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Exploring digital interventions for business resilience during crisis – a systematic literature review

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Abstract

Enterprises responded to the COVID-19 outbreak by deploying various digital technology interventions to achieve business resilience. However, little is known about the nature of enterprise digital technology resilience that emerged during the pandemic and how these can inform businesses to build resilience for future pandemics. The purpose of this study therefore is to explore digital technology interventions and enterprise resilience during the pandemic to inform the development of a pandemic resilience framework for future pandemics. A systematic literature review is being conducted on twenty-three relevant articles sourced from the Scopus database on digital technology intervention and resilience during the COVID-19 pandemic. The analysis of the relevant articles using VOSviewer visualisation revealed five key thematic areas namely information systems, digital health, digital intervention and social media; COVID-19 and wellbeing, and digital resilience. The nature, scope and type of digital technology interventions were mainly data resources, information systems and online platforms. Generally, businesses faced technical, motivational and governance challenges deploying digital technology intervention to emerge resilient from the pandemic. The study concluded that the need for future pandemic preparedness is now, and the lessons learned from businesses in using digital interventions during the recent pandemic are useful. The implications of the study for businesses, policymaking and theorizing in the area of digital intervention and resilience have been highlighted.

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1. Introduction

The unexpected onset of the COVID-19 pandemic created a deluge of crises for individuals, businesses and society. These triggered the search for solutions, tools and strategies by businesses to reduce, mitigate or prevent the undesired consequences of the crisis on the sustenance of businesses. As a result, various interventions were introduced, including digital technology interventions. Digital interventions refer to the digital technology initiatives, tools, strategies, processes and solutions that were developed, deployed, adopted and adapted during the pandemic to mitigate the unwanted effects of the Coronavirus. The aim of deploying digital technology interventions by businesses was to achieve business resilience. Although there is a growth in the literature on digital technologies and business resilience [1], there is rarely a retrospective account of the nature, scope and type of digital technology interventions deployed by businesses in response to the crisis. In addition, little is known about the challenges and the level of digital technology resilience businesses achieve from digital technology interventions to inform future pandemics. The main objective of this study, therefore, is to identify and ascertain the effectiveness of digital technology interventions that were deployed by businesses in response to the pandemic and determine how businesses were able to achieve technological resilience. The purpose of this study is to address the following research questions:

i. what is the state-of-the-art literature on digital technology interventions for business resilience?
ii. what is the nature and type of digital technologies deployed by businesses during the pandemic and how effective were these?
iii. what were the challenges in the deployment of digital interventions during the crisis?
iv. what strategies were used by businesses to emerge resilient from their digital interventions, and how can the lessons learned inform future pandemic or crisis preparedness?

The next section of the paper describes the methods used for the systematic literature review. This is followed by the presentation of the preliminary results of the thematic overlay of studies on digital technology interventions for business resilience. The last section of the paper provides the conclusion for the study and highlights the limitations and areas for future research.

2. Method

This study adopted and followed the three-phase systematic literature review method proposed by [2] and [3]. The phases are planning, conducting, and reporting the review.

2.1 Planning

The study aimed to undertake a systematic literature review to identify digital technology intervention and resilience strategies of enterprises during the pandemic to inform the development of a framework for future pandemics. The plan for the SLR was first to undertake a scoping analysis, which included exploring the search term to use. The planning also includes the selection of the databases to be used and a decision on the inclusion and exclusion criteria to apply to arrive at quality data for the study. The databases initially considered were Web of Science, Scopus, and PubMed. However, the Scopus electronic database was selected for the study because of its wide scope [4].

2.2 Conducting the review

Using the five-step guidelines of [5], the second phase of the SLR focused on the identification of the study, selection of the literature, quality assessment, data extraction and monitoring, and data synthesis.

Step 1: Identification of the study

This study aims to understand the state-of-the-art literature on digital technology interventions and resilience during the pandemic through a systematic review of relevant literature published on the subject.

Step 2: Selection of primary studies

The selection of the articles for the analysis was arrived at after several iterations. The initial Scopus search query used was:

Search keywords:

"digital resilience" OR "digital intervention" AND (covid OR epidemic OR pandemic OR covid19 OR covid-19 OR disaster OR crisis) = output from query = 436 documents

AND

(corporate OR company OR business OR organization OR firm OR corporation OR incorporated OR limited OR enterprise OR multinational OR conglomerate OR enterprise OR business OR venture OR firm OR company OR organization OR startup OR project OR corporation OR endeavour OR initiative OR industry OR commercial OR "commercial entity" OR "business entity" OR establishment OR trade OR institution OR sector OR "economic unit") = output from query = 183 documents

The number of papers returned from each of the subsequent stages of filtering the search output is as follows:

1) limited to article, review, and conference paper = 164 documents found
2) limited to English = 162 documents found
3) limited to 2020 to present = 160 documents found
4) limited to resource type Journal (Journal & conference proceedings) = 158 documents
5) limited to the G7 countries (USA, Canada, Germany, UK, Japan, Italy, France) = 103 documents found
6) limited to journal title (only business and IS and related journals) = 26 documents (final output)

The articles were evaluated by two members of the research team for relevance. The papers were thus reviewed for evidence of digital technology, intervention, resilience, and business. Three documents that did not meet the relevance criteria were excluded, leaving 23 papers.

Step 3: Quality assessment

The researchers applied a series of inclusion and exclusion criteria to ensure data quality. This includes limiting the search to only peer-reviewed journal articles and conference papers in line with the suggestions of [6]. The papers were all published in the English language from 2020 when the COVID-19 pandemic hit. In addition, only papers published in information systems, business, and information technology and engineering were included whilst papers from health, nursing and other disciplines were excluded to enhance the quality of the papers in terms of relevance. After applying all these quality criteria, the number of papers was reduced from 26 to 23. A summary of the 23 journal publications is shown in Table 1 (Appendix A).

Step 4: Data extraction and monitoring

The bibliometric details of the final set of 26 articles were exported from Scopus in CSV format and saved in preparation for data analysis. The PDFs of the 26 articles were downloaded and imported into NVivo for analysis. After the first round of quick reading of the contents, 3 articles were found not to have discussed digital technology interventions and resilience in business and were excluded. Eventually, only 23 relevant papers have been analysed. The initial run of the search query was in January 2024. The last run of the search term was on 8th July a few days before the submission of this paper to ensure that new papers published on the subject were not missed.

Step 5: Data synthesis

The final set of 23 articles was first visualised using *VOSviewer* [7] to identify clusters of themes on the subject of digital technology interventions and resilience by enterprises. The articles were then synthesised through critical review to identify evidence of data that addresses the research questions. The critical review focused on the nature of digital technology interventions, and digital resilience of enterprises. The next section represents the third phase of the SLR process and reports the results of the data synthesis [2].

3.0 Reporting the Review – Results

The critical review of the 23 papers was first aimed at understanding the state-of-the-art literature on digital technology interventions for business resilience. The results of the study showed that digital resilience for businesses

was perceived differently by different authors. For example, [8] and [9] took a process-based approach and described digital resilience as digitalisation or transformation leading to new work and service delivery forms. Kohn [10] and [11] took a capability-based approach and described digital resilience for business operations as an organisation's dynamic capability to change whilst [12] and [11] took an information system (IS)-based approach and described digital resilience the ability of businesses to use IS to adjust to external shocks.

Resilience is a psychological capability, which in the context of businesses may well reflect the positive psychological capability of employees to deal with or adjust to disruption or bounce back from adverse situations [10]. Digital technologies for business resilience could therefore be described as the capability of employees and or organisations to leverage digital tools to mitigate the effect of disruptions to business operations. In a proactive approach, digital resilience could represent a robust plan, strategy, framework or model that businesses can use to deal with uncertainty. A top-level overlay VOSviewer visualisation [7] of the 23 articles revealed five thematic areas (Fig. 1) – namely information systems, digital health, digital intervention and social media; COVID-19 and wellbeing, digital resilience.

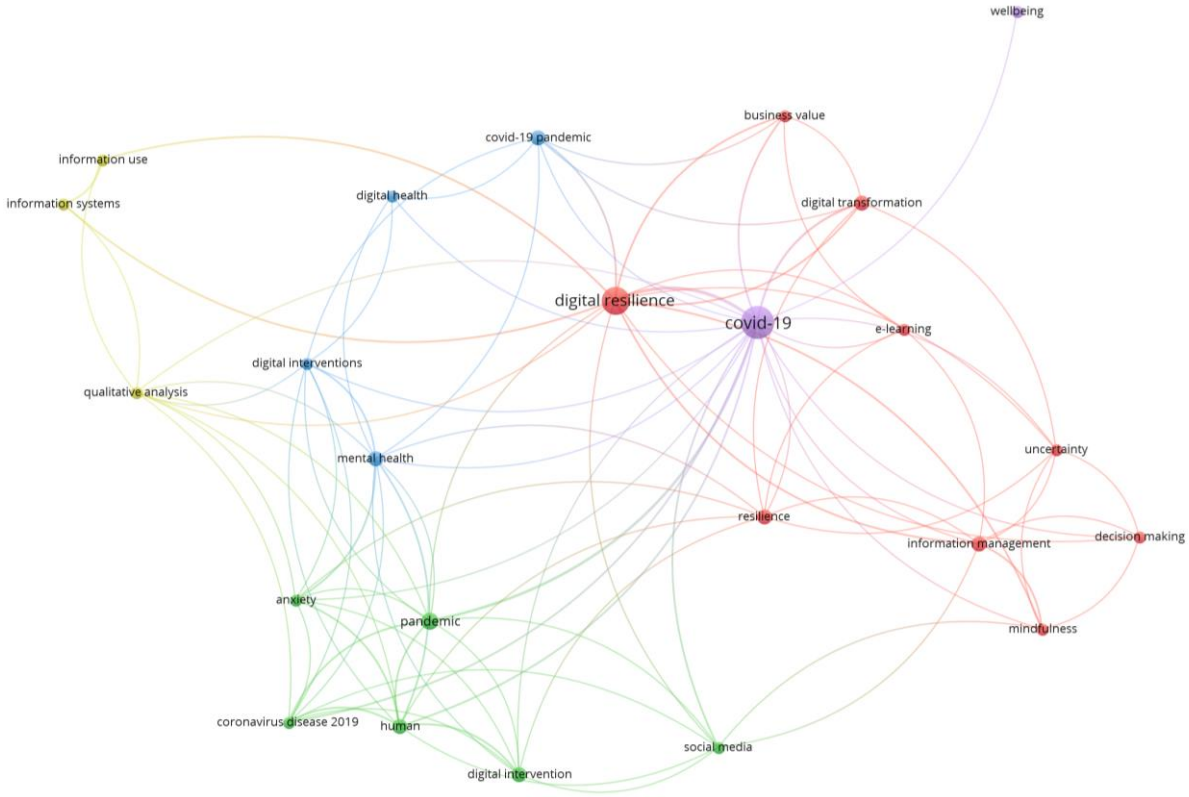

Fig. 1: Thematic areas of digital interventions for business resilience

The results show that businesses deployed digital technology interventions in the form of artificial intelligence and, machine learning-driven solutions to augment their decision-making to achieve business value. Some businesses also adopted various data analytics solutions and blockchain technology to enhance and secure their business operations. The results show that one of the areas of digital technology interventions for business resilience was in the area of e-learning. The higher education sector witnessed massive digital technology interventions [13]. This was to help sustain teaching and learning and help students and educational institutions build resilience in the face of the pandemic whilst sustaining the business of education. It is also worth noting that businesses equally invest in e-learning as a critical intervention to support their employees' transition to remote working. However, the unexpected increase in e-learning and remote working together with the lockdowns during the COVID-19 pandemic resulted in negative consequences requiring digital mental health interventions.

One thematic area of digital intervention during the pandemic was in cyberspace or online platforms especially the use of social media. While individuals switched to the use of online platforms and business

communication and maintain social contacts, businesses switched to setting up online stores, e-commerce activities, social media engagement with customers, and online discussion and communication with stakeholders. Businesses also found online platforms and social media channels as advertising platforms to reach potential customers and expand their market reach. It must be noted that the ability of employees or users to engage in social networking on online platforms very much depends on their digital self-efficacy [14]. For some organisations, the COVID-19 crisis accelerated the digital transformation of their organisation including upskilling to enhance their capacity to use digital technologies [15]. Thus, social networking not only provided a platform for business resilience but also an opportunity for enhancing the digital capabilities of employees and even customers to emerge resilient from the pandemic. The results also revealed that the pandemic indeed accelerated the digitalisation of business processes for firms that were already technologically mature. However, for firms that were not technology-driven, the crisis led to digital transformation of their business operations, service delivery, and stakeholder engagement through digital technology interventions. There was exponential demand and growth in the healthcare business, including the adoption of telemedicine and mobile health services [16]. In addition, businesses appear to have been sustainability-conscious [17] in their choice of digital technologies to combat the pandemic.

Another objective of the study was to ascertain the nature and type of digital technologies deployed by businesses during the pandemic and how effective these were. The results showed that digital technology interventions that were deployed by businesses include data resources [21][29]; information systems [11] including specialised crisis information management systems [18]; online platforms for e-commerce and e-services [27][35]; including third-party platforms to support business operations [22]. The main digital interventions that were deployed by businesses to achieve resilience were digital initiatives such as remote working [12][20]; and digital solutions such as mobile apps [26][30][9][33]. It is thus clear that businesses deployed a good range of digital technology interventions to emerge resilient from the pandemic. Generally, the digital interventions were largely effective although these efforts were not without challenges.

The second objective of the study, therefore, was to ascertain the challenges businesses faced in the deployment of digital interventions during the crisis. The results show that businesses faced challenges with information management, data access [18] [29], IT resource constraints [22], inaccessibility of digital technologies [19], and failure to integrate data from different agencies, especially government agencies [6]. The issues of resource-constrained identified among other things include limited IT investment and governance [24][31][9]. There was also evidence of a lack of digital resilience competencies [20] and IT capabilities [23] of employees and users to use the digital technology interventions deployed during the pandemic. Another challenge faced by businesses in their digital interventions during the pandemic was a lack of inclusivity [8]. This prompted the call for digital interventions to be designed to address the needs of older users [32] as well as younger employees most of whom had to self-train to be able to use the digital tools [8]. These highlight issues of the digital skills gap limited digital literacy and digital poverty [25][27] even among businesses in G7 countries. In addition, the study also identified low engagement and low uptake of digital interventions among business stakeholders [35] which could have been due to privacy and security concerns [8][24][26]. The analysis also revealed a key challenge of digital interventions as the unintended consequences of digitalisation [4]. For example, employees reported technology-mediated interruptions, leading to challenges of work-family life balance, loneliness and lack of support [34]. Generally, businesses faced technical, motivational [10] and governance challenges [31][9][24] in deploying digital technology intervention to achieve resilience from the pandemic. These challenges prompted the need for evidence-based [30] and novel strategies to circumvent these challenges.

The study sought to determine the strategies used by businesses to emerge resilient from their digital interventions. The review of the 23 articles suggests that businesses adopted a reactive approach to digital technology intervention due to the unexpected onset of the pandemic. This includes the implementation of an accelerated digital transformation strategy [23][28]. There was no evidence to suggest that businesses had proactive digital technology strategies to deal with pandemics. This includes adaptive approaches [18]; relationship building, intelligence creation, and value extraction strategies that balance prevention and mitigation of uncertainty through process tracing [21]. Some businesses also employed information campaign strategies to create awareness of and engage users with the digital technologies deployed in response to the pandemic [19] [26]. For resource-constrained businesses, the use of third-party solutions and service platforms helps them shift the risk of digital technology interventions and focus on their core business operations for sustenance.

4.0 Lessons learned to inform future pandemic or crisis preparedness.

Digital resilience should be approached from a sociotechnical perspective [12], where technological capability and resource provision are viewed through user behavioural response within their social environment. Resilient businesses exhibited flexibility in the adoption and integration of digital technologies into their existing operational activities. One of the implications of the study for policymaking is the need for a community resilience framework in combination with digital inclusion mechanisms [28] when considering the deployment of digital interventions in future pandemics. Theoretically, the study offers an opportunity to develop digital interventions and a resilient scale to provide a tool to help businesses measure and quantify their level of digital resilience and provide targeted digital technology interventions during a crisis. The need for future pandemic preparedness is now, and the lessons learned from the lived experience of people in using digital interventions during the pandemic become even more useful. Future studies should therefore look into the possibility of developing digital technology intervention and resilience framework for future pandemics at the individual, business and societal levels.

5. Conclusion, limitations and future research

This paper reports a systematic literature review of the state-of-the-art literature on the nature of digital technology interventions, digital resilience, digitalisation in enterprises during the pandemic, the challenges and success of digital technology interventions, and digital resilience strategies used by enterprises to mitigate the pandemic. The study revealed five thematic areas identified from the visualisation analysis. The COVID-19 pandemic caused a lot of challenges for businesses requiring digital interventions. There was exponential demand and growth in the healthcare business including the adoption of telemedicine and mobile health services [16]. These were largely facilitated by digital technology interventions in the form of online health portals or platforms, mobile apps, fitness and health apps, as well as digital health interventions for mental health. It must be noted that most of the digital technology interventions were largely provided by third-party information technology firms that developed telemedicine mobile health and mental health digital solutions in partnership with healthcare services providers. This indicates that the pandemic also created an opportunity for business solution providers to unleash their innovative capabilities to provide critical digital solutions to help businesses and individuals emerge resilient from the pandemic. In terms of limitations, apart from the current study being limited to G7 countries, the papers were sourced only from the Scopus database. Therefore, future studies can extend this study by expanding the data sources to include other electronic databases such as Web of Science, JSTOR, ERIC, ScienceDirect, and IEEE Xplore among other academic databases.

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Table 1: List and Sources of papers used for the SLR

No.	Authors (Year)	Source Title
1	Kohn V.; Frank M.; Holten R. [12]	Journal of Enterprise Information Management
2	Paulus et al. [18]	Information Systems Frontiers
3	Akinnuwesi et al. [19]	Sustainable Operations and Computers
4	Webb, McQuaid & Webster [8]	World Journal of Science, Technology and Sustainable Development
5	Tramontano, Grant & Clarke [20]	Computers in Human Behavior Reports
6	Tremblay, Kohli & Rivero [21]	MIS Quarterly: Management Information Systems
7	Li S.; Liu Y.; Su J.; Luo X.; Yang X. [22]	Electronic Commerce Research
8	Mangalaraj, Nerur, & Dwivedi [23]	Journal of Computer Information Systems
9	Benitez et al. [24]	Information and Management
10	Kohn [10]	International Conference on Information Systems, ICIS 2020 - Making Digital Inclusive: Blending the Local and the Global
11	Fisher et al. [25]	Journal of Technology in Behavioral Science
12	Kohn [11]	Proceedings of the Annual Hawaii International Conference on System Sciences
13	Shen et al. [26]	Digital Health
14	Choukou et al. [27]	Digital Health
15	Al-Abdulghani, Vatanasakdakul & Aoun [28]	27th Annual Americas Conference on Information Systems, AMCIS 2021
16	Kostkova et al. [29]	Frontiers in Digital Health
17	Prochaska et al. [30]	JMIR mHealth and uHealth
18	Park J.; Son Y.; Angst C.M. [31]	MIS Quarterly: Management Information Systems
19	Gupta et al. [9]	Information Technology and People
20	Stuart et al. [32]	Computers in Human Behavior Reports
21	Rodrigo et al. [33]	Information Systems Frontiers
22	Malgonde, Saldanha & Mithas [34]	MIS Quarterly: Management Information Systems
23	De Witte et al. [35]	Internet Interventions