

A Bibliometric Analysis on Digitalization During the COVID-19 Pandemic

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Abstract

The digitalization phenomenon can be found in academic literature starting the last years of the 20th century. However, during the COVID-19 pandemic organizations and individuals all over the world have found themselves in a position that required the use of digital technologies to adapt to the restrictions imposed by public authorities in order to minimise the spread of the virus. As a direct consequence the academic literature enriched with a significant number of papers discussing the challenges and opportunities brought by this phenomenon.

The aim of this paper is to identify the evolution of this subject between the first months of 2020 and beginning of 2023, by conducting a bibliometric analysis performed with VOSviewer software on papers from Web of Science.

This paper adds value for further research on digitalization during the COVID-19 pandemic.

Keywords: digitalization, organizations, individuals, COVID-19, bibliometric analysis

JEL classification: F23, O33, D23, D81

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1. Introduction

The new coronavirus disease was first observed in December 2019 in Wuhan, China. A couple of months later it was recognized by the World Health Organization (WHO) as SARS CoV-2 and suggestively named COVID-19 (European Council, 2021). In just a few months, the COVID-19 pandemic has forced individuals all over the world to adapt their behaviour, both personally and professionally, social distancing becoming a necessity to reduce the spread of the virus (Tang, et al., 2020). As a result, digitalization has become an essential tool for maintaining business operations, education, and social interactions. There are studies that show that the progress made in the early phase of the COVID-19 pandemic would have typically been made over a much longer period of at least 3-4 years (McKinsey Digital and Strategy & Corporate Finance Practices, 2020). The ability to work remotely is just one example of a digital change that has occurred because of restrictions imposed by the authorities during the COVID-19 pandemic. If the initial

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estimated time for this process to be implemented at the organizational level was 454 working days, at the beginning of the pandemic the duration decreased to 10.5 days, the value of the acceleration factor (f.a. = estimated/real) being 43 (McKinsey Digital and Strategy & Corporate Finance Practices, 2020).

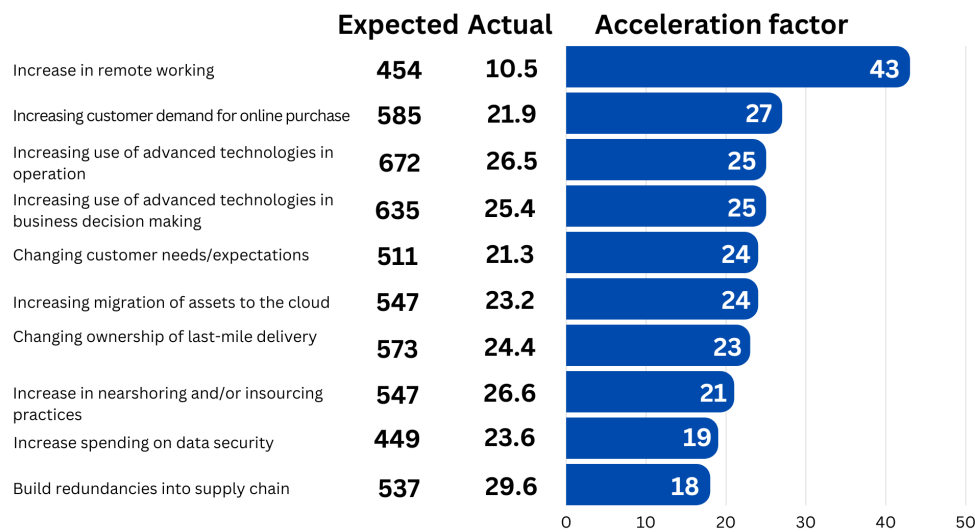


Figure 1 Time required to respond to or implement changes, expected vs actual, number of days

Source: Author's contribution based on McKinsey

The pandemic has accelerated the adoption of digital technologies, forcing individuals and organizations to adapt to new ways of working, communicating, and consuming information. Researchers from various disciplines have explored the implications of this phenomenon on different aspects of society, producing a rapid evolution of the academic literature. The aim of this paper is to provide an overview of the evolution of the academic literature on digitalization during the COVID-19 pandemic, highlighting the key themes and debates that have emerged.

2. Literature Review

2.1 The response of small and medium-sized enterprises to the measures imposed by the COVID-19 pandemic.

The focus of digitization in organizations did not radically change with the emergence of the COVID-19 pandemic, but if before 2020 the focus was on technologies such as Web 4.0, Internet of Things, Industry 4.0 (Almeida, et al., 2020), all part from the fourth industrial revolution, in the early period of the pandemic the most used digital tools were those that allowed remote

communication and collaboration (Pinzaru, et al., 2020). An important aspect mentioned in the specialized literature is that organizations that had already focused on digital collaboration solutions or other solutions with a digital character found it much easier to adapt to the new changes produced by the COVID-19 pandemic, placing them in a favorable position, but those in which the level of digitalization was minimal to non-existent (both in the customer relationship process, in operationalization or in the level of digital skills of employees) (Deloitte, 2020). Therefore, it was easy for SMEs to respond in a more efficient way to the newly emerging crisis, through the lens of what is called dynamic capabilities, defined as "the ability of the organization to integrate, build and reconfigure internal and external competencies for to respond to the ever-changing environment" (Teece, 2010). It was also possible to develop a new digital network that would help overcome the dominance of large organizations, or at least put them in trouble (Zhou, et al., 2021). Social media platforms and technologies developed for mobile devices have played an important role in quick and direct communication with customers (Gregurec, et al., 2021). The less rigid structure and the ability to adapt much more easily due to the malleable structure has allowed small and medium-sized enterprises to adopt the innovation of temporary business models, as long-term strategies are not suitable for such organizations (Clauss, et al., 2021).

2.2 The response of corporations to the measures imposed by the COVID-19 pandemic.

Organizations that had already initiated a digitalization process before the outbreak of the COVID-19 pandemic also found it easier to adapt in the early phase of the restrictions imposed by the authorities. The measures taken by them were both short term, medium and long term (Guo, et al., 2020). Those companies that were digitally mature reported a higher degree of process organization and less interference from managerial and structural decisions in digital work (Deloitte, 2020). By integrating the opportunities offered by digitalization into business models, organizations have acquired not only the roles of a supplier of goods or products or a developer of technologies, but also an aggregator of information that they can later use to their own advantage. The digitalization process during the COVID-19 pandemic often required a restructure of traditional processes, or the rethinking of their logic so that the organization becomes agile, invests in organic structures, strengthens existing standards or develops new ones and puts focus on automation as a key element. A direct effect of these optimizations was improved responsiveness to customers (Almeida, et al., 2020). Where it has been used effectively and intelligently, the digitalization of organizations has led to significant increases in productivity and cost reduction (Khalil, 2020).

2.3 Challenges of the digitization process in the context of the COVID-19 pandemic

The digitization process primarily required the adaptation of business structures to the new requirements, so that the business practices needed in crisis situations can be implemented (Fitriasari, 2020). Some organizations have been forced to adopt new internal work practices and offer products and services through digital channels, due to the impossibility of offering them through the now restricted classic channels. A special situation was that of organizations where remote work was not possible on a large scale. The organizations experienced decreases in staff and subsequently in revenue. Accelerating the digitization process was, however, only one of the five aspects that organizations had to focus on during the COVID-19 pandemic (Pînzaru et al., 2020) and although most industries were affected, the level was different, with significant differences between manufacturing, commercial and service industries (Soto-Acosta, 2020).

2.4 Opportunities of the digitization process in the context of the COVID-19 pandemic

Industries that experts said would take at least 2 years to go through a full digitization process before 2020 managed to complete this process in less than 10 weeks at the start of the COVID-19 pandemic. The binder of this accelerated process (in addition to restrictions imposed by authorities around the world) has been easy access to high-speed Internet (including 5G), allowing organizations to feel the effectiveness of the impact that technologies have on them on a large scale. The way to implement the relevant technologies at macro level was thus opened. The need to use new strategies to limit the spread of the coronavirus with the help of digital technologies also had a significant impact, part of the new work scenarios starting from it and leading to complex applications, with implications in other areas of society (Stone, 2020). And while most industries have experienced declines in revenue, automation processes implemented in the early phase of the COVID-19 pandemic, along with complex data analytics systems have sometimes generated new sources of revenue, allowing organizations to survive or invest in other technologies (Venancio, 2020). The high level of usage of digital solutions has produced a large volume of data (digital exhaust), which has been analyzed and used by some organizations with the aim of reducing redundancy and increasing the degree of innovation (Leonardi, 2021). Some reports show that the most important changes occurred in countries where the degree of restrictions imposed by public authorities was very high, thus forcing organizations to find solutions for a wider range of newly emerging situations (Lukk, 2020). The leaders of the digitization process were retail (73%) and telecom (71%) industries. Moreover, the telecommunications sector is perceived as the one that has completely changed the

user experience by implementing processes that allow fully digital interaction (Capgemini, 2020).

2.5 Employee management in the context of the COVID-19 pandemic

Even before the outbreak of the COVID-19 pandemic, it was necessary for organizations to rethink management and collaboration models to ensure that all roles are involved in the digitization process. However, not all organizations and not all individuals had the necessary resources and skills to equally own this process (Almeida, et al., 2020). As a result, there were effects such as stress caused by the high number of hours spent in front of digital devices without interruptions (Gruia, et al., 2020). More specifically, with the lifting of restrictions and the gradual return to a work style close to the pre-pandemic one, there has been a need for employees to have a number of hours to spend away from digital devices, participating in individual or organized activities (De, et al., 2020). In addition to the need of a strategy to manage the effects of the pandemic, the leaders of the organizations had to find an exit strategy when the restrictions were lifted and there was a return to a way of working similar to the pre-pandemic one. Depending on the region, this process happened gradually during 2022, but some areas in Asia and Western Europe are still partially under the effect of the restrictions imposed by the COVID-19 pandemic. An important aspect that had to be taken into account was the use of technology as support to employees, not a replacement (Khalil, 2020). Mental health has become a priority among organizations, with employees going through a long period of stress both professionally and personally (Spicer, 2020). The COVID-19 pandemic is the source of a large number of fears among them, different depending on the hierarchical position in the organization: people in executive roles fear that they will be out of a job and that they will have financial problems; those who occupy management roles are primarily afraid of losing their hierarchical and social position; those who could not work remotely report a high level of anxiety; those who have permanently worked remotely fear the moment of returning to the office, also having an emotional deficit caused by the lack of human interaction (Mokline & Ben Abdallah, 2021). Last but not least, to be able to provide the best customer experience, employees need to believe in the common purpose and feel important and relevant in the organization (KPMG, 2020).

3. Research Methodology

In the elaboration of the bibliometric analysis, papers indexed in the databases available in Web of Science were selected, considering them sufficient and complete to cover the phenomenon of digitization in managerial decisions. Initially, articles available in Scopus were also considered, but it was observed that most of the materials available in Scopus are also available in Web of Science. The bibliometric analysis was

developed using the VOSviewer tool, version 1.6.19, released on January 23, 2023. The main analysis was done on the degree of co-occurrence of different terms in the title, keywords or abstract of the articles. The mapping function of the VOSviewer tool generates a two-dimensional map that shows the correlation between 2 terms by the distance between them. The term used to search the content was „digitalization” present in the title and keywords of each article.

Articles written in English were selected, from research areas related to management and education. The search returned 4.079 results, exported on 14 February 2023, and imported into VOSviewer tool.

4. Results

The aim of this paper is to analyse the evolution of the academic literature regarding the digitalization phenomenon to see if and how it changed during the COVID-19 pandemic. The first step of this analysis was to compare the number of papers published by year. From a total of 4.079 papers selected, 3.109 (76.2%) were published between 2020 and 2023, showing increased interest regarding this topic.

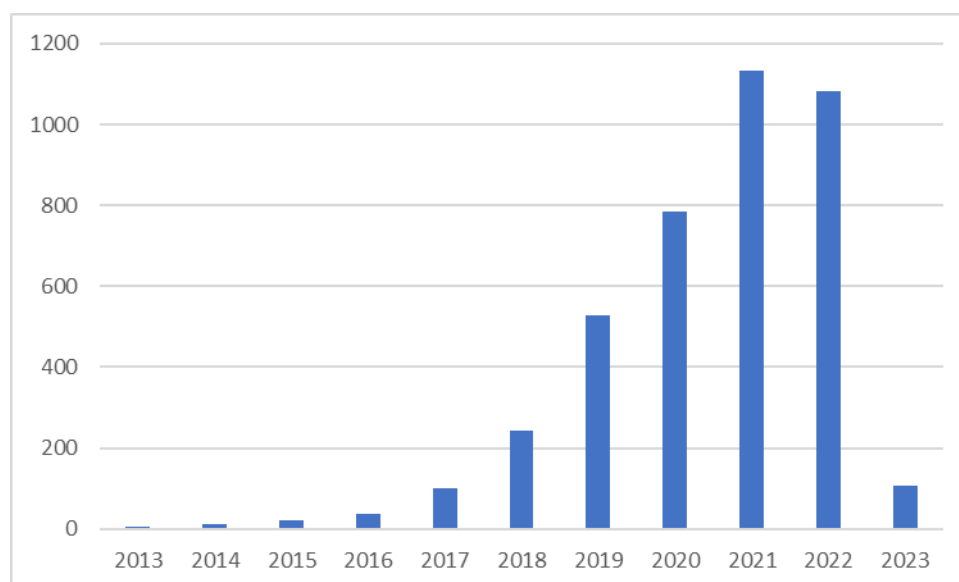


Figure 2. Number of published digitalization papers by year

Source: author's contribution, based on WoS data analysis

Most articles were published in “Management” Web of Science category (510), followed by “Business” (487), Environmental Sciences (432) and economics (411).



Figure 3. Distribution of papers by Web of Science category
Source: author's contribution base on WoS data analysis

The countries with the largest number of digitalization papers published are Germany (595) and Russia (591), followed by England (334) and Sweden (285).

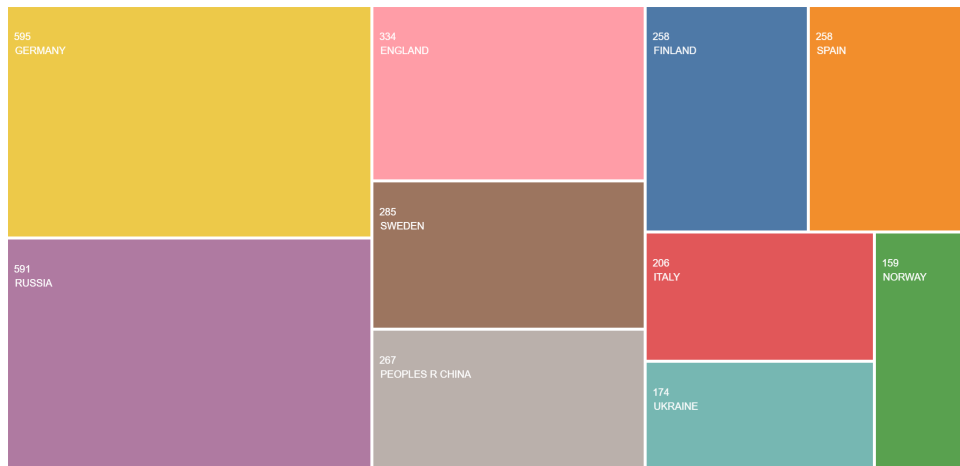


Figure 4. Distribution of papers by country
Source: author's contribution base on WoS data analysis

To better analyze and visualize the connection between digitalization and other keywords, a keyword map was created with the help of VOSviewer tool by grouping keywords into clusters with the clustering technique, described by van Eck & Waltman, 2011. This technique is using keywords as nodes, showing co-occurrence and link strenght by drawing lines of different weights between them. Figure 5 shows the map generated by VOSviewer, containing 489 keywords related to digitalization with at least 10 co-occurences, divided into 6 clusters.

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