Assessing the Readiness of Infrastructure and Human Resources for Sustainable Digital Transformation

تقييم جاهزية البنية التحتية والموارد البشرية للتحول الرقمي المستدام

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Abstract

Background:

Sustainable digital transformation is the strategic imperative of organizations navigating new social and economic realities, from building more flexible and resilient supply chains to scaling remote work capabilities. Infrastructure and personnel preparedness are crucial in order to sustain digital transformation and avoid implementation failures.

Objective:

This systematic review aims to evaluate the preparedness of infrastructure and human resources for sustainable digital transformation by informing gaps in readiness and relevant organizational outcomes appreciating as well as consolidating evidence for identifying determinants.

Methods:

A standard search and screen was carried out using PRISMA 202022 instructions. Review papers that appeared in the past five years across different domains such as SMEs, HEIs, government and industry were reviewed. All together 30 studies were included. Data were entered into a structured literature review matrix and synthesized narratively to develop overarching themes relevant to digital preparedness.

Results:

Results indicate that digital readiness is influenced by three interrelated categories: the technology base, personnel skills and capabilities, and organizational factors. Frequent gaps include a lack of digital infrastructure, weak workforce digital skills, little strategic alignment and scarce change management readiness. Companies with strong digital culture, leadership sponsorship and a robust workforce development plan were more successful in transformation, with better performance results.

Conclusions:

The review suggests that it is a balanced and integrated readiness approach towards sustainable digital transformation. Infrastructure development, human competencies investment and organizational system advancement collectively can help an organization to significantly navigate in digital transition effectively for long term sustainability.

Keywords:
Digital readiness; sustainable digital transformation; infrastructure readiness; human resource capacity.

الملخص

الخلفية:

يُعد التحول الرقمي المستدام ضرورة استراتيجية للمؤسسات التي تتعامل مع الواقع الاجتماعي والاقتصادي الجديد، بدءًا من بناء سلاسل إمداد أكثر مرونة وقدرة على الصمود، وصولًا إلى توسيع قدرات العمل عن بُعد. وتُعد جاهزية البنية التحتية والموارد البشرية عنصرًا حاسمًا لضمان استدامة التحول الرقمي وتجنب فشل التنفيذ.

الهدف:

تهدف هذه المراجعة المنهجية إلى تقييم مدى جاهزية البنية التحتية والموارد البشرية للتحول الرقمي المستدام، من خلال تحديد فجوات الاستعداد والنتائج التنظيمية ذات الصلة، بالإضافة إلى تجميع الأدلة لتحديد العوامل المؤثرة.

المنهجية:

تم إجراء عملية بحث وفرز منهجية وفقًا لإرشادات PRISMA 2020. شملت المراجعة دراسات نُشرت خلال السنوات الخمس الماضية عبر مجالات مختلفة مثل المؤسسات الصغيرة والمتوسطة، ومؤسسات التعليم العالي، والقطاع الحكومي والصناعي. وتم تضمين 30 دراسة في المراجعة. أُدخلت البيانات في مصفوفة مراجعة أدبية منظمة، وتم تحليلها سرديًا لاستخلاص محاور رئيسية تتعلق بالجاهزية الرقمية.

النتائج:

أظهرت النتائج أن الجاهزية الرقمية تتأثر بثلاث فئات مترابطة: البنية التكنولوجية، ومهارات وقدرات الأفراد، والعوامل التنظيمية. وتشمل الفجوات الشائعة نقص البنية التحتية الرقمية، وضعف المهارات الرقمية لدى القوى العاملة، وضعف التوافق الاستراتيجي، وقصور الاستعداد لإدارة التغيير. وقد حققت المؤسسات التي تتمتع بثقافة رقمية قوية، ودعم قيادي فعّال، وخطط تطوير موارد بشرية متينة نجاحًا أكبر في التحول، مع نتائج أداء أفضل.

الاستنتاجات:

تشير المراجعة إلى أهمية تبني نهج متكامل ومتوازن للجاهزية من أجل تحقيق التحول الرقمي المستدام. إذ إن تطوير البنية التحتية، والاستثمار في تنمية الكفاءات البشرية، وتعزيز الأنظمة التنظيمية، كلها عوامل تمكّن المؤسسات من إدارة التحول الرقمي بفعالية وتحقيق الاستدامة على المدى الطويل.

1. Introduction

The fast pace of digital transformation has transformed I systems, service models and national development strategies in all sectors. While governments, companies and organizations are all moving towards technologized operations, preparedness has become a foundational factor in the success of implementation especially digital infrastructure preparedness` as well as human resources (Michelotto & Joia, 2024; Alsulami, 2024). Yet, digital transformation efforts usually do not fail due to technical constraints, but as a result of the fact that organizations do not possess an organizational structure, culture and human capabilities essential for maintaining such changes (Gobniece & Titko, 2024; Khan et al., 2025). This further emphasizes the growing requirement for gas companies to systematically assess how they ready their technology and workforce to enable effective digital transformation over the long term.

Sustainable digital transformation goes beyond technology implementation, and incorporates environmental, economic and social responsibilities within organizational digital strategies (Li et al., 2024; Trần et al., 2025). For SMEs, sustainability-oriented digital roadmaps for can enhance the competitiveness, innovation capacity and resilience of organizations by building internal capabilities and getting the level of DM sought after in line with strategic requirements (Mick et al., 2024). Readiness in public sectors, more specially government and education bodies are about coordinated

governance system, effective IT-business alignment and a flexible organization scheme, which is fit to support ongoing changes (Cretu, 2025; Ly & Huong, 2024). Research has indicated that technological infrastructure is not the only requirement; human-related aspects like computer literacy, management drive, adaptive workforce and learning organizational cultures play a crucial role in the success of transformation processes (Hadi et al., 2025; Apena, 2023; Subrahmanyam, 2025).

At the world level, the disparity in digital resources and capabilities further exacerbates digital divide especially affecting developing countries whose infrastructure capacity, knowledge base systems and strategic governance framework are still fragmentary (Aldhi et al., 2025; Raharjo, 2024). Furthermore, sectors dealing with complex technological changes like manufacturing, healthcare and high-tech innovations meet structural barriers such as absence of preparedness models, lack of skills; internal resistance to change and low systems interoperability (Iqbal et al., 2025; Ivanov & Todorova, 2025; Chursin et al., 2024). Hence, researchers emphasize the need for readiness assessments tailoring with technical capability, human resource preparedness, organizational culture, leadership capacity and level of sustainability alignment (Jewapatarakul & Ueasangkomsate,2024; Maheshwari et al., 2025).

However, despite the increasing body of literature on readiness for the two dimensions digital infrastructure and human resources, a systematic review that synthesizes both dual dimensions in relation to sustainable DT is still lacking. Current studies often address disconnected dimensions like infrastructure, culture, skills and governance without a comprehensive understanding of how these dimensions interact to ultimately shape sustainability transition outcomes. As such, this systematic review seeks to synthesis evidence across industries/geographies about how digital infrastructure readiness and human resource readiness collectively enable organizational capacity for embarking on and sustaining digital transformation initiatives. The insights generated in this review serve to inform theory and practice by defining readiness limitations, documenting cross-sector similarities and discrepancies, and describing what facilitators or barriers support or preclude sustainable change. This supports policymakers, organizations and scholars in the development of evidence-based readiness frameworks, capability-building strategy and governance mechanism to enable smooth running digital transformation in a more connected world.

2. Methodology

This systematic review adhered to PRISMA 2020 standards to ensure transparency, consistency, and scientific rigor in the identification, screening, and synthesis of evidence on infrastructure and human resource preparedness for sustainable digital transformation. The methodology followed in this work is systematic and complies with

the latest research that highlights that systemized, repeating and empirical methods used for investigating DT process, governance mechanisms, maturity model and sustainability outcomes (Mick et al., 2024; Iqbal et al., 2025; Almaqtari et al., 2025). To guide the process of reviewing, methodological standards were employed from sustainability, digital readiness and technological capability research to guide the development of search strategies and quality control (Chursin et al., 2024; Trần et al., 2025), aligning with best practice for systematic reviews of complex, multidisciplinary bodies of literature. A search strategy was constructed based on the following key words and /or their combinations: digital transformation readiness, infrastructure capability, human resource preparedness, digital maturity sustainable management and IT governance. Searches were carried out in major academic databases, such as Scopus, Web of Science, IEEE Xplore, ProQuest and Google Scholar. Limit search to 2020-2025 because "sustainable digital transformation" trajectory is moving fast, and we see several frameworks capturing such a movement incorporating technology, organization and environment (Alsulami, 2024; Sivaiah & Vinodan, 2025). Empirical, conceptual and mixed-method studies offering insights concerning digital readiness, governance, and capacity-building or sustainability performance were included. Exclusion criteria excluded non-academic papers, non-peer-reviewed sources, commentary articles and studies, which were not clear in methodology or to the point of sustainable digital transformation.

The screening was conducted in a hierarchical manner, through the removal of duplicates and title & abstract selection to check for relevance with the review question. For articles selected, a full-text screening was conducted to determine conceptual fit, methodological quality and contribution to the understanding of dimensions of readiness. The tiered system mirrors what has become the norm in the recent networked digital transformation and sustainability reviews, where careful filtering is conducted to ensure only high-quality theory-informed studies make it into these types of syntheses (Iqbal et al., 2025; Mick et al., 2024). The overview of this process is shown in the Figure 1. PRISMA 2020 Flow Diagram, which describes how through the four main steps: identification, screening, eligibility and inclusion the records moved. This figure provides a visual depiction of the records identified visually, removed and included for synthesis in order to provide transparency in the review process. This visual depiction refers to the reporting guidelines suggested in systematic reviews on digital capability assessments, sustainable reporting guidelines Identity nursing (SRGIN), readiness assessment for transformation (RADAR) (Sivaiah and Vinodan, 2025; Trần et al., 2025).

A structured matrix was used to extract data, following relevant key information such as study setting, methodological type, theory underpinning and readiness variables and main results. A narrative synthesis methodology was used to combine the multiple

methodological viewpoints represented in the studies. This method has been widely applied in writing digital transformation literature given the diversity of specific research designs and multidimensional readiness factors such as those related to governance, an organization's use-case maturity, human capital development and sustainability integration (Mick et al., 2024; Alsulami, 2024). Quality assessment criteria were derived from digital transformation and evaluation frameworks for sustainable development to guarantee rigorous methodology as well as relevance for the current state of organizational/public-sector readiness.

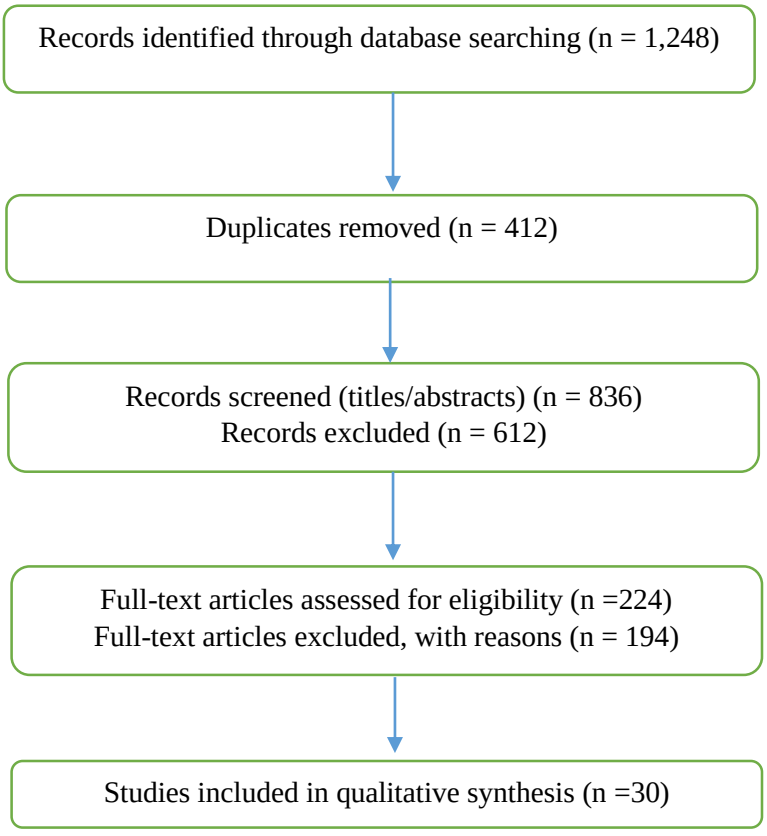


Figure 1: The Systematic Review Process

3. Results

3.1 Study Selection and Characteristics

As an outcome of the review process, studies were included that collectively investigated how infrastructure readiness, human resource ability, digital maturity and organizational alignment influence the sustainable nature of finding gee-digitisation in heterogeneous domains. Using the PRISMA 2020 screening process, we consolidated a broad source of records down to a final-but-high-quality set of empirical and conceptual works, which satisfied eligibility criteria pertaining to digital readiness, digital capability, sustainability and human resource readiness. The chosen research

studies covered a variety of geographical and sectoral settings, e.g., small-and-medium-sized enterprises (SMEs) that are transiting digital maturity processes (Mick et al., 2024), government organizations that aim at enhancing the strategic alignment between IS/IT and business activities (Alsulami, 2024), manufacturing companies implementing Industry 4.0 initiatives (Iqbal et al., 2025), SMEs adopting software-as-a-service systems (Pradesa et al., 2024), and higher education institutions enhancing users' digital knowledge-sharing behavior efforts (Geidam & Dahlan, 2024). Some existing works also addressed workforce digital literacy (Apena, 2023), psychological aspects of digitalized HR systems (Khan et al., 2025) and technology-enabled sustainability management (Trần et al., 2025). These articles constituted the basis of analysis summarized in Table 1.

Table 1. Literature Review Matrix

No.	Author(s) & Year	Digital Infrastructure Readiness	Human Resource Readiness / Skills	Organizational Culture / Change Readiness	Leadership / Management Capability	Technological Capability (ICT / AI)	Sustainability Outcomes
1	Aldhi et al. (2025)	✓	✓		✓	✓	
2	Hadi et al. (2025)		✓	✓			
3	Michelotto & Joia (2024)	✓	✓	✓	✓		
4	Ivanov & Todorova (2025)					✓	
5	Li et al. (2024)	✓				✓	✓
6	Ly & Huong (2024)		✓	✓		✓	
7	Gobniece & Titko (2024)		✓				
8	Emesiobi & John (2025)		✓			✓	✓

No.	Author(s) & Year	Digital Infrastructure Readiness	Human Resource Readiness / Skills	Organizational Culture / Change Readiness	Leadership / Management Capability	Technological Capability (ICT / AI)	Sustainability Outcomes
9	Cretu (2025)	✓	✓			✓	
10	Saihi et al. (2023)				✓	✓	
11	Subrahmanyam (2025)		✓				
12	Rettig & Vanhaverbeke (2025)			✓		✓	
13	Giedraitis et al. (2025)			✓	✓		
14	Jewapatarakul & Ueasangkomsate (2024)			✓		✓	
15	Joshi et al. (2025)				✓	✓	✓
16	Raharjo (2024)		✓				
17	Apena (2023)		✓				
18	Khan et al. (2025)		✓			✓	
19	Yunita (2025)	✓	✓			✓	✓
20	Sivaiah & Vinodan (2025)	✓				✓	✓
21	Maheshwari et al. (2025)	✓		✓	✓		
22	Geidam & Dahlan	✓	✓	✓		✓	

No.	Author(s) & Year	Digital Infrastructure Readiness	Human Resource Readiness / Skills	Organizational Culture / Change Readiness	Leadership / Management Capability	Technological Capability (ICT / AI)	Sustainability Outcomes
23	Baburao & Roy (2025)	✓				✓	
24	Iqbal et al. (2025)	✓		✓		✓	✓
25	Pradesa et al. (2024)		✓			✓	✓
26	Almaqtari et al. (2025)	✓			✓	✓	✓
27	Mick et al. (2024)	✓	✓	✓	✓	✓	✓
28	Chursin et al. (2024)	✓				✓	✓
29	Alsulami (2024)	✓	✓	✓	✓	✓	
30	Trần et al. (2025)			✓		✓	✓

3.2 Determinants of Readiness

In the studies reviewed, readiness for sustainable digital transformation was determined by two types of equipment: infrastructure and human resource. Infrastructure preparedness was a more common underlying driver across our selected studies, and virtually irrelevant in Industry 4.0 barriers in emerging economies reviews; shortcomings of IT infrastructure, cyber security, data architecture and digital standards most notably (Iqbal et al., 2025). Firms' advancement through digital transformation stages in the SME setting was highly dependent on technological infrastructure, digital maturity and the existence of platform-based solutions (Mick et al., 2024; Sivaiah & Vinodan, 2025). In public organizations, such supporting mechanisms as IT governance, interoperability arrangements and scalability solutions proved essential in reinforcing digital alignment and minimizing the risk of failed digital transformation (Alsulami, 2024; Almaqtari et al., 2025).

Human resource readiness was equally decisive, some of the studies pointed to digital skills, change readiness and workforce adaptability as essential factors. The restricted

digital skills of adult workers were found as key challenge for the change in organizations (Apena, 2023) and psychological readiness including trust on digital systems, digital confidence and resilience influenced employees' adoption and use of technology (Khan et al., 2025). The SME literature found that digital organizational culture (digital climate), knowledge acquisition and employees' motivation to use new digital routines all had a significant impact on the successful adoption of new technology (Jewapatarakul & Ueasangkomsate, 2024). Further, strategic fit and leadership support were significant antecedents to HR readiness by enabling communication, motivation and openness of organization toward digital initiatives (Joshi et al., 2025). Together, these side-by-side findings suggest that readiness is multifaceted and shaped not only by technological structures but also by capacities grounded in humanity and conducive to long-term life.

3.3 Outcomes

Better preparation around infrastructure and manpower led to positive implications in sustainable digital transformation. Firms with high levels of digital maturity, advanced technological infrastructure, and solid governance systems presented improved sustainability performance and higher operational efficiency (Almaqtari et al., 2025; Trần et al., 2025). Industry studies confirmed that those who are prone to being ready averaged higher productivity, better customer service and more bendy business processes - especially when incorporating their digital tactics development and capability building interventions (Pradesa et al., 2024; Mick et al, 2024). In the public sectors, a high-level readiness macro facilitated smooth change projects that allowed government organizations to overcome structure and administrative obstacles (Alsulami 2024). HR readiness, digital literacy and psychological involvement were associated with increased cooperation in using the platforms, greater capacity for innovation and continued organizational existence despite turbulence from outside over several years (Khan et al., 2025; Apena, 2023). In addition, digital readiness for environmental and sustainability activities were also significant in contributing to long-term performance outcomes (Trần et al., 2025) it being another example of the synergistic influence of digital on an organization's pursuit of performance milestones. Taken together these results suggest that preparedness of both the infrastructure and the individual is a key enabler for success in achieving digital transformation and can help organizations to navigate changes while addressing sustainability, resilience and competitive issues.

4. Discussion

4.1 Interplay of Technological, Human, and Organizational Determinants

The discovery from this review shows that for sustainable digital transformation, all these factors are interplay under the technological infrastructure, human resource capacity and organizational enabler. Technology enablers such as digital maturity, IT infrastructure strength, cyber security preparedness and inoperability continued to be key foundation requirements of the ability for organisations to take on and scale technology innovations (Iqbal et al., 2025; Mick et al., 2024). However, technology alone was insufficient. The selections regarding the factors of digital literacy, psychological readiness, adaptability, and knowledge-sharing were also among human determinants even individuals determine to what extent newcomers are accepted and utilized well new technologies (Apena, 2023; Khan et al., 2025). Research in SMEs and higher education sector also put emphasis on digital culture and knowledge acquisition to create an environment where employees are capable of involving themselves in the digital process and maintain the efforts of transformation (Jewapatarakul & Ueasangkomsate, 2024; Geidam & Dahlan, 2024).

Organizational factors served as the mediatory level between technology and human elements. Strategic alignment, IT governance architecture, leadership commitment, and amplifying avenues for change were the backbone to the organization in bringing orderliness among digital initiatives (Alsulami, 2024; Almaqtari et al., 2025). For example, positive leadership support was found to enhance the relationship between digital transformation capabilities and performance outcomes, especially within settings where there is a focus on international market growth (Joshi et al., 2025). Likewise the existence of maturity models and structured planning frameworks have been observed to enhance organizational readiness, as both helped in delineating defined ways by which organisations can embed sustainability within DT (Sivaiah & Vinodan, 2025). In summary, the interplay of technological, human and organizational readiness generates an ecosystem that fosters successful digital transformation.

4.2 Policy, Practical and Theoretical Relevance

The implications for policy practice and research a synthesis of the evidence provides powerful messages for policy makers, practitioners and researchers. From a policy perspective, the results highlight the pressing need for nations and sectors to upgrade their digital infrastructures to avoid technological readiness gaps in an increasingly digitised international paradigm; especially given how unequal are such infrastructural provisions across developing economies with formidable infrastructure deficits that hinder Industry 4.0 uptake and digital transformation (Iqbal et al., 2025). Enhancing readiness, for instance, could be aided by government investment in broadband

deployment, cybersecurity protocol setting up, interoperability infrastructure development and digital incentivization of adoption not only among SMEs whose financial and technical capabilities may not always allow them to engage in large scale digital projects (Mick et al., 2024; Yunita, 2025). From a practical point of view, digital literacy training, mechanisms for mental support and programs that improve employees' adaptability, collaboration, and engagement with digital systems should be promoted as measures for the development of workforce (Apena, 2023b; Khan et al., 2025).

Leadership determination and neat IT governance mechanisms are prerequisites for matching technological investments with strategic targets to avoid a fragmented digital transformation scattered across organization levels (Alsulami, 2024; Almaqtari et al., 2025). For SMEs and public sector, adopting structured models such as digital maturity frameworks or sustainability-embedded roadmaps can shape down implementation and failure risk (Sivaiah & Vinodan, 2025; Mick et al., 2024). Conceptually, by aggregating knowledge from several articles across domains as wide-ranging as knowledge management, digital strategy, human resource psychology and sustainability management, the review contributes to a better penetration of TDR in the literature. The results support the importance of multi-theoretical lenses, such as TOE framework, socio-technical systems theory and stakeholder theory, to explain technology-based change as both technological innovation and a socio-organizational process (Jewapataralul & Ueasangkomsate, 2024; Trần et al., 2025). This lays a firm basis for future theoretical improvements.

4.3 Comparison to the Existing Reviews, Limitation and Future Research

In contrast to the many extant reviews that tend to limit their focus on technology-centered change, our review focus is more explicit in identifying readiness as a multi-dimensional construct involving simultaneously infrastructure, human and organizational factors. Whereas previous reviews tended to focus on digital maturity or Industry 4.0 adoption barriers in isolation, the current synthesis reflects a growing body of literature that locates digital transformation within broader sustainability, governance and strategic alignment frameworks (Almaqtari et al., 2025; Mick et al., 2024). This review further enriches the literature by integrating psychological and human resource dimensions, which are relatively underexplored in traditional digital transformation literature (Khan et al., 2025). However, the research is not without its limitations. The review is based on articles during a short period of time and mostly English sources, which may not cover important region-specific research.

The heterogeneity of methods among the included studies further limited direct comparisons as my sample featured conceptual models, qualitative analyses, case

studies and PLS-SEM-based empirical work. In addition, meta-analysis was not performed with the review, because of diverse methodologies. Follow-up studies ought to investigate cross-country comparative analyses to more fully comprehend contextual differences in digital readiness, particularly in developing economies. There is a requirement for additional empirical testing of the proposed models and maturity models such as suggested by Sivaiah and Vinodan (2025) and Mick et al. (2024) for check of their application in different industries. Moreover, researchers are encouraged to investigate the long-term digital readiness related outcomes such as sustainability performance, innovation capability and workforce well-being using longitudinal and multi-method designs. Another potentially interesting direction is combining new technologies like AI, block chain and fintech with readiness appraisals, as proposed by Almaqtari et al (2025).

5. Conclusion

The current systematic review shows that readiness for sustainable digital transformation is a multidimensional concept influenced by the interaction between technology infrastructure, human resource competence and organizational drivers. Clearly, these examples reveal that digital transformation is not a matter of technology investment alone; rather, it involves simultaneous capacity building for workforce skills, cultural flexibility and receptive leadership. The readiness of people as manifested in digital literacy, psychological readiness, knowledge sharing behaviors and lifelong learning also takes on an absolute role in determining how effectively new technologies take up the drivers' seat. Organizational preparedness also reinforces transformation by creating the strategic platform, governance supports, and change-capable cultures, which are required by organizations to orchestrate their digital initiatives effectively. The models and frameworks analyzed in the reviewed works stressed formalized planning, audit results and cross-functional to create long-term transformation capabilities. To sum up, the review indicates that successful digitalization means a systemic recognition by organizations and integration of infrastructure progressions, readiness and learning by workforce and systemic change by organization. For both sides of the equation - public entity and business - by applying these interrelated dimensions, stronger underlying capabilities can be formed to facilitate resilience, performance improvement and competitiveness in an evolving digital environment.

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