

THE IMPACT OF THE DIGITALIZATION PHENOMENON ON MANAGEMENT PRACTICES BEFORE AND AFTER THE COVID-19 PANDEMIC. A LITERATURE REVIEW

Valentin STOICA

National University of Political Studies and Public Administration
30A Expoziției Blvd., District 1, 010324 Bucharest, Romania
valentin.stoica@facultateademanagement.ro

Abstract. *Digital transformation is a topic that was already having a significant popularity in organizations in the last decade, with C-level managers understanding that in order to stay competitive and avoid the disruption happening in many industries they will have to adapt their businesses and have a more digital approach. The COVID-19 pandemic only accelerated this existing process, not only by forcing organizations to adopt new digital tools and technologies, but also by changing mindsets and accelerating processes that would usually take at least a couple of years to happen in an organic environment. Remote work is only an example of change that happened during the COVID-19 pandemic and is currently becoming normality for employees and organizations, although before 2020 one day of remote working each month was a benefit that only a small part of the organizations was offering. The aim of this paper is to analyze the impact of the COVID-19 pandemic on researches about digital transformation in management practices before and after the COVID-19 pandemic by using text mining and visual mapping conducted with the help of VOSviewer software. A change in research topics regarding digital transformation and its implications after the beginning of the COVID-19 pandemic was observed with the help of a bibliometric analysis conducted with the help of Web of Science libraries and VOSviewer software.*

Keywords: *COVID-19; digital transformation; digitalization; management practices; pandemic;*

Introduction

Although the digital transformation literature was already developing at a high rate before 2020, the COVID-19 pandemic produced a significant increase in the number of studies published, as one of the major impacts of the restrictions imposed by the authorities all over the world was the adoption of digital tools on all levels in organizations. Starting from the premise that in order to explore major information trends, categories and to identify existing research gaps, relevant and recent literature was reviewed by doing a literature review on materials published in the Web of Science libraries and by using VOSviewer in order to analyze and visualize the similarities and differences in materials published until 2020, after and during the COVID-19 pandemic. Literature review play a vital role during crises such as the COVID-19 pandemic, where events unfold rapidly and we find ourselves inundated with an overwhelming amount of information as research publications continue to grow.(Stanley, 2001). The Web of Science database was used in August 2022 to find materials containing “digital transformation” and/or “COVID-19” as keywords, returning 7.835 materials.

In Figure 1 is presented the number of published digital transformation materials by years, indicating that almost 38% of the materials were published in the last two years (2021 and 2020), equaling the number of materials published in 2014-2019. And although 2022 is not over, there is already a number of 2.183 materials published, almost as much as in 2020.

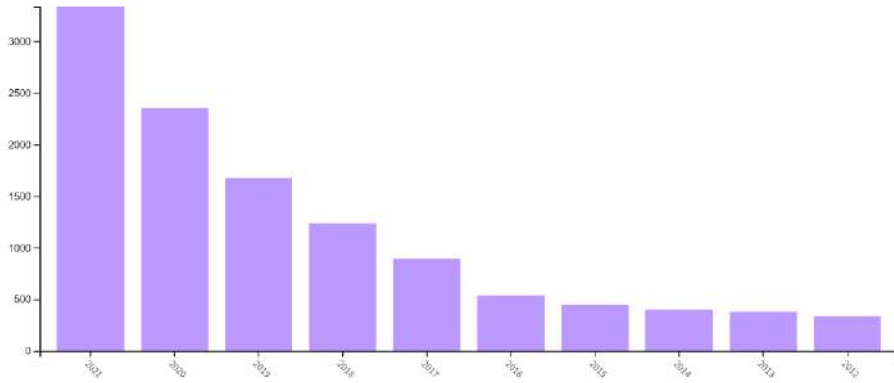


Figure 1 Number of digital transformation materials published in 2014-2021. Source: Web of Science, August 2022

The research area in which the majority of the materials were published was Engineering, with almost a quarter of the total published materials. However, the high number of materials published in research areas related to technology and computer science can be explained by the fact that digital transformation has a strong technological component as being driven and focused on digital tools. The level of interest for this subject in business is proven by the number of materials published in research areas related to management (898 materials published, 6% of the total) and business (675 materials published, 4.5% of the total).



Figure 2 Number of digital transformation materials published by categories in 2014-2021. Source: Web of Science, August 2022

However, restricting the publishing years to 2020, 2021 and first half of 2022, the percent of digital transformation materials published in management and business research areas increases significantly, to 18.5% of the total published digital transformation materials, showing high interest on this topic after the beginning and during the COVID-19 pandemic. This can be explained by the increased number of organizations and individuals that have found solutions with a significant digital component during the COVID-19 pandemic in order to cope with the new challenges imposed by the authorities all over the world.



Figure 3 Number of digital transformation materials published by categories in 2021, 2022 and first half of 2022. Source: Web of Science, August 2022

Literature review

The process of digitalization is reshaping current processes and facilitating the development of new ones, while also impacting individual behavior and requirements. It enables enhanced intra- and inter-company collaboration and paves the way for novel forms of automation. (Kerpedzhiev et al, 2021). Amidst the COVID-19 crisis, the pivotal factor for effective responses has been identified as the presence of dynamic capabilities within organizational performance. (Lin, 2014) (Linnenluecke, 2017). In response to the COVID-19 pandemic in 2020, companies have widely embraced various digital technologies as a means of adhering to social distancing measures and adapting to the "new normal." These technologies had already existed on a large scale before the pandemic but were extensively employed during this period. For instance, educational institutions worldwide had to implement online learning as the sole viable method to continue their operations during lockdowns, even though this technology had been available for a significant period of time prior to its adoption. However, recent studies have indicated that the COVID-19 pandemic has resulted in changes in student behavior. To address these changes, a combination of tangible and digital resources that can ideally be interchanged is necessary, taking into account the specific preferences observed among female and male students, as well as between bachelor's and master's level students. (Hargitai, Pînzaru, & Veres, 2021). The term employed to characterize

the creation of advantageous circumstances for an unprecedented phenomenon is "disruption" or a revolutionary transformation. (Ganichev & Koshovets, 2021). This process is underway as individuals and organizations are compelled to transition their daily activities to a new digital society. It holds significant importance as humanity must cultivate the capacity to devise solutions for the unavoidable shocks and disruptions that impact the economy and society. Numerous recent examples, such as the 2008 global financial crisis and the more recent COVID-19 pandemic, serve as compelling illustrations of the significance of this process, with these events merely scratching the surface of the larger picture. (Ra et al, 2021). Despite significant efforts made since the beginning of the new millennium to transition towards a more digital economy and embrace its implications, it was only recently that the entire world experienced an unprecedented need for this change. The outbreak of COVID-19 resulted in extensive disruptions across various industries, impacting the daily lives of people worldwide. Technology emerged as the solution, with businesses swiftly adopting digitalization of processes, online meetings, and remote work as the logical choice in response to lockdown measures. While the full extent of these changes is yet to be fully measured and analyzed, evidence indicates that the accelerated digitalization process has actually boosted productivity, reduced asset ratios, and generated an increased demand for training as employees had to acquire new technological skills. (Ra et al, 2021).

Digitization, digitalization and digital transformation

In order to have a clear definition of this term, it is important to also define digitization and digitalization. Digitization is defined as being the process of taking analog information and changing it to digital form, without adding significant changes to its essence (Gartner's IT Glossary). The best example for this definition is the process of taking handwritten text and converting it into digital form by typing it using a digital keyboard connected to another device. The main characteristic of this term is that it defines the digitization of information, not the process. That's why, according to Gartner's Glossary, digitalization is defined as „the process of moving to a digital business”, by using digital technologies to change a business model and provide new revenue and value-producing opportunities (Gartner's IT Glossary, n.d.). And although many other definitions imply that digitalization has an impact only in social interactions or in business models, according to the report *Digitalization and American Workforce* by Mark Muro, digitalization is “the process of employing digital technologies and information to transform business operations” (Muro et al, 2017). By buying and implementing “digital technologies”, organizations also have to deal with a change in people's jobs and that's the reason that automatization is a key element in the digitalization story (Tacke & Ehrhardt, 2017). Last but not least, digital transformation, unlike digitalization, it's not something that can be implemented as a project in an organization, but refers to the customer-driven strategic business transformation that requires cross-cutting organizational change as well as the implementation of digital technologies (Bloomberg, 2018). That's why the whole process of digital transformation will often include multiple digitalization projects, requiring the organizations to make changes to their core competency, becoming customer-driven end-to-end. In conclusion, digitization applies to information, digitalization to processes and roles that make up the operations of a business that can be digitally transformed together with its strategy. And while digitization and digitalization are mostly about technology, digital transformation is about customers.

COVID-19 pandemic

The Coronavirus Disease 2019 (COVID-19) initially emerged as an epidemic in mainland China in February 2020. However, it rapidly escalated into a global pandemic, officially declared by the World Health Organization on March 11th, 2020. The profound impact it had on the world was beyond our wildest expectations, transforming it in ways we could never have imagined. (World Health Organization, 2020).

An unseen adversary brought our lives to a halt, forced businesses to close, and posed risks to global economies. Presently, the world grapples with various challenges, including public health strategies, fiscal and monetary support, the pace of vaccine distribution, and the recovery of heavily impacted sectors. However, there is a glimmer of hope for the global economy as prospects begin to improve. (OECD, 2021).

The forecast suggests a 6% increase in global output in 2022, following a 3.5% contraction experienced in 2020. However, this growth will fall short of matching the pre-pandemic trajectory, leading to many OECD countries still lagging behind the expected living standards prior to the pandemic. Nevertheless, swift policy measures have resulted in significant progress. After sixteen months into the pandemic, nearly 2 billion vaccine doses have been administered, laying the groundwork for both health and economic recovery. As the world economy gradually returns to pre-pandemic levels of activity, the projected Global GDP growth stands at approximately 5.75% in 2021 and close to 4.5% in 2022. (OECD, 2021). As countries around the world have started to cautiously ease restrictions, our reliance on digital technologies remains crucial to maintaining activity levels that resemble those prior to the pandemic. Contrary to the prevailing perception that employees are eager to return to office settings, an interesting fact emerges: nearly half of the workers in the UK are willing to accept a reduction in salary to sustain long-term remote work arrangements. (OWL Labs, 2020).

Management practices

Defined as the working methods and innovations that managers use to improve the effectiveness of work systems or as an entity of instruments to support implementation of concepts and ideas at all levels of conceptualization a realization of concepts, ultimately aiming to support organizational processes, management practices are tightly related to the concept of digital transformation in organizations and are constantly adapting. Nowadays, in order to be aligned with the contemporary business environment, organizations use a plethora of different management practices in order to support their operations (Nedelko & Potočan, 2015).

With digitalization, globalization, unexpected crises and shortage of resources being more and more present in our reality, organizations have to assess their impact and prepare themselves for the future. Technology and people are the two determinant factors that are impacting the fundamentals of organizational behavior and pushing them towards changes that can maintain or extend their position in the market. But among these two factors there are others, both external and internal, that are determining the need of a complex and complete digital transformation process in organizations in order to remain competitive and adapt to the new digital economy.

With customers being more and more tech-savvy and the concept of early-adopter being an asset that can easily describe someone, organizations have to know their customers and what they do in terms of digital tools. Additionally, beyond customization, which implies a restriction in the customer's role and involves making suggestions for incremental changes to an almost complete prototype, co-creation has become the new way of developing goods or services by involving the customer as an active collaborator right from the beginning of the innovation process (Kristensson et al, 2008). Since the beginning of the COVID-19 pandemic, organizations had to deal with a large number of new requests coming from customers that were also dealing with a new reality generated by the restrictions imposed by the public authorities. Many of these requests had solutions that involved significant digital development both in terms of hardware and knowledge and changed day-to-day activities for an unlimited period of time.

With disruptive technologies creating growth through the introduction of products or services that are dramatically better, cheaper and more convenient, organizations have to deal with a new wave of technologically unsophisticated individuals or smaller organizations entering and becoming competitive in the industrial workforce, forcing them to change their operations or processes significantly. If during normal times some industries were less affected by disruptive technologies than others, during the COVID-19 pandemic almost all domains faced a new challenge and had to adapt by developing new internal virtual processes before developing user workflows in order to keep customers close to the business and assuring the level of satisfaction as high as possible during crises. For example, restaurants had to adapt and find new ways to deliver their products to the customers during lockdowns, boosting the food delivery apps and forcing other businesses to develop their own delivery services in order to stay competitive.

Reputation is another important external factor that organizations have to deal with during crisis, with corporate social responsibility (CSR) activities also being a priority for organizations and the COVID-19 pandemic leading to a sharp increase in governments' and market participants' attention to CSR considerations (Bae et al, 2021). And with the latest advances in digital technologies and the new way of doing things during crises that impose restrictions and lockdowns, the utilization of social media and other digital communication channels for marketing, promotion of products, CSR practices and stakeholder engagement gave organizations a boost in terms of reputation and allowed them to maintain the customers' satisfaction close to normal. But this involved a high level of understanding the customers' needs and how to respond in a proper way using digital tools as a leverage. Mainly this first implied an internal process of developing the employees' digital skills before they could further develop new digital strategies for customers (Troise & Camilleri, 2021).

Privacy and personal data protection of users has lately become a priority for governments and organizations. With the adoption of the new European regulation, known as GDPR on 25 May 2018, personal data was defined as any information related to a person who can be identified directly or indirectly with specific factors for personal, physical, digital, physiological, genetic, mental, economic, cultural or social identity (intersoft consulting). Organizations had therefore to walk through a new process of carefully handling customers' data and complying with the new regulations for users coming from Europe, with other resembling regulations being gradually implemented in America or Australia (Romansky, 2019). New technologies like cloud computing,

Internet of Things (IoT), Big Data Analysis creates new opportunities for collaboration, remote storing data, smart application and processing very large data but also create problems for the privacy. This domain being mostly regulated by local authorities means that organizations have little to no space to develop new processes and they have to adhere to existing regulations. During the COVID-19 pandemic everything happened faster than usual, meaning that for organizations it was harder to maintain the quality of processes while also keeping them in line with other regulations regarding privacy and data control.

As digital transformation is seen as an adaptation of business models, resulting from the dynamic pace of technological progress and innovation that trigger changes in consumer and social behaviors, it has to benefit from support of the board management and the C-suite. With information technology (IT) becoming a strategic differentiation for many established firms over the last decades (Bassellier, 2004) two new roles were gaining importance: Chief Information Officer and Chief Digital Officer. With competitive differentiation in the market through IT has become a critical C-level topic, the role of the CIO has also changed and became more and more important and associated with evolution, pressure, complexity and tension (Haffke et al, 2016). Beginning as a data processing manager (Martin, 1982) the CIO role is currently dealing with ambiguity, but is also starting to be seen as more valuable and as a business manager than a technical manager (Chun & Mooney, 2009).

Methodology

In order to assemble a general image of the digital transformation materials written, VOSviewer (version 1.6.18) was used to generate multiple maps based on bibliometric data for materials indexed in the Web of Science database. Keywords „digital transformation” and „COVID-19” were used for advanced searches, the results being refined in order to select only materials written in English that were indexed in the Business and Management categories.

Results and discussion

For a better understanding of how the COVID-19 affected management practices, an analysis based on the direct comparison of digital transformation materials published before and after the beginning of the pandemic (March 2020) was developed. Using „digital transformation” as a keyword in Web of Science and selecting only the materials published before 2020 in English, indexed in the Business and Management categories, generated 377 results. The total number of keywords was 260, with 37 of the keywords meeting the criteria of having at least 2 co-occurrences. If the condition of having minimum 3 occurrences was selected, the number of keywords meeting the criteria was significantly lower, down to 16, divided into 4 clusters. The final results had 65 links with a total length strength of 37.

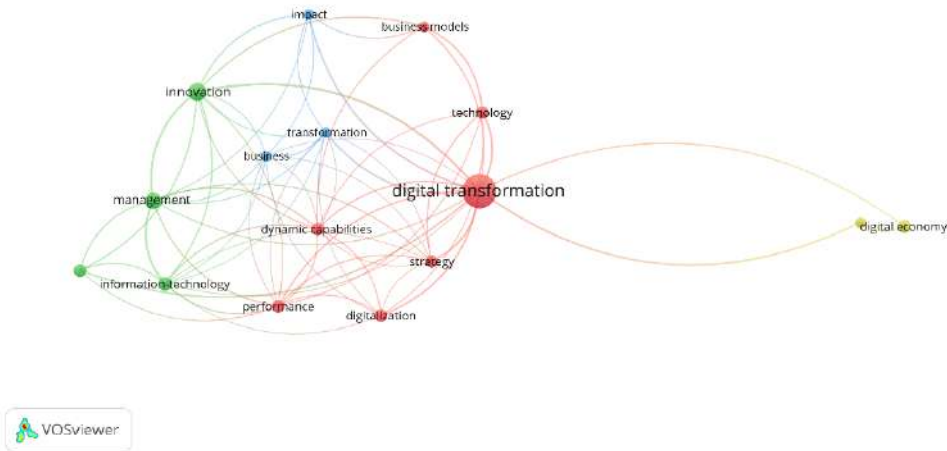


Figure 4 Map of digital transformation literature until 2020 with at least 3 co-occurrences. Author’s own research results

“Digital transformation” keyword has 15 links with other keywords. In its own cluster the strongest link is with „strategy” – 1.98. In order clusters the strongest links are with „innovation” – 2.67, „impact” – 1.33 and „industry 4.0” – 1.50.

Narrowing the results of the search using „digital transformation” as a keyword and selecting only the materials published from 2020 to 2022 (first six months) generates 451 results, 74 more than the materials published before 2020, showing an increased interest over this subject since the beginning of the COVID-19 pandemic. The total number of keywords was 293, with 46 of the keywords meeting the criteria of having at least 2 co-occurrences. If the condition of having minimum 3 occurrences was selected, the number of keywords meeting the criteria halved, to 23, divided into 4 clusters, as seen in Figure 5. The final results had 137 links with a total length strength of 72.50.

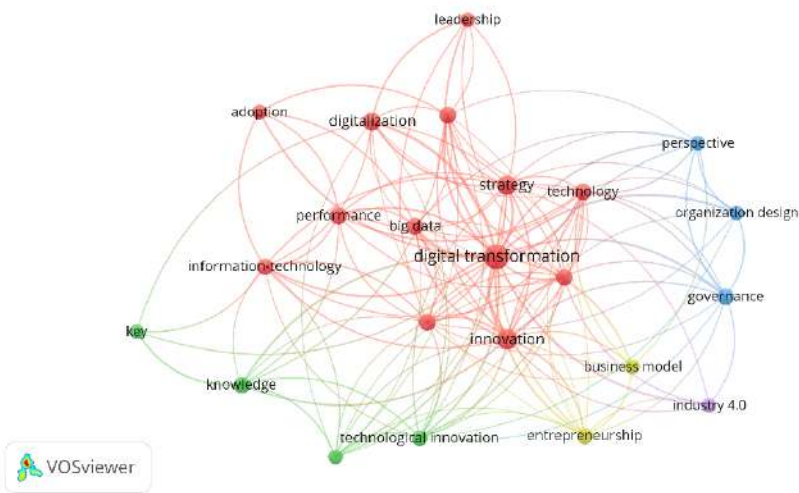


Figure 5 Map of digital transformation literature since 2020 with at least 3 co-occurrences. Author’s own research results

Reducing the number of minimum co-occurrences to 5 generates a map with 14 keywords, 4 clusters and a total link strength of 57.50. „Digital transformation” keyword has 41 occurrences, links with all the other keywords and a total link strength of 31. For digital transformation materials published after the beginning of the COVID-19 pandemic there is a strong link between „digital transformation” and „innovation” keywords – 5.07. „Strategy” is also strongly linked with „digital transformation”, having a link strength of 3.13. „Knowledge” is a keyword directly linked to „digital transformation” that has enough co-occurrences for materials written after 2020 in order to be displayed on the map. This is also in line with the literature showing that among the most successful organizations are those that can be considered as knowledge-based ones, issue addressed more and more since the beginning of the COVID-19 pandemic (Zbucea, Ivan, Petropoulos, & Pînzaru, 2019). So is big data, knowledge, entrepreneurship, and dynamic capabilities, showing the topics that were most popular during the crisis generated by the COVID-19 pandemic and confirming what has been underlined in the chapter dedicated to the literature review.

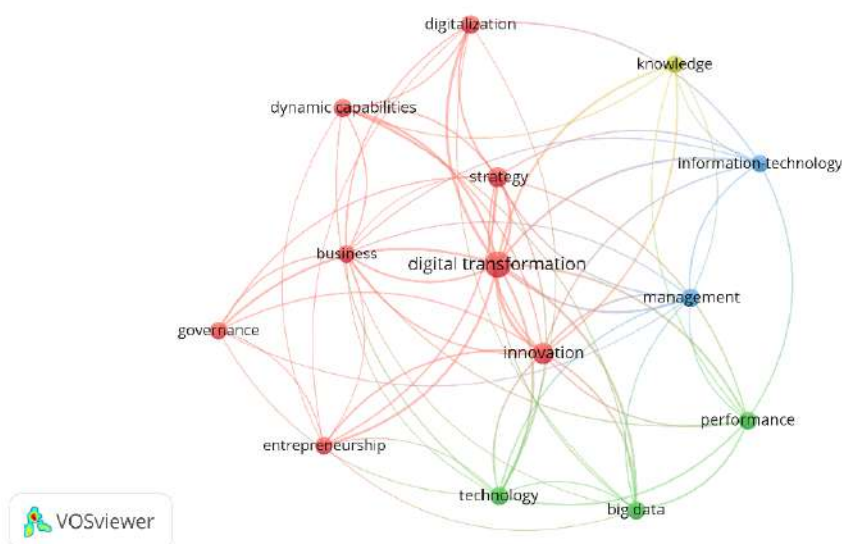


Figure 6 Map of digital transformation literature since 2020 with at least 5 co-occurrences.
Author's own research results

A search on Web of Science using „digital transformation” and „COVID-19” keywords generated 854 materials, published since 2020. The majority of the articles were published in Business and Management areas, a percent of 21% of the total.



Figure 7 Digital transformation and COVID-19 materials published by research area. Author's own research result

In total there were 3.661 keywords from which 195 met the condition of having at least 5 co-occurrences. In order to simplify the visualization, the number of minimum co-occurrences was increased to 20, resulting 32 keywords and 6 clusters as shown in Figure 8.

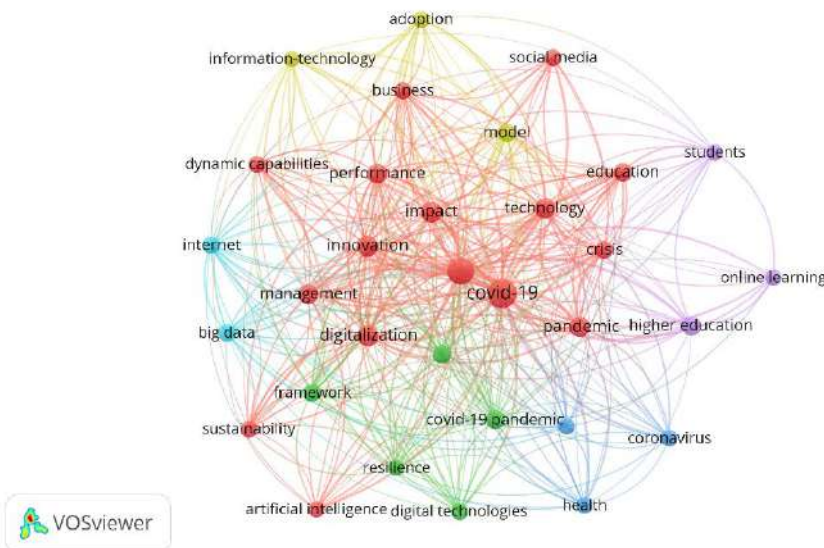


Figure 8 Map of digital transformation and COVID-19 literature since 2020 with at least 20 co-occurrences. Author's own research results

There were 5 important areas where digital transformation and COVID-19 materials were published since the beginning of the pandemic: education, health, resilience, big data and artificial intelligence, all of them connected and generating a total link strength of 670. An important mention goes to “social media” keyword, being directly linked to “COVID-19” and “digital transformation”, as seen also in the chapter dedicated to the Literature review for being a very common solution adopted by organizations during the COVID-19 pandemic in order to keep in touch with their customers.

When looking at each cluster separately one can observe the characteristics defining that area, as following: in Cluster 2 (green) the focus is on digital technologies as a solution for generating frameworks in order to develop the resilience of an organization in order to support the transformation process during crisis. Cluster 3 (dark blue) has only 3 keywords: coronavirus, health and information, showing that the focus was on keeping individuals updated by providing relevant information regarding health issues. Cluster 4 (yellow) also has 3 keywords: adoption, information-technology and model, while Cluster 5 (purple) is related to education and online learning and Cluster 6 (light blue) focuses on big data.

Conclusions

Literature review together with the bibliometric analysis shows the change of focus in research on digital transformation materials since the beginning of the COVID-19 pandemic, with an increase of the number of materials published in Business and Management areas. Some keywords were also observed to be more recent and more popular since 2020, with big data, knowledge, entrepreneurship, and dynamic capabilities being directly linked with digital transformation. As the materials published and the research is still ongoing further research in order to assess the changes produced by the COVID-19 pandemic in the literature researching the impact of digital transformation has to be done.

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