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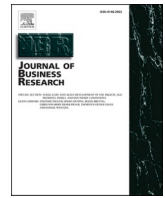
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Mastering digital transformation: The nexus between leadership, agility, and digital strategy

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ABSTRACT

Drawing upon new institutional theory, we developed and tested a model on how digital transformational leadership and organizational agility influence digital transformation with digital strategy as a moderator. We found that digital transformational leadership and organizational agility positively influence digital transformation, and digital transformational leadership influences organizational agility. The finding of our study also indicates organizational agility to mediate the relationship between digital transformational leadership and digital transformation. Our findings offer an advanced understanding of the impact of transformational leadership and organizational agility on digital transformation and the role of digital strategy. Our study's findings address critical questions about how leadership style and promoting organizational agility in the public sector can enhance digital transformation.

1. Introduction

Jack Welch once said, “When the rate of change inside an institution becomes slower than the rate of change outside, the end is near” (Viaene, 2018). The current business environment and operations are undergoing rapid changes due to current digital transformation technologies. With the integration of the Internet, blockchain, big data, artificial intelligence (AI), and related technologies, the changing dynamics of customer demand, and the disturbances stemming from COVID-19, business operations changes have become problematic. Therefore, organizations, especially in the public sector, are seriously exploring the opportunities emerging digital transformation technologies provide to enhance organizational agility and the flexibility needed to adapt to changing environments and meet government and customer demands. However, public sector organizations are still facing many barriers to implementing digital transformation, such as the lack of administrative skills, data availability, lack of resources, lack of technological capabilities (Ferraris et al., 2020), and environmental uncertainty related to public management in the public sector (Oliva et al.,

2019). Despite these difficulties, implementing digital transformation technologies in the public sector organization holds many benefits, such as improved transparency and accountability, better access to government data, support for innovation, a responsive supply chain, improved government services, support for environmental initiatives, operational benefits, and the encouragement of participation (Altayar, 2018; Seepma et al., 2020; AlNuaimi et al., 2021a).

McGrath and McManus (2020) reported that many business leaders nowadays are rushed into investing in large-scale, radical digital transformation and hoping for the best. This leads to expensive digital transformation failures that result in management departures, layoffs, and a back-to-basics strategy wherein digital efforts are sidelined, thus remaining in the pilot-project stage (Siebel, 2019). The leading cause of this is the growing disconnect between rhetoric and reality, accompanied by the ongoing strategy–execution gap (Li, 2020). Throughout Industry 4.0, many studies are available that could enable organizations to pursue digital transformation and innovate their processes to generate many benefits. However, for organizations to remain successful and to survive in today's disruptive market environment, they must tackle the

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challenges that digital transformation, innovation, commitment, new skill sets, and other rapidly emerging new technologies pose (Scuotto, Magni, Palladino, and Nicotra, 2022).

Nevertheless, many organizations fail with digital transformation because they begin with technological changes without building holistic plans and coherent digital strategies (DSs) (Stefanova and Kabakchieva, 2019; Bresciani et al., 2021a). Leaders must ensure that their organizations develop digital mindsets and the agility required to respond to disruptions related to digital technologies (Vial, 2019). Consequently, this study aims to combine several internal factors that could influence digital transformation in the public sector to understand their interactions and contributions to organizational agility. Thus, this study aims to: (1) examine the relationship between organizational agility and digital transformational leadership, including this relationship's influence on digital transformation; and (2) determine whether any positive moderation effect of digital strategy on organizational agility, digital transformational leadership, and digital transformation exists. We drew upon institutional theory (INT: Greenwood & Hinings, 1996; Greenwood et al., 2017) and new institutional theory (NIT: Greenwood, Oliver, Sahlin, & Suddaby, 2008) to examine and find the answer to these two research questions.

Thus, this study has several key contributions to advance theory and practice in the field. First, INT is often used to explain the adoption and spread of formal organizational structures and organizational culture change, including written policies, standard practices, and new forms of organization (Suddaby et al., 2010). However, the utilization of INT in investigating organizational agility in the literature is lacking. Dubey et al. (2018a) recommended augmenting INT in future research to shed light on the influence of organizational agility in the context of digital transformation technologies. This paper intends to bridge this gap by utilizing INT, emphasizing new institutional theory (NIT) to investigate this phenomenon. Second, our study fills in the lack of understanding of how organizational agility, leadership, and strategy can contribute to digital transformation, especially when many public and private sector organizations are pushing the need to deploy digital transformation to survive during and post COVID-19 (Li, Hu, Zhao, and Li, 2021). Organizations are more likely to succeed with digital transformation by focusing on internal abilities, leadership, relationships, and the alignment of digital transformation with business strategy, which, in turn, enhances their agility to respond to environmental turbulence (Li et al., 2021). Finally, our study advances extant literature on digital transformation and organizational agility in the context of the public sector organization. However, recent literature investigating the impact of digital transformation technologies in the context of public sector organization's supply chain knowledge domain (Frössling and Ek, 2020; Nekrasov and Sinitynsya, 2020; Seepma et al., 2020; AlNuaimi et al., 2021a), or have been qualitative and conceptual studies (Durão et al., 2019; Guarnieri and Gomes, 2019). Hence, this study aims to fill this gap by investigating various internal factors influencing digital transformation implementation in the public sector organization.

2. Literature review and hypotheses development

This study's theoretical framework is based on one primary theory: the NIT theory. NIT has been widely used in the digital transformation literature to investigate various aspects of digital transformation (Dubey et al., 2018b; Shashi et al., 2020; Verhoef et al., 2021). However, what is missing in the literature is the use of this theory to investigate internal aspects related to digital transformation implementation, such as leadership, OA, and DS, which are addressed in this section.

2.1. Institutional theory (INT) and new institutional theory (NIT)

INT is a prominent perspective in contemporary organizational research. It encompasses a large body of theoretical and empirical work emphasizing the importance of cultural understandings and shared

expectations (David and Bitektine, 2009). NIT also explains how organizations interact with their environments to survive and succeed amidst competition and challenges. Institutions/organizations are viewed as products of shared understandings and shared interpretations of acceptable norms of collective activity, such as policies, practices, and job titles (Parsons, 1956; Meyer and Rowan, 1977). NIT highlights three fundamental forces that shape organizations. The first is coercive pressures, which often stem from government-sponsored agencies, the demands of the powerful, or resource-controlling organizations. The second is imitative pressures, which result from decision-maker's dependence on other organizations' behavior to guide their organizations. The third is normative pressure, i.e., social expectations generated through professionals and other actors' implicit or explicit efforts about adopting particular policies and practices (Meyer and Rowan, 1977).

NIT has commonly been used to understand the organizational change concerning implementing advanced technology by investigating external pressures/factors on organizations' practices and cultures (Adebanjo et al., 2018; Dubey et al., 2019). Change and innovation have been explained within NIT by emphasizing the sociocultural aspects of organizing using two approaches: (1) considering the relationship between stasis and change, seeing continuity and homogeneity as well as change and heterogeneity amongst organizations (Greenwood et al., 2017); and (2) perceiving stasis and change as the outcomes of planning, structures, activities, and actions at multiple levels of analysis, including the societal, field, organizational, and individual levels (Scott, 2013). This study opted to use these two NIT approaches to explore digital transformation as a complex and radical coercive change in the public sector organization, emphasizing leadership, strategy, and, more importantly, organizational agility.

2.2. Digital transformation

Digital transformation (DT) is characterized by planned changes built on a foundation of advanced technologies (Bresciani et al., 2021b). Digital transformation can be described as an organizational shift to big data, analytics, the cloud, mobile communication technologies, and social media platforms to provide goods and services (Bresciani et al., 2021b; Nwankpa and Roumani, 2016). Nasiri et al. (2020) also described digital transformation as a tool for transforming business processes, cultures, and organizational aspects to meet changing market requirements brought about by digital technologies. Digital transformation is characterized by three elements: (1) reexamining and redefining firm boundaries; (2) the opening up of products and services to community input, as well as reducing property rights; and (3) reshaping organizational and product identities (Parmentier and Mangematin, 2014). NIT views digital transformation as a radical institutional change that diffuses through and disrupts both fields and organizations (Del Giudice et al., 2021; Hinings et al., 2018). Digital transformation comprises the combined effects of several digital innovations and technologies, bringing about novel actors, structures, practices, values, arrangements, and beliefs that change, destroy, replace, or complement existing rules of the game within organizations, ecosystems, industries, or fields (Westerman, Bonnet, and McAfee, 2014; Scuotto, Arrigo, Candelo, and Nicotra, 2020; Parmentier and Mangematin, 2014; Krimpmann, 2015). Digital transformation entails various consequences that reshape business models, impact employment among leaders, employees, and knowledge workers, and impact organizational cultures (Scuotto, Nicotra, Del Giudice, Krueger, and Gregori, 2021; Legner et al., 2017; Loebbecke and Picot, 2015).

2.3. Leadership and digital transformation

From an NIT perspective, digital transformation represents an organizational change in digitally-enabled institutional arrangements that diffuse through fields and organizations. Digital transformation must gain legitimacy through the organization's belief system to succeed

(Hinings et al., 2018). From an NIT perspective, leadership is considered a fundamental element of organizational values and belief systems; when organizations change over time, leadership must also change and adapt (Biggart and Hamilton, 1987). Organizations shift to digital transformation by genuinely changing how they operate and deliver their products/services by promoting digital cultures that flourish (Bresciani, Ferraris, Romano and Santoro, 2021; Chierici, Tortora, Del Giudice, and Quacquarelli, 2021). It would not be possible without leaders who create platforms for this and drive stakeholders toward action (Sainger, 2018).

The role of a leader in assuring and propelling the shift to Industry 4.0 has been highlighted in the literature (Li et al., 2016; Porfirio et al., 2021). Leaders can help companies to succeed in the digital age through three habits: (1) following the trends of emergent technologies; (2) determining the direction of the digital change and investment strategy; and (3) leading the team to change swiftly and precisely (Swift and Lange, 2018). Leaders with digital transformation mindsets, also known as “digital leaders,” can build collaborative networked organizations and find digital competencies (Frankowska and Rzezzycki, 2020; Bresciani et al., 2021c). Transformational leadership (TFL) has been specifically highlighted in the digital transformation literature investigating leadership in a digital environment. Transformational leaders engender trust, seek to develop leadership in others, exhibit self-sacrifice, and serve as moral agents, focusing both themselves and their followers on objectives that transcend the immediate needs of the workgroup (Avolio, 1999). Hence, digital leadership is considered a combination of the transformational leadership style and digital technology (De Waal et al., 2016).

The extant literature indicates that transformational leadership facilitates organizations’ innovation capability, which is the foundation of digital transformation (Sasmoko et al., 2019; Lei et al., 2020; AlNuaimi et al., 2021b). Ardi et al. (2020) also investigated digital leadership from a transformational leadership perspective and determined that digital transformational leadership positively influences organizational innovativeness and performance. Hence, following the above discussion, as well as INT views of organizational change and leadership, we propose the following hypothesis:

H1: Transformational digital leadership positively influences digital transformation.

2.4. Organizational agility and digital transformation

According to INT, institutional environments are vital in (re)forming organizational structures and actions. From the NIT perspective, decisions are not driven entirely by rational goals of efficiency but also by social and cultural factors and concerns for legitimacy (Scott, 1995). Digital transformation (DT) can be viewed through the lens of institutional pressure (Liu et al., 2010; Dubey et al., 2018b; Gupta et al., 2020). The decision to implement digital transformation may not be due to internal motives; institutions are likely to be stimulated to adopt and use technology via external isomorphic pressures, such as competitors, customers, or the government (Bresciani et al., 2021; DiMaggio and Powell, 1983). Mimetic, coercive, and normative forces can play a role in influencing institutions to adopt digital transformation (Teo et al., 2003). Regardless of the pressure, organizational change is considered a precondition and can become a bottleneck for digital transformation if not adapted properly (Teichert, 2019). Organizations need to change their traditional processes, structure, and management towards more agile processes and management practices.

Agility refers to a system’s ability to meet rapidly changing needs and other external stimuli cost-effectively without compromising the quality of its products and services (Ganguly et al., 2009). It allows firms to replace existing processes by applying new procedures and resources, and it is instrumental in redesigning organizational structures based on new conditions (Troise, Corvello, Ghobadian, and O’Regan, 2022; Ferraris et al., 2022; Darvishmotevali et al., 2020). Meanwhile,

organizational agility (OA) is defined as the organization’s ability to identify unexpected changes in the environment and respond swiftly and efficiently by utilizing and reconfiguring internal resources, thus gaining a competitive advantage in the process (Žitkienė and Deksnys, 2018). From an NIT perspective, agility can be explained by emphasizing the concept of cognitive factors (DiMaggio, 1991). Specifically, agile institutions should focus on the representation, use, and development of the content and structure of knowledge structures both to address value commitments and facilitate the capacity for action in changing environments (Walsh, 1995).

Menon and Suresh (2021) expanded the notion of organizational agility in the context of ICT adoption. They identified eight factors that could influence organizational agility: (1) the ability to sense the environment; (2) the organizational structure; (3) the adoption of ICT; (4) organizational learning; (5) human resource strategies; (6) leadership; (7) willingness to change; and (8) collaboration with stakeholders. On the one hand, digital transformation has improved organizational agility, as digitization leads to new occupational profiles and specific stress on the organizational fabric and agility (Del Giudice et al., 2018; Jesse, 2018). Ghasemaghaei et al. (2017) argued that, by utilizing data analytics, firms could enhance their agility by achieving greater levels of fit between analytical tools, data, employees’ capabilities, and firm tasks. On the other hand, technology competencies and digital transformation (Rane et al., 2019; Nguyen et al., 2020) and e-commerce capabilities (Li et al., 2020) are vital for improving organizational agility. Digital transformation is also considered a prerequisite for information processing capability to achieve agility (Li et al., 2021). Thus, we propose that organizational agility influences digital transformation:

H2: Organizational agility positively influences digital transformation.

2.5. The relationship between leadership and organizational agility in digital transformation

From an NIT perspective, for an organization to move toward an institutionally novel change, a high degree of organizational capacity is needed that involves these skills and resources within the organization and its mobilization. Mobilization, in this sense, is an act of leadership (Greenwood and Hinings, 1996). NIT also posits that organizations should improve and guard their legitimacy when proposing any changes by adopting organizational practices and seeking leaders with “desirable” qualities/practices (Meyer and Rowan, 1977; Scott, 1995). Meanwhile, agile firms must foster five agile human attributes: (1) forging a common purpose; (2) embedding core values; (3) enriching work; (4) promoting personal growth; and (5) providing commensurate returns (Shafer et al., 2001). With these human attributes and proper leadership, firms can become flexible and quickly adaptive to change by making the necessary changes to the organizational structure. Thus, it can easily be assumed that the leadership style used in an organization may influence organizational agility. Leadership is vital for improving firms’ organizational agility through leaders’ ability to alter their business situations and organizations’ readiness to reverse unsuccessful strategic decisions (Ahhammad et al., 2020). However, the existing literature markedly fails to establish how this relationship occurs or even the interdependence level between these variables (de Oliveira et al., 2012).

In the present study, organizational agility is viewed as a manifestation of continuous improvement, continuous delivery, communication, team and people maturity, and flexibility. An agile organization is represented by teams working together, being motivated, gifted, self-disciplined, organized, and showing a remarkable ability to improvise (Stettina and Heijstek, 2011). It requires proper leadership to provide power distribution, authority, and responsibilities among the members, thus contributing to the team’s motivation and confidence (Gunasekaran, 1999). Hence, organizational leadership plays an essential role in enforcing an organization’s commitment to improving organizational

agility (Raеisi and Amirnejad, 2017). NIT views leadership skills as a set of activities required to manage institutional change. These skills include being charismatic (envisioning, energizing, and enabling), instrumental (structuring, controlling, and rewarding), and institutional (ensuring that changes stick) (Nadler and Tushman, 1990). Such leaders are linked to transformational leadership in the literature; for example, transformational leaders drive followers' values, attitudes, and emotions (Bass and Avolio, 1993). These leaders can improve organizational agility through their ability to develop appropriate relationships with subordinates and encourage them to think beyond their personal needs operate effectively in complex and risky situations. Transformational leaders prepare themselves and their employees to take appropriate action when facing challenges and potential opportunities (Burke and Collins, 2001; Veiseh and Eghbali, 2014). In fact, in agile organizations, the leadership constantly adjusts courses of action and development trajectories. Such leaders are not satisfied merely with periodic strategy reviews, which is why companies such as Nokia have failed (Doz and Kosonen, 2008).

In the context of the present study, transformational leadership has been found to influence e-business adoption (Alos-Simo et al., 2017) and to improve organizational agility (Veiseh and Eghbali, 2014; Akkaya and Tabak, 2020; Wanasida et al., 2020). In addition, transformational leadership affects organizational creativity (Veiseh and Eghbali, 2014), organizational innovation (Pirayesh and Pourrezay, 2019), and innovation projects' performance (de Oliveira et al., 2012). Transformational leadership can also improve organizational learning orientations to achieve higher levels of organizational ambidexterity, which manifests organizational agility (Ojha et al., 2018). In addition, Lin (2011) showed that transformational leadership has a positive and significant effect on public sector organizations' agility and supports service recovery performance. Hence, we propose the following hypothesis:

H3a. Digital transformational leadership positively influences organizational agility.

Agile organizations should spread organizational agility, workforce agility, and system agility (Muduli, 2016). Organizational agility has four fundamental skills: responsiveness; flexibility; speed; and competence (Akkaya and Tabak, 2020). It means that all employees need to change their actions by implementing adequate information systems, precise and fast instructions, and support from top leadership (Larjo-vuori et al., 2016). As to dimensions of organizational agility, culture, leadership, and organizational change have significant positive relationships with organizational performance (Dalvi et al., 2013). Transformational leadership can influence organizational agility and digital transformation by creating a cultural context that embodies its mission statement and guides employee behavior toward attaining the requisite skills (Babnik et al., 2014). Thus, we propose that organizational agility can also mediate the relationship between digital transformational leadership and digital transformation:

H3b. Organizational agility mediates the relationship between digital transformational leadership and digital transformation.

2.6. The moderating role of digital strategy

Dacin et al. (2002) studied the concept of deinstitutionalization in the broader context of institutional change. The traditional beliefs and practices have weakened and disappeared due to new beliefs and practices. It highlights the importance of having an excellent strategy to manage this shift (Dacin et al., 2002). Suddaby et al. (2013) conceptualized strategy in the context of NIT as comprising three interrelated aspects: (1) practices, which refer to the routinized types of behavior upon which actors draw in their strategizing activities; (2) praxis, which represents the activities that are informed and guided by concrete, unfolding strategies; and (3) practitioners, who are the actors performing and engaging with the strategy work based on their education and experience. However, digital transformation is not a typical project or

program quickly introduced and implemented in a planned amount of time. Instead, it must be understood as a dynamic, continuous process (Lipsmeier et al., 2020). Data need to be continuously collected, cleaned, securely stored, and executed in the digital environment to support analyses and generate meaningful output in a feedback loop. Subsequently, the extracted data should be processed to expand all employees and the organization (Correani et al., 2020). Hence, digital transformation requires a comprehensive revision of the firm's operations, strategy, leadership skills, innovation capability, and business models (Schwertner, 2017; Correani et al., 2020).

Although digital transformation offers many opportunities for today's firms, many academics and practitioners struggle to grasp it, mainly because it differs from the well-established concept of IT-enabled organizational transformation (Wessel et al., 2021). This is due to the complexity of the digital transformation processes, as it involves technology, a clear vision, and a detailed digital strategy to complete the necessary steps. In other words, digital transformation requires targeted organizational restructuring and entails consequences for the metrics used to adjust performance (Verhoef et al., 2021). Developing a digital strategy that embraces corporate and business strategies has been the predominant digital transformation success factor (Porfirio et al., 2021). For this reason, we see the emergence of the role of the chief digital officer (CDO) as key to operationalizing digital strategy and making sure that it is aligned with the company's purpose and mission (Henriette et al., 2016). Senior managers and workers cannot benefit from digital transformation if they cannot effectively implement it. Organizations that focus on developing solid digital strategies can use them to drive digital transformation and improve top executives' decision-making processes (Mikalef et al., 2019). Porfirio et al. (2021) consider a digital strategy to be a synergetic sum of information technology (IT) and information systems (IS) strategic initiatives, driven by managers' decisions about exploiting these available infrastructures. Consequently, no matter how talented leaders are in coping with risk and uncertainty or how well they manage the flexibility/efficiency tradeoff, all is for naught if these activities are not aligned with good strategies (Teece et al., 2016). Hence, we propose the following hypothesis:

H4a. Digital strategy moderates the relationship between digital transformational leadership and digital transformation.

Organizational agility is limited in terms of the managerial guidance it provides. The role of managers is limited without having a strategy and adjusting it when needed (Teece et al., 2016). Hence, agility and strategy work in tandem. In this context, organizations need to develop adequate organizational agility to implement an agile digital strategy (Shams et al., 2021). In some cases, agility will need to be sacrificed to aid strategy (Teece et al., 2016). Organizations need to understand that agility is a complex, adaptive strategy. It focuses on specific applications and issues that accompany organizational change, including (1) strategic analysis, which is concerned with gaining insight into the organization's current and future competitiveness; (2) strategic choice, which is concerned with deciding which option or configuration to adopt; and (3) strategic implementation (McCarthy and Tsinopoulos, 2003). This is why Franken and Thomsett (2013) called for organizations to acquire strategic agility, which focuses on rapidly and flexibly adapting to unforeseen changes in the external environment.

However, strategy moves quickly in the digital transformation context; governments and customers increasingly demand higher quality products and services and greater adaptability and customization capability to meet their changing needs (Henriette et al., 2016). Hence, to have agile digital strategies, organizations must have strategies that define the role of information systems in the organization, the business goals to be achieved through digital transformation, the selection of the digital transformation standards and architecture, and how digital transformation is deployed (Lee et al., 2006). A digital strategy must include a clear vision for the organization's development and be supported by the unlimited possibilities of digital technologies to compete in today's market (Vial, 2019; Schwertner, 2017). Moreover, strategic

alignment and governance through establishing a digital strategy and ensuring agility, collaboration, and digital expertise are the primary enablers of digital transformation success (Fischer et al., 2020). Therefore, digital strategy formulation is vital for identifying all of the firm’s business model elements that must be modified according to the scope of its digital transformation (Correani et al., 2020; Morakanyane et al., 2020). Because market needs and technology standards currently vary across locations and change over time, developing an agile digital strategy to meet specific local business needs becomes a critical issue (Lee et al., 2006). Therefore, we propose the following hypothesis:

H4b. Digital strategy moderates the relationship between organizational agility and digital transformation.

This paper’s conceptual model, including hypotheses, is presented in Fig. 1.

3. Methodology

This study utilized a quantitative approach to examine the relationships among digital transformational leadership, organizational agility, digital strategy, and digital transformation in public sector organizations. Since the data used in this study are primary data collected to enrich the literature in the business management field, we conducted survey research via questionnaires.

3.1. Data collection

The present study’s population comprises public sector organizations located in the capital of the UAE, Abu Dhabi. We chose Abu Dhabi because it contains all federal public sector organizations and many local government organizations. The confidentiality of all participants was ensured, and they were free to discontinue their participation at any time. A total of 600 electronic questionnaires were sent to employees’ emails in public sector organizations after receiving approval from their leadership. These organizations were chosen because they have already adopted digital technologies to operate and provide services to the public.

The items were measured using a five-point Likert scale ranging from (1) “Strongly disagree” or “Never” to (5) “Strongly agree” or “Always.” Six indicators were adapted and modified to fit the DT context from previous TFL scales (Podsakoff et al., 1996; Chen and Chang, 2013) to measure DTL. For the measurement of OA, six items were adapted from Cegarra-Navarro et al. (2016). Four statements were adapted from Li et al. (2021) to measure DS. A total of five indicators were adapted to measure the DT (Nasiri et al., 2020). In addition to the demographic questions, a question was added to check whether the respondents were aware of a shared DS in their organizations, which could be helpful later in the analysis and discussion part of the study. Appendix A provides all

scales and items developed and used for the study. We used the procedure used in other studies (Butts et al., 2015; Ng et al., 2019) to collect data from the target sample. It took three weeks to receive the questionnaires from the target sample, with 513 completed responses being returned and validated. Thus, the total sample size of this current study was 513. The response rate was 85.5%, which is more than adequate for the public sector organizations. Table 1 provides the participants’ demographic details.

3.2. Data analysis

After completing the data collection, the data were analyzed and presented using a partial least squares structural equation modeling (PLS-SEM) tool (SmartPLS 3.3.3), which can assess the measurement instrument, conceptual model, and multigroup analysis (MGA) simultaneously. Since this study conducted comprehensive reasoning to test hypotheses grounded in a robust theoretical framework, the choice of SEM as a data-analysis method is justified because PLS-SEM can handle model complexity with fewer restrictions than other methods (Ringle et al., 2012). In addition, PLS-SEM can deliver valid results even for small and medium sample sizes (Chin, 1998).

4. Results

4.1. The measurement model

We assessed the constructs’ reliability using the internal consistency measure analysis, obtaining acceptable values for Cronbach’s alpha and composite reliability (CR). However, DS demonstrated an unacceptable average variance extracted (AVE) value. Therefore, we dropped item DS2 to improve the model’s internal consistency and reliability and avoid having an issue with the model. Table 2 summarizes the results of convergent validity and internal consistency reliability. All indicators and constructs meet the required measurement criteria. Specifically, the outer loadings (λ) are all above 0.612, demonstrating that indicator reliability is achieved (Chin, 1998; Henseler et al., 2009). In addition, Cronbach’s alpha values are above the acceptable threshold of 0.5. The AVE values are >0.50 , denoting that convergent validity is also achieved (Hair et al., 2010). Furthermore, CR values are 0.864 or higher, well above the required minimum level of 0.70, thus demonstrating internal consistency (Hair et al., 2014). In other words, the results show that the model has good convergent validity and internal consistency.

Discriminant validity is how a construct is unique from its counterparts. We checked the discriminant validity of the measures by determining whether the square root of the AVE for each construct was more significant than its correlation with the other factors. As shown in Table 3, the AVE’s square root for each construct was more significant

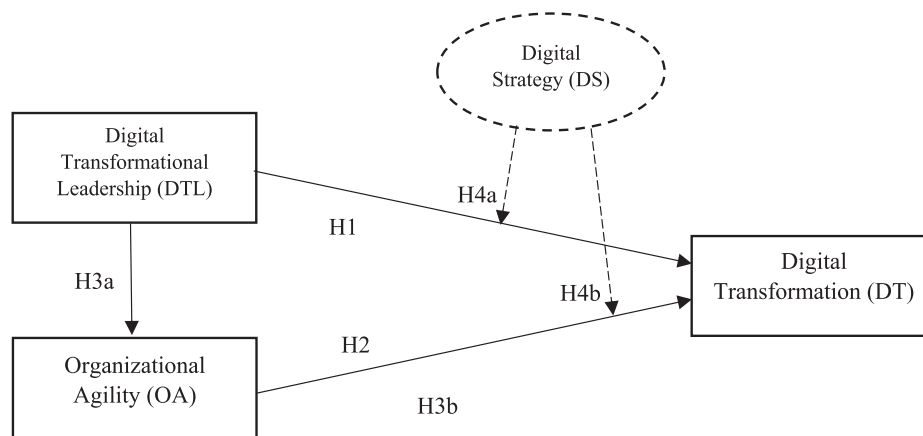


Fig. 1. Conceptual model.

Table 1
Participants' profile (N = 513).

Gender	N	%	Age group	N	%	Education	N	%
1) Male	249	48.5	1) 18–24 years	46	9.0	1) High school/ diploma	117	22.8
2) Female	264	51.5	2) 25–30 years	148	28.8	2) Four-year college/ university	262	51.1
			3) 31–37 years	111	21.6	3) Higher education	134	26.1
			4) 37–44 years	128	25.0			
			5) 45 + years	80	15.6			
Experience			N		%	Years implementing DT	N	%
1) Up to 2 years			25	4.9	1) 1–2 years	72	14.0	
2) 3–5 years			61	11.9	2) 3–5 years	138	26.9	
3) 6–10 years			86	16.8	3) 6–10 years	116	22.6	
4) 11–15 years			76	14.8	4) >10 years	187	36.5	
5) 16–19 years			57	11.1				
6) >20 years			208	40.5				

Table 2
Measurement model.

Items	Loadings	Cronbach's α	CR	AVE
Digital transformation leadership	-	0.924	0.941	0.725
DTL	0.811			
DTL1	0.855			
DTL2	0.837			
DTL3	0.797			
DTL4	0.818			
DTL5	0.971			
DTL6				
Digital transformation (DT)	-	0.840	0.887	0.612
DT1	0.745			
DT2	0.713			
DT3	0.765			
DT4	0.737			
DT5	0.612			
Organizational agility (OA)	-	0.871	0.903	0.607
OA1	0.720			
OA2	0.670			
OA3	0.730			
OA4	0.655			
OA5	0.794			
OA6	0.765			
Digital strategy (DS)	-	0.791	0.864	0.614
DS1	0.651			
DS3	0.762			
DS4	0.755			

Table 3
Fornell–Larcker criterion.

	DS	DT	DTL	OA
DS	0.783			
DT	0.751	0.782		
DTL	0.565	0.688	0.852	
OA	0.624	0.688	0.638	0.779

than the correlation between any pair of factors, thereby confirming the scale's discriminant validity (Fornell and Larcker 1981).

4.2. The structural model

Before testing the structural model, we first tested its collinearity. Collinearity is measured using the variance inflation factor (VIF), and, ideally, the VIF values should be close to and lower than 3 (Hair et al., 2019). The results show that all VIF values are below this threshold, suggesting no collinearity among the constructs. We also examined the adjusted R² value, which indicates the model's predictive power by showing the endogenous variable's variance that the exogenous variables can explain. The adjusted R² value (0.684) indicates that all the constructs combined explain 68.4% of the variance in DT. Further, we checked the Q² values to assess the predictive relevance values

generated by the variables. The Q² values for DT (0.409) and AO (0.243) were above 0, which means that the model has predictive relevance (Chin, 2010).

Finally, the goodness of fit was determined using SmartPLS by calculating the standardized root mean square residual (SRMR; 0.076) and the normed fit index (NFI; 0.866). SRMR values below 0.08 mean that the data fit the model (Hu and Bentler, 1999; Henseler et al., 2014), whereas for NFI values (which are between 0 and 1), the closer the value is to 1, the better the fit (Lohmöller, 1989). Therefore, we can conclude that the model predicts and tests the hypotheses.

4.3. The direct and indirect results of the structural model testing

We tested the proposed hypotheses using SmartPLS, as shown in Fig. 2. The direct effect results determined that H1 was supported (β = 0.282; p < 0.001), as was H2 (β = 0.638; p < 0.001), demonstrating that DTL has a positive impact on OA and DT. Further, H3a was supported (β = 0.233; p < 0.001), indicating the positive relationship between OA and DT. H3b was also supported (β = 0.149; p < 0.001), demonstrating the mediation impact of OA on the DTL–DT relationship. However, the results of the moderation test revealed that H4a (β = 0.005; p = 0.915) and H4b (β = 0.003; p = 0.961) were not supported. The results are summarized in Table 4.

To further explore the moderating effect DS has on how DT relates DTL and OA in organizations that share their DSs compared to organizations that do not, we conducted an MGA. MGA aims to compare the explained variance among groups caused by heterogeneity (Klesel et al., 2019). To do this, we utilized the PLS-MGA test, the parametric test, and the Welch–Satterthwaite test in SmartPLS. In PLS-MGA, a result is significant at the 5% probability of error level if the p-value is <0.05 or >0.95 for a distinct difference of group-specific path coefficients (Sarstedt et al., 2011). The parametric and Welch–Satterthwaite tests are parametric significance tests for the difference in group-specific PLS-SEM results that assume equal variances across groups (Henseler, 2012). These two tests are considered the most conservative PLS-SEM techniques for assessing the differences between the two groups' path coefficients (Md Noor et al., 2019). The MGA results (see Table 5) do not reveal any significant difference, confirming that DS does not have any moderating effect on the relationship between DTL, OA, and DT in both groups (shared vs. not shared DS), indicating insignificant results both for H4a and H4b.

5. Discussion

The current study has examined the conceptual model comprising several variables, namely digital transformational leadership and organizational agility, and how they interact and influence digital transformation under the moderation influence of digital strategy. We formulated the relationships among the identified variables based on new institutional theory (NIT); the results for the hypotheses proposed are discussed in detail below.

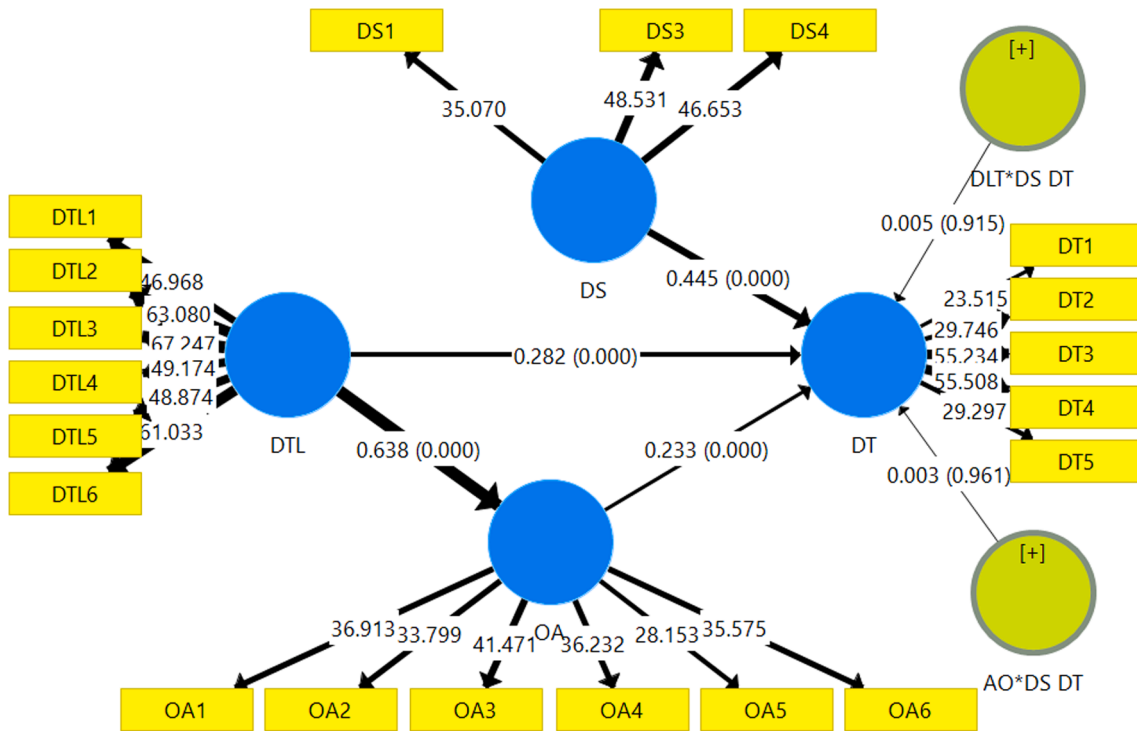


Fig. 2. PLS path model from SmartPLS.

Table 4 Hypothesis testing.

H#	Relationship	B	Std Dev	T Statistics	P-Value	Results		
H1	DTL → DT	0.282	0.043	6.505	0.000	Supported**		
H2	OA → DT	0.233	0.052	4.44	0.000	Supported**		
H3a	DTL → OA	0.638	0.034	18.524	0.000	Supported**		
H3b	DTL → OA → DT	0.149	0.033	4.494	0.000	Supported**		
Moderation								
	Relationship	B	Std Dev	T Statistics	P-Value	5% CILL	95% CIUL	Results
H4a	DS*DTL → DT	0.005	0.051	0.102	0.915	-0.070	0.097	Not Supported
H4b	DS*OA → DT	0.003	0.055	0.048	0.961	-0.084	0.097	Not Supported

Note: ** $p < 0.001$.

Table 5 Multigroup analysis (MGA) results.

Construct	Path coefficients-diff (shared DS vs. not shared)	p-value original 1-tailed (shared DS vs. not shared)	p-value new (shared DS vs. not shared)	p-value (parametric test)	p-value (Welch-Satterthwaite test)
DS*DTL → DT	-0.096	0.823	0.355	0.387	0.353
DS*OA → DT	-0.123	0.789	0.422	0.309	0.366

5.1. Discussion of findings

Based on the extant literature, we had proposed that digital transformational leadership significantly positively influences digital transformation (i.e., H1). The results show that digital transformational leadership positively affects digital transformation, supporting H1. This finding is consistent with our investigation of the literature and NIT, suggesting that transformational leaders are better equipped to handle organizational change, especially in a digital environment (De Waal et al., 2016). From a neo-institutional perspective, these findings affirm that transformational leaders can promote digital values and shift the organizational belief system towards achieving any organizational change, such as digital transformation (Hinings et al., 2018; Sainger,

2018). Therefore, organizations need to seek leaders who have the transformational leadership abilities to digitally transform their operations to stay relevant and compete in the Industry 4.0 era (Li et al., 2016; Porfirio et al., 2021).

Similarly, H2, which proposed that organizational agility significantly influences digital transformation, was also supported. As expected, organizations' agility capability can help shape the change organizations aim to implement, as the literature suggests (Li et al., 2021). Our findings suggest that, for organizations to be agile, they must disrupt their traditional processes, structure, and management (Teichert, 2019; Darvishmotevali et al., 2020), which is precisely what must be done to attain any organizational change, such as digital transformation. Organizations must focus on improving their cognitive

abilities by improving organizational learning and supporting proper knowledge management practices (Menon and Suresh, 2021) to be agile and implement digital transformation initiatives as conceptualized by NIT (DiMaggio, 1991; Walsh, 1995). In addition, organizations need to adopt agile ICT systems and HR strategies to be more agile in a digital environment, as suggested by Menon and Suresh (2021).

H3a. proposed that digital transformational leadership has a positive relationship with organizational agility, while H3b proposed that organizational agility mediates the relationship between digital transformational leadership and digital transformation. The results of the data analysis confirmed the positive association between digital transformational leadership and organizational agility (H3a). These results were in line with earlier studies that suggested that transformational leaders can promote organizational agility through relationship building with subordinates and encourage employees to innovate and take calculated risks when facing challenges and potential opportunities (Burke and Collins, 2001; Veisheh and Eghbali, 2014). Wanasida et al. (2020) found that transformational leadership positively impacts increasing firms' organizational agility, as transformational leadership tends to make the organization change quickly to meet digital transformation demands. Hence, organizations seeking to succeed in digital transformation must look for leaders with transformational leadership attributes to see the problems from many different perspectives that could affect organizational agility.

Furthermore, H3b was empirically-supported, relevant to the previous hypothesis (H3a). This finding supports this study's assumptions that transformational leaders can influence organizational agility and digital transformation in many ways, such as creating a link between the organizational change mission statement and employee behavior, leading to greater agility (Babnik et al., 2014). Such leaders also have the ability and willingness to teach and inspire their subordinates to be creative (Veisheh and Eghbali, 2014) and improve their innovation capability (Pirayesh and Pourrezay, 2019). Such ability to encourage knowledge creation and innovation is essential for firms' survival and agility in a dynamic and unpredictable digital environment (Ferraris et al., 2022; Akkaya and Tabak, 2020).

Finally, the last set of hypotheses examined the moderation effect of digital strategy. H4a hypothesized that digital strategy moderates the relationship between digital transformational leadership and digital transformation, and H4b hypothesized that digital strategy moderates the relationship between organizational agility and digital transformation. Neither hypothesis was supported. The digital strategy does not moderate the relationship between digital transformational leadership and digital transformation, which was not anticipated based on much recent literature suggesting that digital strategy can drive digital transformation by improving decision-making processes (Mikalef et al., 2019). Further, the digital strategy does not moderate the relationship between organizational agility and digital transformation, which was also not expected because the digital strategy has been found to be able to enforce strategic alignment and governance to ensure collaboration and organizational agility (Fischer et al., 2020). Lee et al. (2006) asserted that digital transformation is not simply a matter of standards and architecture but that its successful strategy rests on how digital transformation is deployed and shared. To further investigate this, we examined the scale used for digital strategy. The present study measured digital transformation by adopting the digital-technology-business-strategy alignment scale developed by Li et al. (2021). These authors developed this scale after an extensive literature review and surveying chief information officers (CIOs), subsequently conducting a pre-test and validation among Ph.D. students in a US university, and finally organizing a pilot study with professional IT consultants, which resulted in a Cronbach's alpha value of 0.897. Hence, the digital strategy scale may not be the issue. For this reason, this study also conducted MGA to compare the moderating effect of digital strategy in organizations that share their digital strategies compared to organizations that do not. We observed that digital strategy does not moderate the relationship

between digital transformational leadership, organizational agility, and digital transformation in either group (shared vs. not shared digital strategy) in the UAE public sector organizations.

One possible reason for these unexpected results related to the moderation effect of digital strategy is that the UAE public sector organization has rushed to implement digital strategy due to governmental pressure. Western-based IT consultants in the UAE public sector organizations develop and implement digital strategies based on their private-sector experience, which could be problematic and may not work as expected in the public sector organization. A winning strategy should allow management to rethink their business model to evaluate their existing culture, tasks, and resources to efficiently formulate effective business strategies to maintain a future approach flow (Rothaermel, 2013; Correani et al., 2020). One possible reason is the lack of involvement of the entire organization. When the survey asked the participants whether they were involved in the digital strategy development, almost all the answers were "Never." Recent literature has suggested that digital strategy should focus not only on digitizing and digitalizing but also on how to implement these changes by engaging the entire organization and its people (Ahmed Khamis et al., 2020; Correani et al., 2020; Lipsmeier et al., 2020). Another possible reason is that UAE public sector organization is still experimenting with digital transformation technologies, such as AI and big data. The leadership and the employees are still in a learning stage and therefore not grasping the full benefits of digital strategy; it could take some time to train everyone on digital transformation to help them understand these new concepts and flourish. Regardless of the reasons, digital strategy is considered a key enabler for digital transformation by coordinating the digitalization initiatives in line with a common strategic direction (Lipsmeier et al., 2020).

5.2. Implications for theory

The current study offers four contributions that can help advance research in behavioral and organizational culture in the context of digital transformation. First, the study responds to the call to utilize INT to investigate organizational agility in the digital transformation era and how this influences institutions (Dubey et al., 2018a). We empirically investigated how organizational agility is positively associated with digital transformation and how organizational agility can act as a mediator between digital transformational leadership and digital transformation. Due to this, the present study adds to the scant literature on INT on the adverse impact of organizational agility to support digital transformation, which has been far outweighed by utilizing theories such as RBV and dynamic capability framework (Elia et al., 2021). The previous literature on digital transformation and organizational agility has predominantly been either exploratory in nature (Al Humdan et al., 2020; Shashi et al., 2020) or focused only on resources and capabilities, such as organizational behavior (Felipe et al., 2017; Li et al., 2021), IT capabilities (Irfan et al., 2019; Pattij et al., 2020), flexibility (Ghase-maghaei et al., 2017), innovative behavior, and creativity (Ravichandran, 2018; Mihardjo and Rukmana, 2019; Darvishmotevali et al., 2020). Our findings suggest the apparent value of the NIT perspective in exploring organizational agility and digital transformation as a complex and interrelated organizational challenge in the public sector organizations, emphasizing the role of leadership and strategy.

Second, this paper contributes to the literature by investigating the leadership role in the relationship between organizational agility and digital transformation. The leadership role in organizational agility is a pervasive theme in the existing literature (Dalvi et al., 2013; Raeisi and Amirnejad, 2017; Akkaya and Tabak, 2020; Wanasida et al., 2020). However, the literature on the role of leadership in digital transformation is still nascent (Ardi et al., 2020; Porfirio et al., 2021); the concept of how digital leadership may induce organizational agility and digital transformation has been little explored to date. The conceptualization of digital transformational leadership and the findings of our

study can serve as the basis for future researchers to explore our model and expand it further to yield further insights in other areas, such as knowledge management and technology-based workspace behavior.

Third, the study enriches the limited research and insights on the role of strategy in influencing digital transformation to conceptualize digital strategy as a moderator between digital transformational leadership and digital transformation and between organizational agility and digital transformation. Recent research on the role of strategy in digital transformation comprises mainly conceptual and systematic reviews (Hanelt et al., 2020; Saleh and Awany, 2020; Kitsios and Kamariotou, 2021). This has been reflected in a call for researchers to fill this gap with empirical studies and different theoretical frameworks (Hanelt et al., 2020). We responded to this call by providing novel insights utilizing NIT as a theoretical framework, highlighting that strategy alone cannot induce digital transformation in organizations regardless of how skilled the leaders are and how agile an organization is. Successful digital strategy requires other contributing factors, such as business model alignment (Correani et al., 2020) and organizational involvement in terms of strategy (Lipsmeier et al., 2020). The current study's insights may help future researchers to develop our conceptual framework to include these factors.

Finally, there is a pressing need to investigate digital transformation in the public sector firms to redesign and reengineer government services from the ground up to fulfill government requirements and customers' needs to increase the efficiency and effectiveness of government services (Mergel et al., 2018), especially post-COVID-19 (Agostino et al., 2021). Our study's findings thus contribute to this recent research trend in the public sector organizations.

5.3. Practical implications

Although this study was conducted in the context of the UAE, its findings and implications can inform practice in many governments and other organizations, including businesses. Our study provides four important insights for practice. First, the findings suggest that digital transformation is a radical institutional change that disrupts organizational culture by adopting new IT infrastructure and force-feeding new digital skillsets, which overload the transition for employees and the entire organization. All this affects the acceptance of the new technology and delays the digital strategy's progress. Therefore, government leadership should not emphasize technology adoption without considering how to obtain managers with the appropriate leadership skills and attributes to make such change successful. Hence, our study suggests that, in addition to digital knowledge, transformational leadership attributes, such as engendering trust, seeking to develop teams, self-sacrifice, and leading by example, may best fit organizational changes towards digital transformation. This finding can also guide human resource and training departments during their career and recruitment planning decisions for any digital transformation endeavors.

Second, organizations should develop procedures to promote organizational agility, positively influencing digital transformation. Unfortunately, public sector organizations are currently among the largest and most complex, in which public-sector organizational leaders are pressured to do more with less (Rieckhoff and Maxwell, 2017). Many organizational practices focus on following procedures and processes, thus allowing for minimal creativity and employee agility (Sanatigar et al., 2017; Banihashemi et al., 2019). However, our study suggests that governments should embrace the concept of agility and learn from the

private sector to streamline processes and reduce bureaucracy to help create more agility required for digital transformation to succeed.

Third, many wealthy governments in the region have been employing global consulting firms to bring knowledge from the private sector to their governments without considering the cultural and organizational context. An effective national digital strategy must address the cultural, educational, and ideological challenges of the government information environment and decision-making (Korovkin, 2019). Governments should be careful when contracting any consultancy firms and look beyond fancy presentations and promises by first recruiting local specialists, of which there are many, to address these cultural issues before engaging a consultant. Finally, from a strategic perspective, for the public sector organization to succeed in digital transformation, this study suggests the pursuit of change and strategy involvement (bottom-up) instead of expecting employees to follow whatever comes from the top. Public sector organizations have been reported to have lower employee commitment to change, especially in the UAE (AlNuaimi and Khan, 2019).

6. Limitations and suggestions for future research

Although this paper has produced several encouraging results, it has some limitations that should be acknowledged. First, this study was conducted on a small sample size in UAE public sector organizations. Future work can access a larger sample drawn exclusively from many UAE government sectors. Second, this paper is limited by factors that could influence digital strategy. It would be worthwhile investigating other recently discussed variables not included in this paper, such as digital culture (Weritz et al., 2020; Abhari et al., 2021), knowledge management (Zoppelletto et al., 2020), and innovation (Abdalla and Nakagawa, 2021). The third limitation is that data for this study were collected only in one country. Future research could develop this study by collecting data from countries with different digital transformation implementation maturity levels and considering other cultural factors. Finally, we used a cross-sectional research design when the UAE government was rapidly enforcing digital transformation technologies ahead of EXPO 2020 and in response to the COVID-19 crisis; most likely, the respondents had not benefited from the full capabilities of digital transformation. Hence, it would be useful to employ a case study or a longitudinal study to check the maturity of digital transformation implementation and capture its stability and lessons learned across time or settings.

CRedit authorship contribution statement

Bader K. AlNuaimi: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Sanjay Kumar Singh:** Writing - review & editing, Resources, Visualization, Methodology, Supervision. **Shuang Ren:** Writing – review & editing, Supervision. **Pawan Budhwar:** Supervision, Visualization. **Dmitriy Vorobyev:** Visualization, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. . Construct measurement instrument

Construct	Source	Measures
Digital Transformational leadership (DTL)	Chen and Chang (2013), Podsakoff et al. (1990), Podsakoff et al. (1996) Six items	DTL1:Our leaders inspire all members with the digital transformation plans for our organization. DTL2:Our leaders provide a clear digital transformation vision for the organization's members to follow. DTL3:Our leaders motivate team members to work together for the same digital transformation goals. DTL4:Our leaders encourage all members to achieve digital transformation goals for our organization. DTL5:Leaders in my organizations act by considering the digital transformation beliefs of all members. DTL6:Our leaders stimulate all members to think about digital transformation ideas.
Organizational Agility (OA)	Cegarra-Navarro et al. (2016) Six items	OA1:We can rapidly respond to customers' and government's needs. OA2:We can rapidly adapt production, process, and activities to meet demand fluctuations. OA3:We can cope with problems from suppliers and partners rapidly. OA4:We rapidly implement decisions to face market and government changes. OA5:We continuously search for forms to reinvent or redesign our organization. OA6:We see the market and government changes as opportunities for rapid capitalization and growth.
Digital Strategy (DS)	Li et al. (2021) Four items	DS1:In my organization, we integrate digital technology and business strategy to attain strategic alignment with the government and other partners. DS2:In my organization, we create a shared vision of the role of digital technology in business strategy. DS3:We jointly plan how digital technology will enable the business strategy. DS4:In my organization, we confer before making strategic decisions.
Digital Transformation	Nasiri et al. (2020) Five items	DT1:In my organization, we aim to digitalize everything that can be digitalized. DT2:In my organization, we collect large amounts of data from different sources. DT3:In my organization, we aim to create more robust networking with digital technologies between the different business processes. DT4:In my organization, we aim to enhance an efficient customer interface with digitality. DT5:In my organization, we aim at achieving information exchange with digitality.

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