Air Transport Management*, Vol. 50, pp. 62-70.
- Ali, M. and Park, K. (2016), "The mediating role of an innovative culture in the relationship between absorptive capacity and technical and non-technical innovation", *Journal of Business Research*, Vol. 69 No. 5, pp. 1669-1675.
- Al Issa, H. (2019), "Organisational culture in public universities: empirical evidence", *Asian Journal of Business and Accounting*, Vol. 12 No. 1, pp. 41-70, doi: [10.22452/ajba.vol12no1.2](https://doi.org/10.22452/ajba.vol12no1.2).
- Al Issa, H. and Abdelsalam, M.K. (2021), "Antecedents to leadership: a CB-SEM and PLS-SEM validation", *International Journal of Sustainable Development and Planning*, Vol. 16 No. 8, pp. 1403-1414, doi: [10.18280/ijstdp.160801](https://doi.org/10.18280/ijstdp.160801).
- Amor, A.M., Vázquez, J.P.A. and Faiña, J.A. (2020), "Transformational leadership and work engagement: exploring the mediating role of structural empowerment", *European Management Journal*, Vol. 38 No. 1, pp. 169-178.
- Backbase (2022), "Banking 2025, four pillars of the digital-first bank", available at: www.backbase.com/resources/banking-2025-whitepaper/?utm_source=google&utm_medium=cpc&utm_campaign=banking_2025_RSA_us&utm_content=whitepaper&gclid=Cj0KCQjw1ZeUBhDyARIsAOzAqQIwLhxuGFEaQJJR2D18hJFL1AT-Y4_uQ2MLPDwWR67MyRyE_jEJ4waAhbnEALw_wcB
- Bakker, A.B. and Albrecht, S. (2018), "Work engagement: current trends", *Career Development International*, Vol. 23 No. 1, pp. 4-11.
- Bakker, A.B. and Demerouti, E. (2007), "The job demands-resources model: state of the art", *Journal of Managerial Psychology*, Vol. 22 No. 3, pp. 309-328, doi: [10.1108/02683940710733115](https://doi.org/10.1108/02683940710733115).
- Bass, B.M. and Avolio, B.J. (1993), "Transformational leadership and organisational culture", *Public Administration Quarterly*, Vol. 17 No. 1, pp. 112-121.
- Bass, B. and Avolio, B. (1994), *Improving Organisational Effectiveness through Transformational Leadership*, Sage, Thousand Oaks, CA.
- Bauwens, R., Denissen, M., Van Beurden, J. and Coun, M. (2021), "Can leaders prevent technology from backfiring? Empowering leadership as a double-edged sword for technostress in care", *Frontiers in Psychology*, Vol. 12, p. 702648.

- Benitez, J., Arenas, A., Castillo, A. and Esteves, J. (2022), "Impact of digital leadership capability on innovation performance: the role of platform digitisation capability", *Information and Management*, Vol. 59 No. 2, p. 103590.
- Blau, P.M. (1964), *Exchange and Power in Social Life*, Wiley, New York, NY.
- Boyer-Davis, S. (2019), "The empirical relationship between leadership style and technostress", *ASBBS Proceedings*, Vol. 26, pp. 99-112.
- Bresciani, S., Ciampi, F., Meli, F. and Ferraris, A. (2021a), "Using big data for co-innovation processes: mapping the field of data-driven innovation, proposing theoretical developments and providing a research agenda", *International Journal of Information Management*, Vol. 60, p. 102347.
- Bresciani, S., Ferraris, A., Romano, M. and Santoro, G. (2021b), *Digital Transformation Management for Agile Organisations: A Compass to Sail the Digital World*, Emerald Publishing, Bingley.
- Brown, J., Stubbings, C. and Sethi, B. (2014), "The future of work", *PwC*, available at: www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf
- Cameron, K.S. and Quinn, R.E. (2011), *Diagnosing and Changing Organisational Culture: Based on the Competing Values Framework*, John Wiley and Sons, San Francisco, CA.
- Central Bank of Libya (2022), available at: <https://cbl.gov.ly/en/>
- Chandra, S., Shirish, A. and Srivastava, S.C. (2019), "Does technostress inhibit employee innovation? Examining the linear and curvilinear influence of technostress creators", *Communications of the Association for Information Systems*, Vol. 44 No. 1, p. 19.
- Chen, M.Y.C., Lin, C.Y.Y., Lin, H.E. and McDonough, E.F. (2012), "Does transformational leadership facilitate technological innovation? The moderating roles of innovative culture and incentive compensation", *Asia Pacific Journal of Management*, Vol. 29 No. 2, pp. 239-264.
- Cheng, C.C. and Krumwiede, D. (2012), "The role of service innovation in the market orientation—new service performance linkage", *Techovation*, Vol. 32 Nos 7/8, pp. 487-497.
- Chen, M.Y.C., Lin, C.Y.Y., Lin, H.E. and McDonough, E.F. (2012), "Does transformational leadership facilitate technological innovation? The moderating roles of innovative culture and incentive compensation", *Asia Pacific Journal of Management*, Vol. 29 No. 2, pp. 239-264.
- Christensen, C.M. (1997), *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business School Press, Boston, MA.
- Citi, G. (2016), "Digital disruption: how FinTech is forcing banking to a tipping point", available at: www.ivey.uwo.ca/media/3341211/citi-2016-fintech-report-march.pdf
- Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Sciences*, Lawrence Erlbaum, Mahwah, NJ.
- Coetzee, J. (2018), "Strategic implications of Fintech on South African retail banks", *South African Journal of Economic and Management Sciences*, Vol. 21 No. 1, pp. 1-11.
- Crawford, E.R., Rich, B.L., Buckman, B. and Bergeron, J. (2014), "The antecedents and drivers of employee engagement", *Employee Engagement in Theory and Practice*, Vol. 44 No. 6, pp. 57-81.
- Cropanzano, R., Anthony, E.L., Daniels, S.R. and Hall, A.V. (2017), "Social exchange theory: a critical review with theoretical remedies", *Academy of Management Annals*, Vol. 11 No. 1, pp. 479-516.
- Crossan, M.M. and Apaydin, M. (2010), "A multi-dimensional framework of organisational innovation: a systematic review of the literature", *Journal of Management Studies*, Vol. 47 No. 6, pp. 1154-1191.
- Cziesla, T. (2014), "A literature review on DT in the financial service industry", 27th Bled eConference, eEcosystems, June 1 - 5, 2014, Bled, Slovenia.
- Damanpour, F. (1991), "Organisational innovation: a meta-analysis of effects of determinants and moderators", *Academy of Management Journal*, Vol. 34 No. 3, pp. 555-590.
- Davidson, E., Wessel, L., Winter, J.S. and Winter, S. (2023), "Future directions for scholarship on data governance, digital innovation, and grand challenges", *Information and Organization*, Vol. 33 No. 1, p. 100454.

- Decuyper, A. and Schaufeli, W. (2020), "Leadership and work engagement: exploring explanatory mechanisms", *German Journal of Human Resource Management: Zeitschrift Für Personalforschung*, Vol. 34 No. 1, pp. 69-95.
- Denti, L. and Hemlin, S. (2012), "Leadership and innovation in organisations: a systematic review of factors that mediate or moderate the relationship", *International Journal of Innovation Management*, Vol. 16 No. 3, p. 1240007.
- Drucker, P. (2014), *Innovation and Entrepreneurship*, Routledge, NY.
- Durcikova, A., Fadel, K.J., Butler, B.S. and Galletta, D.F. (2011), "Research note—knowledge exploration and exploitation: the impacts of psychological climate and knowledge management system access", *Information Systems Research*, Vol. 22 No. 4, pp. 855-866.
- Eberl, J.K. and Drews, P. (2021), "Digital leadership—Mountain or molehill? A literature review", *International Conference on Wirtschaftsinformatik, Springer, Cham*, pp. 223-237.
- Eldor, L. (2017), "The relationship between perceptions of learning climate and employee innovative behavior and proficiency", *Personnel Review*, Vol. 46 No. 8, pp. 1454-1474, doi: [10.1108/PR-08-2016-0202](https://doi.org/10.1108/PR-08-2016-0202).
- Ferrari, R. (2016), "FinTech impact on retail banking—from a universal banking model to banking verticalisation", *The FinTech Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*, Wiley, pp. 248-252.
- Fieseler, C., Grubenmann, S., Meckel, M. and Müller, S. (2014), "The leadership dimension of coping with technostress", 2014 47th HI International Conference on System Sciences, *IEEE*, pp. 530-539.
- Fitzgerald, M., Kruschwitz, N., Bonnet, D. and Welch, M. (2014), "Embracing digital technology: a new strategic imperative", *MIT Sloan Management Review*, Vol. 55 No. 2, p. 1.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
- Fu, L., Liu, Z. and Liao, S. (2018), "Is distributed leadership a driving factor of innovation ambidexterity? An empirical study with mediating and moderating effects", *Leadership and Organization Development Journal*, Vol. 39 No. 3, pp. 388-405, doi: [10.1108/LODJ-05-2017-0134](https://doi.org/10.1108/LODJ-05-2017-0134).
- Fuglseth, A.M. and Sørebo, Ø. (2014), "The effects of technostress within the context of employee use of ICT", *Computers in Human Behavior*, Vol. 40, pp. 161-170.
- Garg, S. and Dhar, R. (2017), "Employee service innovative behavior: the roles of leader-member exchange (LMX), work engagement, and job autonomy", *International Journal of Manpower*, Vol. 38 No. 2, pp. 242-258.
- Gerlach, F., Hundeling, M. and Rosing, K. (2020), "Ambidextrous leadership and innovation performance: a longitudinal study", *Leadership and Organization Development Journal*, Vol. 41 No. 3, pp. 383-398.
- Gierlich-Joas, M., Hess, T. and Neuburger, R. (2020), "More self-organisation, more control – or even both? Inverse transparency as a digital leadership concept", *Business Research*, Vol. 13 No. 3, pp. 921-947.
- Gupta, A. and Xia, C. (2018), "A paradigm shift in banking: unfolding Asia's Fintech adventures", *Banking and Finance Issues in Emerging Markets*, Emerald Publishing, Bingley, Vol. 25, pp. 215-254.
- Hair Jr., J.F., Hult, G.T.M., Ringle, C. and Sarstedt, M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage Publications, LA.
- Hwang, I., Kim, S. and Rebman, C. (2021), "Impact of regulatory focus on security technostress and organisational outcomes: the moderating effect of security technostress inhibitors", *Information Technology and People*, doi: [10.1108/ITP-05-2019-0239](https://doi.org/10.1108/ITP-05-2019-0239).
- Jaworski, B.J. (2011), "On managerial relevance", *Journal of Marketing*, Vol. 75 No. 4, pp. 211-224.
- Kassa, A.G. and Tsigu, G.T. (2021), "Corporate entrepreneurship, employee engagement and innovation: a resource-based view and a social exchange theory perspective", *International Journal of Organizational Analysis*, Vol. 30 No. 6, pp. 1694-1711.

- Khaola, P. and Coldwell, D. (2019), "Explaining how leadership and justice influence employee innovative behaviours", *European Journal of Innovation Management*, Vol. 22 No. 1, pp. 193-212, doi: [10.1108/EJIM-08-2017-0103](https://doi.org/10.1108/EJIM-08-2017-0103).
- Khatri, V. and Samuel, B.M. (2019), "Analytics for managerial work", *Communications of the ACM*, Vol. 62 No. 4, pp. 100-100.
- Kim, M.S. and Koo, D.W. (2017), "Linking LMX, engagement, innovative behavior, and job performance in hotel employees", *International Journal of Contemporary Hospitality Management*, Vol. 29 No. 12, pp. 3044-3062.
- Kohli, R. and Melville, N.P. (2019), "Digital innovation: a review and synthesis", *Information Systems Journal*, Vol. 29 No. 1, pp. 200-223.
- Khosravi, P., Newton, C. and Rezvani, A. (2019), "Management innovation: a systematic review and meta-analysis of past decades of research", *European Management Journal*, Vol. 37 No. 6, pp. 694-707.
- Krasonikolakis, I., Tsaropoulos, M. and Eng, T.Y. (2020), "Are incumbent banks bygones in the face of digital transformation?", *Journal of General Management*, Vol. 46 No. 1, pp. 60-69.
- Kraus, S., Jones, P., Kailer, N., Weinmann, A., Chaparro-Banegas, N. and Roig-Tierno, N. (2021), "Digital transformation: an overview of the current state of the art of research", *SAGE Open*, Vol. 11 No. 3, p. 21582440211047576, doi: [10.1177/21582440211047576](https://doi.org/10.1177/21582440211047576).
- Larjovuori, R.L., Bordi, L., Mäkineniemi, J.P. and Heikkilä-Tammi, K. (2016), "The role of leadership and employee well-being in organisational digitalisation", *Tiziana Russo-Spena and Cristina Mele*, 1159.
- Lavrakas, P.J. (2008), *Encyclopedia of Survey Research Methods*, Sage Publications, Oaks, CA.
- Li, L. and Wang, X. (2021), "Technostress inhibitors and creators and their impacts on university teachers' work performance in higher education", *Cognition, Technology and Work*, Vol. 23 No. 2, pp. 315-330.
- Li, H., Wu, Y., Cao, D. and Wang, Y. (2021), "Organisational mindfulness towards DT as a prerequisite of information processing capability to achieve market agility", *Journal of Business Research*, Vol. 122, pp. 700-712.
- MacKenzie, S.B. and Podsakoff, P.M. (2012), "Common method bias in marketing: causes, mechanisms, and procedural remedies", *Journal of Retailing*, Vol. 88 No. 4, pp. 542-555.
- Madrid, H.P., Patterson, M.G., Birdi, K.S., Leiva, P.I. and Kausel, E.E. (2014), "The role of weekly high-activated positive mood, context, and personality in innovative work behavior: a multilevel and interactional model", *Journal of Organizational Behavior*, Vol. 35 No. 2, pp. 234-256.
- Magesa, M.M. and Jonathan, J. (2021), "Conceptualising digital leadership characteristics for successful DT: the case of Tanzania", *Information Technology for Development*, Vol. 28 No. 4, pp. 777-796.
- Mäkineniemi, J.P., Ahola, S. and Joensuu, J. (2020), "A novel construct to measure employees' technology related experiences of well-being: empirical validation of the techno-work engagement scale (TechnoWES)", *Scandinavian Journal of Work and Organizational Psychology*, Vol. 5 No. 1, pp. 1-14, doi: [10.16993/sjwop.79](https://doi.org/10.16993/sjwop.79).
- Martín-de Castro, G., Delgado-Verde, M., Navas-López, J.E. and Cruz-González, J. (2013), "The moderating role of innovation culture in the relationship between knowledge assets and product innovation", *Technological Forecasting and Social Change*, Vol. 80 No. 2, pp. 351-363.
- Meng, J. and Berger, B.K. (2019), "The impact of organisational culture and leadership performance on PR professionals' job satisfaction: testing the joint mediating effects of engagement and trust", *Public Relations Review*, Vol. 45 No. 1, pp. 64-75.
- Mubarak, N., Khan, J., Yasmin, R. and Osmadi, A. (2021), "The impact of a proactive personality on innovative work behavior: the role of work engagement and transformational leadership", *Leadership and Organization Development Journal*, Vol. 42 No. 7, pp. 989-1003, doi: [10.1108/LODJ-11-2020-0518](https://doi.org/10.1108/LODJ-11-2020-0518).

-
- Mulligan, R., Ramos, J., Martín, P. and Zornoza, A. (2021), "Inspiring innovation: the effects of leader-member exchange (LMX) on innovative behavior as mediated by mindfulness and work engagement", *Sustainability*, Vol. 13 No. 10, p. 5409.
- Mumford, M.D. and Licuanan, B. (2004), "Leading for innovation: conclusions, issues, and directions", *The Leadership Quarterly*, Vol. 15 No. 1, pp. 163-171.
- Naveed, R.T., Alhaidan, H., Al Halbusi, H. and Al-Swidi, A.K. (2022), "Do organisations really evolve? The critical link between organisational culture and organisational innovation toward organisational effectiveness: pivotal role of organisational resistance", *Journal of Innovation and Knowledge*, Vol. 7 No. 2, p. 100178.
- Nisafani, A.S., Kiely, G. and Mahony, C. (2020), "Workers' technostress: a review of its causes, strains, inhibitors, and impacts", *Journal of Decision Systems*, Vol. 29 No. sup1, pp. 243-258.
- Orth, M. and Volmer, J. (2017), "Daily within-person effects of job autonomy and work engagement on innovative behaviour: the cross-level moderating role of creative self-efficacy", *European Journal of Work and Organizational Psychology*, Vol. 26 No. 4, pp. 601-612.
- Özsungur, F. (2019), "Ethical leadership, intrapreneurship, service innovation performance and work engagement in chambers of commerce and industry", *Journal of Human Behavior in the Social Environment*, Vol. 29 No. 8, pp. 1059-1081.
- Paladino, A. (2007), "Investigating the drivers of innovation and new product success: a comparison of strategic orientations", *Journal of Product Innovation Management*, Vol. 24 No. 6, pp. 534-553.
- Pallant, J. (2013), *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows*, 4th ed., McGraw Hill Open University Press, England.
- Podsakoff, P.M. and Organ, D.W. (1986), "Self-reports in organizational research: problems and prospects", *Journal of Management*, Vol. 12 No. 4, pp. 531-544.
- Porfirio, J.A., Carrilho, T., Felício, J.A. and Jardim, J. (2021), "Leadership characteristics and DT", *Journal of Business Research*, Vol. 124, pp. 610-619.
- Parzefall, M.R., Seeck, H. and Leppänen, A. (2008), "Employee innovativeness in organisations: a review of the antecedents", *Finnish Journal of Business Economics*, Vol. 2 No. 8, pp. 165-182.
- Ragu-Nathan, T.S., Tarafdar, M., Ragu-Nathan, B.S. and Tu, Q. (2008), "The consequences of technostress for end users in organisations: conceptual development and empirical validation", *Information Systems Research*, Vol. 19 No. 4, pp. 417-433.
- Ramali, K. (2018), "Digital payment methods in Libya report", available at: <https://medium.com/@khadejahusseini/digital-money-libya-11883c69242e>
- Reydet, S. and Carsana, L. (2017), "The effect of digital design in retail banking on customers' commitment and loyalty: the mediating role of positive affect", *Journal of Retailing and Consumer Services*, Vol. 37, pp. 132-138.
- Rohwer, E., Flöther, J.C., Harth, V. and Mache, S. (2022), "Overcoming the 'dark side' of technology—a scoping review on preventing and coping with Work-Related technostress", *International Journal of Environmental Research and Public Health*, Vol. 19 No. 6, p. 3625.
- Rönkkö, M. and Cho, E. (2022), "An updated guideline for assessing discriminant validity", *Organizational Research Methods*, Vol. 25 No. 1, pp. 6-14.
- Ryan, R.M., Mims, V. and Koestner, R. (1983), "Relation of reward contingency and interpersonal context to intrinsic motivation: a review and test using cognitive evaluation theory", *Journal of Personality and Social Psychology*, Vol. 45 No. 4, p. 736.
- Salminen, R.T., Oimonen, M. and Haimala, J. (2014), "Managerial implications in solution business studies: analysis of type of relevance addressed", *Journal of Business and Industrial Marketing*, Vol. 29 Nos 7/8, pp. 562-573.
- Santos-Vijande, M.L., López-Sánchez, J.Á., Pascual-Fernández, P. and Rudd, J.M. (2021), "Service innovation management in a modern economy: insights on the interplay between firms'

- innovative culture and project-level success factors”, *Technological Forecasting and Social Change*, Vol. 165, p. 120562.
- Sareen, A. and Pandey, S. (2021), “Organizational innovation in knowledge intensive business services: the role of networks, culture and resources for innovation”, *FIIB Business Review*, Vol. 11 No. 1, p. 23197145211020737.
- Sarros, J.C., Cooper, B.K. and Santora, J.C. (2008), “Building a climate for innovation through transformational leadership and organisational culture”, *Journal of Leadership and Organizational Studies*, Vol. 15 No. 2, pp. 145-158.
- Satell, G., Kates, A. and McLees, T. (2021), “4 Principles to guide your digital transformation”, available at: <https://hbr.org/2021/11/4-principles-to-guide-your-digital-transformation>
- Sattayaraksa, T. and Boon-Itt, S. (2016), “CEO transformational leadership and the new product development process: the mediating roles of organisational learning and innovation culture”, *Leadership and Organization Development Journal*, Vol. 37 No. 6, pp. 730-749.
- Schaufeli, W.B., Salanova, M., González-Romá, V. and Bakker, A.B. (2002), “The measurement of engagement and burnout: a two sample confirmatory factor analytic approach”, *Journal of Happiness Studies*, Vol. 3 No. 1, pp. 71-92.
- Schaufeli, W.B. (2015), “Engaging leadership in the job demands-resources model”, *Career Development International*, Vol. 20 No. 5, pp. 446-463, doi: [10.1108/CDI-02-2015-0025](https://doi.org/10.1108/CDI-02-2015-0025).
- Schaufeli, W.B., Shimazu, A., Hakanen, J., Salanova, M. and De Witte, H. (2017), “An ultra-short measure for work engagement”, *European Journal of Psychological Assessment*, Vol. 35 No. 4, pp. 1-15.
- Schein, E.H. (2004), *Organizational Culture and Leadership*, Jossey-Bass, San Francisco, CA.
- Schilke, O., Hu, S. and Helfat, C.E. (2018), “Quo Vadis, dynamic capabilities? A content-analytic review of the current state of knowledge and recommendations for future research”, *Academy of Management Annals*, Vol. 12 No. 1, pp. 390-439, doi: [10.5465/annals.2016.0014](https://doi.org/10.5465/annals.2016.0014).
- Schwab, K. (2017), *The Fourth Industrial Revolution*, Crown Publishing Group, NY.
- Schwarz Müller, T., Brosi, P., Duman, D. and Welp, I.M. (2018), “How does the DT affect organisations? Key themes of change in work design and leadership”, *Management Revu*, Vol. 29 No. 2, pp. 114-138.
- Shaikh, A.A., Glavee-Geo, R. and Karjaluoto, H. (2017), “Exploring the nexus between financial sector reforms and the emergence of digital banking culture—evidence from a developing country”, *Research in International Business and Finance*, Vol. 42, pp. 1030-1039.
- Shu, Q., Tu, Q. and Wang, K. (2011), “The impact of computer self-efficacy and technology dependence on computer-related technostress: a social cognitive theory perspective”, *International Journal of Human-Computer Interaction*, Vol. 27 No. 10, pp. 923-939.
- Slater, S.F., Mohr, J.J. and Sengupta, S. (2014), “Radical product innovation capability: literature review, synthesis, and illustrative research propositions”, *Journal of Product Innovation Management*, Vol. 31 No. 3, pp. 552-566.
- Srivastava, S.C., Chandra, S. and Shirish, A. (2015), “Technostress creators and job outcomes: theorising the moderating influence of personality traits”, *Information Systems Journal*, Vol. 25 No. 4, pp. 355-401.
- Sultan, N. (2015), “Reflective thoughts on the potential and challenges of wearable technology for healthcare provision and medical education”, *International Journal of Information Management*, Vol. 35 No. 5, pp. 521-526.
- Sweeney, P. (2015), “How globalisation and technology drive insecurity”, available at: <https://socialeurope.eu/insecurity>
- Tanniru, M. (2018), “Digital leadership”, *Management of Information Systems*, InTech., doi: [10.5772/intechopen.76045](https://doi.org/10.5772/intechopen.76045).
- Tarafdar, M., Pullins, E.B. and Ragu-Nathan, T.S. (2015), “Technostress: negative effect on performance and possible mitigations”, *Information Systems Journal*, Vol. 25 No. 2, pp. 103-132.

- Tian, G. and Zhang, Z. (2020), "Linking empowering leadership to employee innovation: the mediating role of work engagement", *Social Behavior and Personality: An International Journal*, Vol. 48 No. 10, pp. 1-8.
- Tigre, F.B., Curado, C. and Henriques, P.L. (2023), "Digital leadership: a bibliometric analysis", *Journal of Leadership and Organizational Studies*, Vol. 30 No. 1, pp. 40-70.
- Trabucchi, D., Bellis, P., Di Marco, D., Buganza, T. and Verganti, R. (2021), "Attitude vs involvement: a systematic literature review at the intersection between engagement and innovation", *European Journal of Innovation Management*, Vol. 24 No. 5, pp. 1730-1762, doi: [10.1108/EJIM-05-2020-0171](https://doi.org/10.1108/EJIM-05-2020-0171).
- Tsindeliani, I.A., Proshumin, M.M., Sadovskaya, T.D., Popkova, Z.G., Davydova, M.A. and Babayan, O.A. (2022), "Digital transformation of the banking system in the context of sustainable development", *Journal of Money Laundering Control*, Vol. 25 No. 1, pp. 165-180, doi: [10.1108/JMLC-02-2021-0011](https://doi.org/10.1108/JMLC-02-2021-0011).
- Vaccaro, I.G., Jansen, J.J., Van Den Bosch, F.A. and Volberda, H.W. (2012), "Management innovation and leadership: the moderating role of organisational size", *Journal of Management Studies*, Vol. 49 No. 1, pp. 28-51.
- Vial, G. (2021), "Understanding digital transformation: a review and a research agenda", *Managing Digital Transformation Understanding the Strategic Process*, 1st ed., Routledge, pp. 13-66, available at: www.taylorfrancis.com/chapters/edit/10.4324/9781003008637-4/understanding-digital-transformation-gregory-vial
- Wang, K., Shu, Q. and Tu, Q. (2008), "Technostress under different organisational environments: an empirical investigation", *Computers in Human Behavior*, Vol. 24 No. 6, pp. 3002-3013.
- Weisman, R. (2019), "A leadership approach to successful DT using enterprise architecture", Doctoral dissertation, University of Ottawa.
- Westerman, G., Tannou, M., Bonnet, D., Ferraris, P. and McAfee, A. (2012), "The digital advantage: how digital leaders outperform their peers in every industry", *MIT Sloan Management and Capgemini Consulting, MA*, Vol. 2, pp. 2-23.
- Wiesböck, F. and Hess, T. (2020), "Digital innovations", *Electronic Markets*, Vol. 30 No. 1, pp. 75-86.
- Wu, D.D. and Olson, D.L. (2020), "The effect of COVID-19 on the banking sector", *Pandemic Risk Management in Operations and Finance*, Springer, Cham, pp. 89-99.
- Zeike, S., Bradbury, K., Lindert, L. and Pfaff, H. (2019), "Digital leadership skills and associations with psychological well-being", *International Journal of Environmental Research and Public Health*, Vol. 16 No. 14, p. 2628.

Further reading

- Ardi, A., Djati, S.P., Bernarto, I., Sudibjo, N., Yulianeu, A., Nanda, H.A. and Nanda, K.A. (2020), "The relationship between DT leadership styles and knowledge-based empowering interaction for increasing organisational innovativeness", *International Journal of Innovation, Creativity and Change*, Vol. 11 No. 3, pp. 259-277.
- Filotto, U., Caratelli, M. and Fornezza, F. (2021), "Shaping the DT of the retail banking industry. empirical evidence from Italy", *European Management Journal*, Vol. 39 No. 3, pp. 366-375.
- Greenwood, R., Oliver, C., Lawrence, T.B. and Meyer, R.E. (2017), *The Sage Handbook of Organisational Institutionalism*, Sage, LA.
- Jung, D.I., Chow, C. and Wu, A. (2003), "The role of transformational leadership in enhancing organisational innovation: hypotheses and some preliminary findings", *The Leadership Quarterly*, Vol. 14 Nos 4/5, pp. 525-544.
- Kothari, U. and Seetharaman, A. (2020), "Impact of digital transformation on retail banking industry in the UAE", *Re-imagining Diffusion and Adoption of Information Technology and Systems: A*

- Lukas, B.A., Menon, A. and Bell, S.J. (2002), "Organising for new product development speed and the implications for organisational stress", *Industrial Marketing Management*, Vol. 31 No. 4, pp. 349-355.
- O'Cass, A. and Viet Ngo, L. (2007), "Market orientation versus innovative culture: two routes to superior brand performance", *European Journal of Marketing*, Vol. 41 Nos 7/8, pp. 868-887, doi: [10.1108/03090560710752438](https://doi.org/10.1108/03090560710752438).
- Saunders, M., Lewis, P. and Thornhill, A. (2009), *Research Methods for Business Students*, Pearson education, Noida.
- Schiama, G., Schettini, E. and Santarsiero, F. (2021), "How wise companies drive digital transformation", *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 7 No. 2, p. 122.
- Schiama, G., Schettini, E., Santarsiero, F. and Carlucci, D. (2021), "The transformative leadership compass: six competencies for DT entrepreneurship", *International Journal of Entrepreneurial Behavior and Research*, doi: [10.1108/IJEBR-01-2021-0087](https://doi.org/10.1108/IJEBR-01-2021-0087).
- Tabachnick, B.G. and Fidell, L.S. (2007), *Using Multivariate Statistics*, 5th ed., Pearson Education, Boston, MA.
- Utoyo, I., Fontana, A. and Satrya, A. (2020), "The role of entrepreneurial leadership and configuring core innovation capabilities to enhance innovation performance in a disruptive environment", *International Journal of Innovation Management*, Vol. 24 No. 6, p. 2050060.

Appendix

Digital innovation

- The quality of our digital solutions is superior compared to our competitors.
- The features of our digital solutions are superior compared to our competitors.
- The applications of our digital solutions are totally different from our competitors.
- Our digital solutions are different from our competitors in terms of product platform.
- Our new digital solutions are minor improvements of existing products.
- Some of our digital solutions are new to the market at the time of launching.

Technostress inhibitors

Literacy facilitation

- I am strategic about the way I manage my academic workload.
- I am satisfied with the progress I have made toward meeting my overall career goals.
- I regularly seek advice and help from teaching staff.
- Time spent on private study.

Technical support provision

- Our end-user help desk is well staffed by knowledgeable individuals.
- Our end-user help desk is easily accessible.
- Our end-user help desk is responsive to end-user requests.

Involvement facilitation

- Our end users are rewarded for using new technologies.
- Our end users are consulted before introduction of new technology.
- Our end users are involved in technology.

Techno-work engagement

- At my work, I feel bursting with energy (vigor).
- I am enthusiastic about my job (dedication).
- I am immersed in my work (absorption).

Innovative culture

- We are energetic about being innovative in this firm (innovativeness).
- We are encouraged to try new things and to take advantage of opportunities in this firm (rapid exploitation of advantageous circumstances).
- We will be rewarded for our risk taking in this firm (risk taking).

Corresponding author

Hussein-Elhakim Al Issa can be contacted at: alissah@gmail.com