



Investigating the Factors That Influence Digital Transformation: A Systematic Literature Review

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ABSTRACT

Digital transformation is trending in the business world. All businesses are keen to have and pursue a digital transformation strategy. However, many organizations do not fully understand digital transformation, how it should be performed, and what is best for the organization. Thus, this paper seeks to understand the factors that might impact digital transformation in organizations. This systematic literature review considers the course of digital transformation in organizations.

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1. Introduction

The term organizational transformation emerged mid-century from the work of organizational theorist Kurt Lewin (Odor, 2018). Information technology associated with organizational transformation appeared in the management literature by the late 20th century (Yates, 2001), and digital transformation (society, organizations) appeared shortly after that (Laguerre, 2005). There is no definitive consensus on these terms; collectively, they refer to a paradigm change or a step-change for businesses in reconfiguring their organizational models to meet social or technological developments. The assumption is that organizations use such technical advances to build value and meet their goals (Urbinati et al., 2019).

The literature may portray these paradigm shifts as industrial revolutions, the current labeled 4.0. Ibarra et al. (2018) explained that the fourth industrial revolution was brought about by the fusion of industrial processes (goods and services) and information and communication technologies (digital data management developing from analog business processes). These are also termed cyber-physical systems. Ibarra et al. (2018) described business models arising from the hybrid systems as service-oriented, a network or supply-chain approach, or a user-driven marketing model. Other theorists preferred to use aspects of sustainability as the fourth industrial revolution; transformation examples are (Wankhar et al., 2021) describing an Indian business model, (Fallahpour et al., 2021) advising on sustainable supply chain member characteristics, and Alkaraan et al. (2022) environmental measure for corporate transformation.

2. Methodology

The methodology chosen to conduct this study was a systematic literature review with multiple phases. The systematic review was designed using the principles espoused by (Okoli & Schabram, 2010):

1. Identify the purpose of the literature review
2. Define the protocol for the reviewers
3. Search the literature
4. Screen for inclusion – define which studies are included and excluded
5. Quality appraisal – identify studies of insufficient quality for inclusion
6. Data extraction
7. Synthesis of studies, including analysis
8. Writing the review

The study was also broken into two phases, intended to generate several factors for consideration. The first phase targeted previous literature review studies on digital transformation. The second phase was a more comprehensive review of the extant literature focusing on organizational digital transformation studies, particularly those that identified implications or consequences of adoption.

Phase 1

The initial search was exploratory with a focus on Digital transformation literature relevant to the internet technology stage (cloud, mobile devices, internet of things). The searches were repeated until distinct factors emerged and became established in the data (Kraus, Breier, & Dasí-Rodríguez 2020).

Phase 2

A comprehensive systematic literature review of recent digital organizational transformation studies was conducted. The focus was on studies identifying the implications and consequences of digital transformation adoption on organizations. Literature was gathered from two sources: 1) academically published papers and 2) reports published by reputable organizations such as Google, Microsoft, and Gartner.

The literature review focused on digital transformation implications, adoption effects, and consequences. This review searched six related information systems databases (IEEE Xplore, ScienceDirect, ProQuest, Wiley online library, ACM digital library, and Google Scholar). The following keywords were used to search the databases: Digital transformation effect, Digital transformation adoption, Digital transformation implications, Digital transformation consequences, factors influencing Digital transformation, and Digital transformation and organizations.

This search initially yielded 184 papers that matched the search criteria. However, after reviewing the papers' abstracts, 98 papers were eliminated as they were found not related to the search criteria. This resulted in 86 papers that were analyzed thoroughly and excluded another 39 papers. The remaining 47 were then analyzed for the key issues they discussed.

3. Results

For the *digital transformation in an organization s* literature search, several articles were identified to have factors that might impact Digital transformation in the organization. The following Table 1 discusses them.

Table 1
Literature Articles' Discussion

Factor	Authors	Title	Relevance	Comment
Digital transformation reviews	(Rêgo, Jayantilal, Ferreira, & Carayannis, 2021)	Digital transformation and strategic management:	Determined research factors such as internal and external environments, strategy formation and implementation, assessment, and action	The conclusion fits a project management plan. The sample (n=42) was not justified as comprehensive
	(Nadkarni & Prügl, 2021)	Digital transformation, review, synthesis research suggestions	Identified underdeveloped factors: pace, culture, supervision of technology transformation	Review dates did not compare the same technological states, early and later dates should have been excluded
	(Trenerry et al., 2021)	Preparing Workplaces for digital transformation	Determined that team identity, commitment and adaptability and organizational skills, leadership, and culture were factors	Social psychology field: used individuals, teams, and executive levels to determine relevant and predictable factors,
Data systems	(Gharaibeh et al., 2017)	Smart cities	Digital environment for organizations	Organizations may have little choice in innovation
	(Halpern, Mwesiumo, Suau-Sanchez, Budd, & Bråthen, 2021)	(Airports) Ready for digital transformation	Airports: Factors of organizational readiness, innovation, airport size, and ownership	Organizational readiness, airport size, and innovation,
	(Fletcher & Griffiths, 2020)	Digital transformation during a lockdown	Crisis management using technology for a continuation of service	Introduced the acronym VUCA volatility, uncertainty, complexity, and ambiguity – in crisis management
	(Baiyere, Salmela, & Tapanainen, 2020)	Digital Transformation and the new logics of business process management	Business process management is integral to digital systems and is disrupted by change	Authors argue that fundamental aspects of modeling, infrastructural alignment, and the process should be restructured for transformative change
	(Griggs, Griffiths, & Fletcher, 2019)	Managing the digital transformation of an organization	Presented the HINGE approach	Combines a strategic review and planning model for MBAs
	(Zaki, 2019)	Digital transformation: Harnessing digital technologies for the next generation of services	Nominated four factors: digital strategy, systems, customer experience, business models	Focused on new customer experience. An organization needs to build new networks and value chains
	(van Tonder, Schachtebeck, Nieuwenhuizen, & Bossink, 2020)	A framework for digital transformation and business model innovation	Similar to Baiyere et al. 2020, the authors modeled digitalization, digital transformation, and business process management	The findings were that digital capabilities and strategy were required. Process management additionally required a profit and customer focus and resources
	(Fenton, Ahmed, & Hides, 2019)	Measuring the digital transformation in an organization:	Recommended an audit to identify and measure the added value	Customer reaction to digital transformation can be measured by determining the use-value of a product or service
	(Paavola, 2020)	Digital Transformation of public sector organizations	Case studies - found that success was influenced by familiarity with technology	Familiar technological changes were managed inhouse, emerging technologies by external providers
	(Jonathan, Rusu, & Perjons, 2022)	Digital transformation in public organizations	Public organizations set standards for digitizing through their actions with the public	Use 'organizational readiness' as a set of variables, showing wide variation in models under this rubric
International organizational	(Mhlungu, Chen, & Alkema, 2019)	Success factors in the implementation	Centered on the customer. governance, innovation, access to resources	The 95 participants were equally divided between technical and non-technical staff. There was no significant difference between their responses

	(Hur, Cho, Lee, & Bickerton, 2019)	The 'Smart Work' myth	In South Korea, Technology-enabled geographical division of public sector staff led to inefficiencies	Staff hesitancy, redundant data systems, and office politics impeded productivity
	(Rose & Brown, 2021)	Reconstructing attitudes towards work from home during COVID-19	In South Korea, managers dropped their adherence to tradition and liked working from home	Changed attitude when faced with necessity.
	(Wang, Feng, Zhang, & Li, 2020)	The effect of digital transformation strategy on performance	Seeking outcomes from Strategy in a Chinese Environment	There were financial relationships between strategy elements, including cognitive conflict, or indecision
	(Peter, Kraft, & Lindeque, 2020)	Strategic action fields of digital transformation of Swiss SMEs and large enterprises.	Used datasets of strategic action fields in digital transformation experiences	Drivers are: process engineering, cloud technology, and digital business development (customer centricity and digital marketing)
	(Isaksen, Trippl, Kyllingstad, & Rypestøl, 2020)	Digital transformation of regional industries through asset modification	Authors argue that digital transformation does not necessarily translate similarly across regions	A framework is described to modify assets across borders to facilitate a successful integration
	(Ziółkowska, 2021)	Digital transformation and marketing activities in small and medium-sized enterprises	Smaller Polish firms were examined for transformative use of marketing technology	Emails were predominantly used, but firms were active in multimedia applications. The Internet of things and Virtual reality were being explored
Skilled resources	(Gilch & Sieweke, 2021)	Recruiting digital talent	Sourcing skilled staff	A critical resource for organizations
	(Cardenas-Navia & Fitzgerald, 2019)	Digital dilemma: strategies in the digital talent race.	Digital transformation decisionmaking	Executives need sufficient information to make rational decisions: consultants, or staff (new or retrained)
	(Wiblen & Marler, 2021)	Digitalized talent management and automated talent decisions	Hiring technical staff via algorithm	Using digital recruitment software results in different outcomes, even in one organization
	(Hoeft, 2021)	Auto makers and radical innovation	Recruiting digital skills within traditional carmaking	Changing European carmaking culture to meet the challenges of incumbents such as Tesla
	(Guinan, Parise, & Langowitz, 2019)	Creating an innovative digital project team	Enabling digital transformation	Factors for a successful digital implementation team were: diverse professional members, iterative goal setting, continuous learning, and talent management.
	(Gulati & Reaiche, 2020)	Soft skills: A key driver for digital transformation	Developing a model for personal and social skills to facilitate digital transformation	Seeking to gain awareness beyond the functions of digital transformation to motivate staff to best practice
	(Schiuma, Schettini, Santarsiero, & Carlucci, 2021)	Transformative leadership compass: Six competencies for digital transformation entrepreneurship	Developed a transformational leadership model	Identifying key concepts, Understanding the purpose of transformation, Proposing value creation, Building a new environment for digitalization, Communicating vision/mission, and Motivating staff
	(Gekara, Snell, Molla, & Karanasios, 2020)	International approaches to building digital skills for the digital transformation of industry.	Mapping national workforce skills frameworks to plan coordinated approach in Australian jurisdictions	National policies, Lifelong learning programs in the vocational sector; Funding, Processes used to identify digital skills and knowledge requirements, and Notable digital skills development initiatives
	(Monteiro & Leite, 2021)	Digital literacies in higher education (Portugal)	Digital transformation in universities	Portuguese faculties were unable to transfer basic keyboard skills into strategies or processes
	(Teixeira, Gonçalves, & Taylor, 2021)	How higher education institutions are driving digital transformation	A partnership between Porto in Portugal and Polytechnic to drive digitalization in the city.	Local companies took advantage of skills training to increase digital competencies
	(Iivari, Sharma, & Ventä-Olkkonen, 2021)	Digital transformation of everyday life-How the COVID-19	Highlighted digital divisions emerging in education and areas for action	Nominated professional development for teachers. The noted industrial division between digital engineering and business management streams

	2020)	pandemic transformed the primary education of the young generation		
Dataset security	(Yang, Xiong, & Ren, 2020)	Data security and privacy protection for cloud storage.	Means of securing datasets offsite	Discusses risks of cloud storage and lists current (2020) security protocols
	(Zhu & Badr, 2018)	Identity management systems for the internet of things	Putting client identity within the organization's distributed systems framework	Encrypted client connections safeguard their identities without unnecessary personal data
	(Khan & Samad, 2020)	Enterprise strategic shift in technology	Deciding on cloud-based or distributed systems	Security issues with the proliferation of new data sources/ connections
	(Garcia-Perez, Cegarra-Navarro, Sallos, Martinez-Caro, & Chinnaswamy, 2022)	Resilience in healthcare systems: Cyber security and digital transformation	Dealing with ransomware threats with sensitive databases	Digital transformation of healthcare was essential to manage the coronavirus pandemic. Minimal datasets are not used for sensitive patient data
	(Mendhurwar & Mishra, 2021)	Integration of social and IoT technologies: an architectural framework for digital transformation and cyber security challenges	Integration of new technologies, such as the Internet of things and Social technologies are forming Cyber-physical-social systems	Technology convergence introduces new cybersecurity challenges

4. Discussion

This section considers the value of the literature on each factor in the table above.

4.1. Digital Transformation Literature Reviews

The first consideration was how others had undertaken such reviews. There was consistency in their approaches and findings. (Rêgo et al., 2021) advised management on how to proceed with digital transformation, but they used an operational approach rather than a paradigmatic shift of the business model. This article illustrates a greater need for reasoned research rather than following operational steps.

On the other hand, Nadkarni and Prüggl (2021) validated their methodology in their quest to find gaps in the digital transformation literature for future research. They selected 58 studies using subject and technology as the independent variables and devised nine core dependent variables or influencers. Next, they took another 60 cross-disciplinary studies to obtain different perspectives on the core independent variables. They found gaps in the literature for the variables: the pace of technological change, the influence of the working environment on digital transformation (project?), and the role of supervisors. While the author's review design was exemplary, the sample was not: it spanned from 2001 to 2019. Their sample base thus ranged from pre-internet mainframe technical environments to screen-based digital environments where much of the earlier work was automated.

The third literature review, also over 20 years, considered individual and social psychology and organizational behavior (Trenerry et al., 2021). Factors sought by the researchers for the individual were technology aptitude and application; competencies and attainment; interest in their work, and adaptability in meeting the job's and team's needs. Similarly, at the group level, the variables used were team dynamics and involvement of members, and actively pursuing the organization's interests. At the organizational level, the researchers considered leadership, group skills and knowledge, and the social environment (culture).

The findings from these randomly selected (systematic) literature reviews, all of this century, were that stages of rapid technology development were included. In the early internet studies, research topics were futuristic or targeted early gaps, system errors, or

flawed outcomes in digitized environment transformations, most of which became redundant over time. Technology-based metareviews should be restricted to surveys of similar technical environments, management goals, and user competencies.

4.2. Digital Systems

Researchers were particularly interested in digital systems extending from the organization and its industry, that is regional and industry networks.

Organizational systems were of interest to (Halpern et al., 2021) in their study of organizational (industry-based) digital transformation. They used standard quantitative models and measures: organizational readiness, innovation, airport size, and ownership—the sample (n=94) as members of a global airport association. The findings were that organization size directly affected the change process; that is, all staff and organizational systems (policies and technical) must be in place and operational for accreditation. Thus (Halpern et al., 2021) were bound to find that organizational readiness was a significant factor. Their subsequent linking of innovation with organizational readiness was related to the commercial expansion of the airports for further revenue flows.

Fletcher and Griffiths (2020) extended their digital transformation to systems under a crisis. They used a social framework (pandemics affect people/societies differently based on socio-economic status) and variables of volatility, uncertainty, complexity, and ambiguity in crisis management. The authors noted digital immaturity in some organizations, although no evidence was presented in their findings (Fletcher & Griffiths, 2020).

The organization's operational framework and business process management must be flexible to accommodate change (Baiyere et al., 2020). However, Baiyere et al. (2020) argued that traditional assumptions of the theoretical process management framework were inadequate for digital transformation concepts of *light touch processes* (process), *infrastructural flexibility* (infrastructure), and *mindful actors* (agency) (Baiyere et al., 2020). Their revision of the standard framework would contribute to a successful transformation during digital change procedures. Similarly, van Tonder et al. (2020) successfully modeled digital transformation and business model innovation concepts to integrate factors for digital renewal. In an academic approach, Griggs et al. (2019) presented a strategic HINGE model for digital transformation: *horizon scanning* (external environment); *internal audit* of skills, systems, and capabilities; *new applicable business models*, *gap analysis*, and *evaluation*. This was a component of a business administration degree. Fenton et al. (2019) confirmed that determining the use or value of a new service to the customer provides a performance measure.

In the public sector, (Jonathan et al., 2022) used a case study of a local government entity to study the organization's digital state. This was of interest because of the crisis caused by the coronavirus pandemic and the rapid transformation of existing platforms for public notice and interaction. Before 2019, public health platforms had been underdeveloped and underutilized. These were readily expanded for community use during the pandemic. Familiarity was also helpful in Paavola (2020)'s findings of digitization in Finnish public organizations, where success was influenced by technological awareness. Existing stepwise technological changes, such as the example of (Jonathan et al., 2022) were successfully managed inhouse, but emerging technologies, such as moving to the cloud, necessitated external providers and more substantial staff integration for successful implementation (Paavola, 2020).

Digital transformation of systems can introduce new technology or an external *socioeconomic shock* (such as the pandemic). As systems are dynamic, they continue to evolve after significant changes (transformations) occur. While the transformation of digital systems for an airport and a city were presented, there were also socioeconomic system disruptors caused by the coronavirus. However, these outcomes were shared worldwide, illustrated by the United States and Brazil suffering high casualties (0.33%) in 2020-2021.

4.3. National Cultures

The literature showed similarities in the types of systems and experiences of digital organizational transformation across societies. In Africa, Mhlungu et al. (2019) used a quantitative research design to survey 95 people from 34 firms on digital organizational transformation. Mhlungu et al. (2019) categorized their data as the organization's ability to focus on customers, its governance (policies), its ability to innovate, the scale of change (transformation), and resources acquisition (finance, availability). These factors could be modeled as a future measure of transformation, although they found that the organization's size was valuable (Mhlungu et al., 2019).

Interestingly, given the dominance of technology in modern workplaces, Hur et al. (2019) studied the *Smart work* database and network used by the South Korean public service. Starting in 2012, the public administration was progressively relocated to another city. Hur et al. found that the Smart work platform only minimally addressed the understandably massive disruption that this caused. This resulted in bureaucratic inefficiencies, which they attributed to distance interaction rather than face-to-face encounters. Hur et al. (2019) were dismissive of the technology, preferring the certainty of set office hours and staff availability for physical meetings. The Korean managers (n=95) complained of staff hesitancy in engagements, redundant data systems coexisting with newer versions, and the continued influence of politicians on decision-making. The findings of Hur et al. (2019) were supported by (Rose & Brown, 2021), who stated that Korea was well-known for its hierarchical organizational structures, rigid work culture, and expectation that all staff would put in long hours. Rose and Brown surveyed Korean managers (n=229) about their experiences after two years of lockdowns and a move to remote work (working from home). These managers had adapted well to their new work practices and intended to continue working from home (Rose & Brown, 2021).

Organizational digital transformation in China was also a conflicted strategy, according to Wang et al. (2020). They studied transformation implementation in a *conflict environment*, with performance as a measure for *minority dissent*, *skewed conflict*, and *overreaching*. They nevertheless found that structural change involving technology was related to performance and moderated both in the short and long term by *cognitive conflict* (doubt or indecision).

In a Swiss enterprise dataset example, Peter et al. (2020) identified *strategic action fields* (factors) of digital transformation: process engineering, cloud technologies, and digital business development (customer focus and online/social media marketing). While they noted limitations in these measures, their findings were consistent with the business process modeling of van Tonder et al. (2020) and Baiyere et al. (2020). Ziłkowska (2021) studied marketing media in smaller Polish firms, finding that the firms were successfully pursuing broad media applications, including virtual reality and the internet of things, in their customer engagement. In Britain, Zaki (2019) added that leadership understood the necessity for changes to the customer experience through new networks and value chains.

In the digital organizational transformation of multinational organizations, differences in *asset modification* across borders affect organizational implementation, according to Isaksen et al. (2020). The authors provided a regional assets framework to build sufficient resource flexibility to accommodate ongoing change for different characteristics of regional assets.

Cultural implications from organizational and technological transformation depend on local practices, including import/export protocols, business management systems, employment regulations, and greater reliance on land or satellite communications. However, apart from these peripheral matters, the global internet, supply chains, and trading protocols leave little room for countries to impose cultural restraints on their businesses. Further, the South Korean papers illustrated how generations of beliefs that physical presence was necessary to signify organizational loyalty vanished within months. On the other hand, China's self-isolation may divide globalized technology protocols if it develops parallel systems.

4.4. Skills, Talent, Resources

First, the organization must have a competent executive with the knowledge and skills to lead staff in strategy and operations, and following this, the business media continues to highlight the lack of 'talent' available (Gilch & Sieweke, 2021). Focusing on the lead of technology within the business model, digital executives must know the organizational environment and its competitors and be able to advise on the optimum digital pathway for the firm to follow. They must also be able to select appropriate data management systems and direct data operatives or contractors (Gharaibeh et al., 2017). The current strategies for data management decisions include the type of data system, such as automation/artificial intelligence; data transfer and storage, which could be cloud-based and/or distributed ledger; and the extent of employment of these (where, how, when) (Khan & Samad, 2020). Similarly, (Cardenas-Navia & Fitzgerald, 2019) nominated four skilled resource options: purchase consultants, undertake a complete transformation to a purely technical firm, recruit staff to suit business needs, retrain existing staff, or use a combination of all sources. Even before the pandemic, Cardenas-Navia and Fitzgerald pointed out the necessity for in-house technical/digital decision making, at least for recruiting appropriate digital skills. The importance of inhouse team members for a digital implementation team was emphasized by (Guinan et al., 2019), together with a diversity of competencies and training to ensure the team was aware of its protocols and targets. This training was also critical for organization members with new tasks and processes from the change.

Wiblen and Marler (2021) noted the increased reliance on online competency questionnaires in recruiting new staff. However, using algorithms in the job (or executive) selection does not reduce risk in the selection process. Wiblen and Marler (2021) found that human resource staff varied in rating preferences, even in a single office. One person may accept the algorithm's probabilities listings of best fit candidates, while another selector may use demographics over and above the core skills and responsibilities to consider the social environment and group dynamics in their selection (e.g., gender balance). There is no real risk reduction in any of these selections for the manager.

An example of recruitment issues hiring digital skills occurred in Germany (Hoeft, 2021). Hoeft described ongoing difficulties in recruiting skilled digital workers encountered by traditional vehicle firms, but that even people for non-digital jobs were found to prefer status electric vehicle brands such as Tesla. The incumbent firms were thus challenged by *digital-native* firms and their traditional premium competitors. In Australia, academic, industry, and government sources were using advisory bodies to plan educational pathways in education and industry to provide skills and competencies for the digital economy (Gekara et al., 2020). In higher education, problems also emerged; Monteiro and Leite (2021) found that Portuguese universities could not transfer keyboard skills into digital strategies (transformation) for lifelong learning. However, Teixeira et al. (2021) established that partnerships in Porto, Portugal, between local government, higher education institutes, and city businesses increased employee digital skills. Local companies took advantage of skills training to increase digital competencies.

This continued with Iivari et al. (2020) in Finland, who pointed out that digital competency was now a social skill that should permeate society as a part of life. For example, an industry-based faculty division between digital engineering and business management should be removed (Iivari et al. 2020).

Leadership and staff motivators were found to be necessary. (Schiuma et al., 2021) Proposed leadership characteristics implicit in organizational technology implementation, while (Gulati & Reaiche, 2020) emphasized the importance of personal and interpersonal skills in successful enterprise transformations.

Management grappled with digital transformation in devising reasonably long-term goals to build their organization. While business plans were developed to replace(manufacturing) or standardized tasks (office work), project staff or external resources were still necessary to fulfill the transition, then to f and As illustrated by the vehicle industry example, engaging skilled youth and skilling up recruits was challenging

management. Subsequently, the digitally transformed organization had to embed these changes and continue its core mission with new or retrained staff and reoriented targets.

4.5. Digital Security

The coronavirus epidemic underscored the inevitability of managing data in a cloud environment, given that national data management and storage are beyond the capacity of any government (Yang et al., 2020). Yang et al. acknowledged that cloud operations and storage would continue for digital organizational transformation, the Internet of Things, communications, and business systems (plus social media). Issues for cloud providers to protect data included data confidentiality, data integrity, data availability, fine-grained access control, secure data sharing in a dynamic group, and leakage-resistant (Yang et al., 2020).

They then nominated existing encryption principles, protection methods, current security standards, and future research (Yang et al., 2020). The organization must know the entities it deals with for practical and legal reasons. But there is some risk that any information held in the organization's data systems could be maliciously encrypted (frozen), stolen, or deleted (Khan & Samad, 2020; Zhu & Badr, 2018). This risk is increased during data activity or transfer, and organizations are especially vulnerable during a digitization transformation of local servers to the cloud or desktop to mobile. However, if the purpose of retaining information was merely to (re-)establish identity, then once this has been confirmed, specific identification may no longer be necessary and can be erased or stored offline. But as Zhu and Badr pointed out, identity protocols should be conducted as part of coding for the data system: pre-emptive encryption between the organization and its client users. This would reduce the quantity of sensitive information that is increasingly prone to ransom demands, especially in health and education.

Minimal data retention was not an option for national healthcare systems when the digital transformation of medical datasets was essential in managing the coronavirus epidemic, and these data were shared among agencies (as is regulatory and organizational data). Mendhurwar and Mishra (2021) stated that technology convergence introduces new cybersecurity challenges that must be addressed. Working in the United Kingdom, Garcia-Perez et al. (2022) recommended that both public and private organizations should establish permanent *digital information auditors* to maintain oversight of an organization's digital resources and invest in *cyber resilience* (such as duplicated autonomous systems) to avoid the more obvious attacks on their databases.

While the coronavirus pandemic was instrumental in completing global societies' move to rely on the internet for public health, the predominant risk became privacy and data security. It was probably inevitable that organizational risks from digital transformation would remain and that data protection issues expanded with the proliferation of such data. There were state-based privateers and pirates at work when supply chains and business systems were under attack, which is beyond the scope of this study (Chernenko, 2021). However, the means exist to protect such data, although loopholes and end user mistakes abound, but these means of criminal entry can be either closed or nullified through encryption, blockchain, and rigorous protocols.

5. Conclusion

This review of the digital organizational transformation focused on whether the rate of digitization slowed after the pandemic, that is, whether organizations were successful in their implementation and transfer to new business strategies. First, the issues inherent in technology reviews over decades were raised. Given constraints in legitimacy, an overview of the vast literature from 2015 to the present resulted in the extraction of four factors: characteristics of digital systems (airport certification, healthcare networks); influences of national cultures on those systems (minimal against other measures such as firm size and competencies); the issue of employee competencies during and after these fundamental business changes (unresolved), and data security (rising influences).

The conclusion from the factors used in this review is that the rate of digital organizational transformation probably peaked in 2020-2021 due to organizations s forced

into moving inhouse data to the cloud and then to mobile devices. Influential factors were digital systems primarily adapted by organizations upscaling their existing platforms and training staff. National organizational cultures such as South Korea were found to adapt to circumstances. A traditional organization found difficulty in transforming its systems due to the preferences of young talent. Coincidentally, security issues were exacerbated by the lack of user (organization) knowledge and skills. With continual training at work, these skills could be learned earlier in life (state education systems). Another ongoing issue was multi-level security which should be audited and given the same attention by organizations as their financial matters.

Authors Contribution

Khalid Alshammari: Complete manuscript is compiled.

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

References

- Baiyere, A., Salmela, H., & Tapanainen, T. (2020). Digital transformation and the new logics of business process management. *European Journal of Information Systems*, 29(3), 238-259.
- Cardenas-Navia, I., & Fitzgerald, B. K. (2019). The digital dilemma: Winning and losing strategies in the digital talent race. *Industry and Higher Education*, 33(3), 214-217. doi:<https://doi.org/10.1177/0950422219836669>
- Chernenko, E. (2021). Cyber security in EU-Russia relations. In *The Routledge Handbook of EU-Russia Relations* (pp. 184-194): Routledge.
- Fenton, A., Ahmed, W., & Hides, M. (2019). Measuring the digital transformation in an organisation: Audit to discover what value was added. In *Strategic Digital Transformation* (pp. 194-200): Routledge.
- Fletcher, G., & Griffiths, M. (2020). Digital transformation during a lockdown. *International journal of information management*, 55, 102185. doi:<https://doi.org/10.1016/j.ijinfomgt.2020.102185>
- Garcia-Perez, A., Cegarra-Navarro, J. G., Sallos, M. P., Martinez-Caro, E., & Chinnaswamy, A. (2022). Resilience in healthcare systems: Cyber security and digital transformation. *Technovation*, 102583.
- Gekara, V., Snell, D., Molla, A., & Karanasios, S. (2020). International scan of approaches taken by select economies to build the digital skills of the existing workforce in response to the digital transformation of industry.
- Gharaibeh, A., Salahuddin, M. A., Hussini, S. J., Khreishah, A., Khalil, I., Guizani, M., & Al-Fuqaha, A. (2017). Smart cities: A survey on data management, security, and enabling technologies. *IEEE Communications Surveys & Tutorials*, 19(4), 2456-2501. doi:<https://doi.org/10.1109/COMST.2017.2736886>
- Gilch, P. M., & Sieweke, J. (2021). Recruiting digital talent: The strategic role of recruitment in organisations' digital transformation. *German Journal of Human Resource Management*, 35(1), 53-82.
- Griggs, T., Griffiths, M., & Fletcher, G. (2019). Managing the digital transformation of an organisation. In *Strategic Digital Transformation* (pp. 48-54): Routledge.
- Guinan, P. J., Parise, S., & Langowitz, N. (2019). Creating an innovative digital project team: Levers to enable digital transformation. *Business Horizons*, 62(6), 717-727. doi:<https://doi.org/10.1016/j.bushor.2019.07.005>
- Gulati, R., & Reaiche, C. H. (2020). *Soft skills: A key driver for digital transformation*. Paper presented at the The Fourteenth International Conference on Digital Society.
- Halpern, N., Mwesumo, D., Suau-Sanchez, P., Budd, T., & Bråthen, S. (2021). Ready for digital transformation? The effect of organisational readiness, innovation, airport size and ownership on digital change at airports. *Journal of Air Transport Management*, 90, 101949. doi:<https://doi.org/10.1016/j.jairtraman.2020.101949>
- Hoeft, F. (2021). Auto makers and radical innovation: culture, capital and talent form road blocks. *Journal of Business Strategy*.
- Hur, J.-Y., Cho, W., Lee, G., & Bickerton, S. H. (2019). The "smart work" myth: how bureaucratic inertia and workplace culture stymied digital transformation in the

- relocation of South Korea's capital. *Asian Studies Review*, 43(4), 691-709.
doi:<https://doi.org/10.1080/10357823.2019.1663786>
- Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life—How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International journal of information management*, 55, 102183.
doi:<https://doi.org/10.1016/j.ijinfomgt.2020.102183>
- Isaksen, A., Tripll, M., Kyllingstad, N., & Rypestøl, J. O. (2020). Digital transformation of regional industries through asset modification. *Competitiveness Review: An International Business Journal*.
- Jonathan, G. M., Rusu, L., & Perjons, E. (2022). Digital Transformation in Public Organisations: IT Alignment-Related Success Factors.
- Khan, H. U., & Samad, H. S. I. A. (2020). Enterprise strategic shift of technology: cloud-based systems verses traditional distributed system. *International Journal of Enterprise Network Management*, 11(4), 320-346.
doi:<https://doi.org/10.1504/IJENM.2020.111775>
- Mendhurwar, S., & Mishra, R. (2021). Integration of social and IoT technologies: architectural framework for digital transformation and cyber security challenges. *Enterprise Information Systems*, 15(4), 565-584.
doi:<https://doi.org/10.1080/17517575.2019.1600041>
- Mhlungu, N. S., Chen, J. Y., & Alkema, P. (2019). The underlying factors of a successful organisational digital transformation. *South African Journal of Information Management*, 21(1), 1-10. doi:<https://hdl.handle.net/10520/EJC-1693a0fd5a>
- Monteiro, A., & Leite, C. (2021). Digital literacies in higher education: Skills, uses, opportunities and obstacles to digital transformation. *Revista de Educación a Distancia (RED)*, 21(65). doi:<https://doi.org/10.6018/red.438721>
- Nadkarni, S., & Prügl, R. (2021). Digital transformation: a review, synthesis and opportunities for future research. *Management Review Quarterly*, 71(2), 233-341.
- Okoli, C., & Schabram, K. (2010). A guide to conducting a systematic literature review of information systems research. doi:<https://doi.org/10.2139/ssrn.1954824>
- Paavola, R. (2020). Digital transformation of public sector organisation: Interpretive case studies.
- Peter, M. K., Kraft, C., & Lindeque, J. (2020). Strategic action fields of digital transformation: An exploration of the strategic action fields of Swiss SMEs and large enterprises. *Journal of Strategy and Management*.
- Rêgo, B. S., Jayantilal, S., Ferreira, J. J., & Carayannis, E. G. (2021). Digital transformation and strategic management: A systematic review of the literature. *Journal of the Knowledge Economy*, 1-28. doi:<https://doi.org/10.1007/s13132-021-00853-3>
- Rose, P. A., & Brown, S. (2021). Reconstructing attitudes towards work from home during COVID-19: A survey of south korean managers. *Behavioral Sciences*, 11(12), 163.
doi:<https://doi.org/10.3390/bs11120163>
- Schiuma, G., Schettini, E., Santarsiero, F., & Carlucci, D. (2021). The transformative leadership compass: six competencies for digital transformation entrepreneurship. *International Journal of Entrepreneurial Behavior & Research*(ahead-of-print).
- Teixeira, A. F., Gonçalves, M. J. A., & Taylor, M. d. L. M. (2021). How higher education institutions are driving to digital transformation: A case study. *Education Sciences*, 11(10), 636. doi:<https://doi.org/10.3390/educsci11100636>
- Trenerry, B., Chng, S., Wang, Y., Suhaila, Z. S., Lim, S. S., Lu, H. Y., & Oh, P. H. (2021). Preparing workplaces for digital transformation: an integrative review and framework of multi-level factors. *Frontiers in Psychology*, 12, 620766.
- van Tonder, C., Schachtebeck, C., Nieuwenhuizen, C., & Bossink, B. (2020). A framework for digital transformation and business model innovation. *Management: Journal of Contemporary Management Issues*, 25(2), 111-132.
doi:<https://doi.org/10.30924/mjcmi.25.2.6>
- Wang, H., Feng, J., Zhang, H., & Li, X. (2020). The effect of digital transformation strategy on performance: The moderating role of cognitive conflict. *International Journal of Conflict Management*. doi:<https://doi.org/10.1108/IJCMA-09-2019-0166>
- Wiblen, S., & Marler, J. H. (2021). Digitalised talent management and automated talent decisions: the implications for HR professionals. *The InTernaTional Journal of human resource management*, 32(12), 2592-2621.
doi:<https://doi.org/10.1080/09585192.2021.1886149>

- Yang, P., Xiong, N., & Ren, J. (2020). Data security and privacy protection for cloud storage: A survey. *IEEE Access*, 8, 131723-131740.
doi:<https://doi.org/10.1109/ACCESS.2020.3009876>
- Zaki, M. (2019). Digital transformation: harnessing digital technologies for the next generation of services. *Journal of Services Marketing*.
doi:<https://doi.org/10.1108/JSM-01-2019-0034>
- Zhu, X., & Badr, Y. (2018). Identity management systems for the internet of things: a survey towards blockchain solutions. *Sensors*, 18(12), 4215.
doi:<https://doi.org/10.3390/s18124215>
- Ziółkowska, M. J. (2021). Digital transformation and marketing activities in small and medium-sized enterprises. *Sustainability*, 13(5), 2512.
doi:<https://doi.org/10.3390/su13052512>