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Bibliometric analysis of digital transformation on organization design

Библиометријска анализа дигиталне трансформације на организациони дизајн

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Abstract: Digital transformation has become a key driver of change in modern organizations, reshaping their design and way of functioning. This paper aims to investigate how digitalization has impacted organizations and their organizational design, using a bibliometric approach to analyze research trends in this area. Using the Bibliometrix software package in the R programming language, bibliographic data analysis was performed in order to identify the most influential authors, key topics and future research directions. The study analyzed a dataset of 175 publications in English from the period 2000-2023, sourced from Web of Science Core Collection database, focusing on research articles discussing digital transformation and organizational design. Bibliometrix application was used to perform the bibliometric analysis, which included co-citation, keyword analysis, and thematic mapping to reveal core trends and influential papers in the literature. The study reveals that digital transformation significantly alters organizational structure and role distribution, often decentralizing power and increasing flexibility within companies. These findings align with theories on dynamic capabilities and suggest that further research could focus on how digital transformation supports agility in organizational design, providing practical insights for adapting organizations to digital era demands. Future research on the impact of digital transformation on organizational design could focus on artificial intelligence integration, digital skill requirements, hybrid structures, blockchain technology, as well as challenges and strategies for managing data security and privacy.

Keywords: digitization, organizational design, information technologies, artificial intelligence, organization, bibliometric analysis
JEL classification: L22, D02, M15

Сажетак: Дигитална трансформација је постала кључни покретач промена у савременим организацијама, преобликујући њихов дизајн и начин функционисања. Овај рад има за циљ да истражи како је дигитализација утицала на организације и њихов организациони дизајн, користећи библиометријски приступ за анализу трендова истраживања у овој области. Коришћењем софтверског пакета Библиометрикс, у програмском језику Р, извршена је анализа библиографских података у циљу идентификације најутицајнијих аутора, кључних тема и будућих праваца истраживања. Студија је анализирала скуп података од 175 публикација на енглеском језику из периода 2000-2023, добијених из базе података Web of Science Core Collection, фокусирајући се на истраживачке чланке који говоре о утицају дигиталне трансформације на организациони дизајн. Библиометрикс апликација је коришћена за обављање библиометријске анализе, која је укључивала коцитирање, анализу кључних речи и тематско мапирање да би се открили кључни трендови и утицајни радови у литератури. Студија открива да дигитална трансформација значајно мења организациону структуру и дистрибуцију улога, често децентрализујући моћ и повећавајући флексибилност унутар компанија. Ови налази су у складу са теоријама о динамичким способностима и сугеришу да би се даља истраживања могла фокусирати на то како дигитална трансформација подржава агилност у организационом дизајну, пружајући практичан увид за прилагођавање организација захтевима дигиталне ере. Будућа истраживања о утицају дигиталне трансформације на организациони дизајн могла би се фокусирати и на интеграцију вештачке

интелигенције, захтеве за дигиталним вештинама, хибридне структуре, блокчејн технологију, као и изазове и стратегије за управљање безбедношћу података и приватношћу.
Кључне речи: дигитализација, организациони дизајн, информационе технологије, вештачка интелигенција, организација, библиометријска анализа
ЈЕЛ класификација: L22, D02, M15

Introduction

Digitization is more than simply introducing new technologies into business; it is a comprehensive strategic initiative that requires fundamental changes in the way organizations function (Kretschmer & Khashabi, 2020). This process involves redefining the organizational design and business model, thus adapting the organization to new digital opportunities and market needs. Technology has long been recognized as one of the key factors shaping organizational forms and structures, which is widely accepted among academic researchers (Thompson & Bates, 1957). Its role in defining the way companies function is becoming increasingly important with the development of new technological achievements. Organizations that successfully integrate digital technologies into their business can realize numerous benefits, including increasing operational efficiency, improving customer experience and significantly strengthening their competitive position in the market. Such changes not only enable organizations to be more agile and innovative, but also help them better respond to dynamic changes in the environment. Given that organizations today operate in a very dynamic business environment that is heavily influenced by digitalization, the purpose of the paper is to map and explore the impact of digitalization, information technology (IT) and artificial intelligence on organizational design.

The main areas of impact of digital transformation, as the author Kuusisto (2017) points out, include organizational learning, digital innovation, organizational agility, business ecosystems and adaptation of organizational structures. These factors help companies adapt to changes faster, improve innovation and optimize internal processes to achieve a successful digital transformation. The organizational structure, as a segment of the organizational structure, has a key role in improving the level of business excellence (Nielsen, Spasenić & Stevanović, 2024). Digital transformation, as defined by Hess et al. (2016), refers to changes that digital technologies bring to business models, products or organizational structures of companies. This represents one of the biggest challenges for managers in the past and future decades. Although technology plays a key role, the presence of trained employees and managers is also necessary in order to realize its full potential. In the study of Omol et al. (2023), the terminology of digitalization has changed over time, so that the term "digital transformation" has only started to be used in scientific research since 2010. Authors Nadkarni and Prügl (2020) analyze the growth of academic research on digital transformation, focusing on 58 studies published between 2001 and 2019. The authors identify two key dimensions: technology and actors, developing nine core themes that help understand the digital transformation process. It also points to under-researched aspects such as the speed of transformation, work culture and the role of middle management. In this paper, bibliometric analysis was used, which fundamentally involves the application of

statistical methods to scientific articles and other publications in order to gain insights into the dynamics of publication within a certain discipline. Bibliometric analysis is a methodological approach used to quantitatively study publications, often including scientific papers or books (Junquera & Mitre, 2007; Merigó & Yang, 2017). The main goal of the study is to identify the most relevant research and the latest trends based on data from the Web of Science Core Collection (WOS CC) database.

Specifically, the paper aims to answer three research questions:

- R.Q.1: Which authors have made the most significant contributions to research on the impact of digitization on organizational design?
- R.Q.2: What are the key topics associated with research on digitization and organizational design?
- R.Q.3: In which direction could future research on the impact of digital transformation on organizational design develop?

The paper is structured into three main sections. The first section briefly presents a literature review of the impact of digitalization on organizational design. Second, the methodology section explains the bibliometric approach, which applies quantitative techniques to bibliographic data, highlighting its significance in analyzing scientific literature and research trends systematically. The results section focuses on three key aspects: performance analysis, network analysis and science mapping. Performance analysis evaluates the contributions of researchers, institutions, and countries based on publication volume, citations, and impact indices, while science mapping examines relationships between research entities, thematic linkages, and the development of knowledge networks in digital transformation and organizational design. Finally, the conclusion summarizes key findings, discusses research gaps, and proposes future directions, emphasizing the relevance of bibliometric methods in advancing the understanding of digital transformation in management and business studies.

1. Literature review

Digitalization has a significant impact on organizational design, as it changes the way organizations function, communicate, and make decisions. As a result of IT replacing most of the coordination and control roles of the hierarchy, new forms of organizational structure can be developed that are process-oriented rather than function-oriented. This new coordination role of IT makes it a key component in the structure of organizations, and it is no longer possible to design or modify organizations without taking into account the role of IT. Also, it is emphasized that research into the dynamics of human behavior within organizations must take into account the influence of information technologies (Zammuto, 2007). Based on the bibliometric analysis, we can conclude that the impacts of digital transformation are reflected in various aspects of the design of organizations. First of all, the change of organizational structures, which means that digital transformation requires

reorganizing traditional hierarchical structures according to more agile and flexible models (Kaiser & Buxmann, 2012; Fabac, 2021).

Decentralized structures enable faster decision-making, better innovation management and adaptation to changes in the digital environment. In addition, technology plays an important role in decision-making, in the form of artificial intelligence (AI) and data analytics that are key tools in strategic decision-making (Raj & Seamans, 2019; Dixon, 2021). These technologies enable organizations to respond more quickly to changes in the market, increasing operational efficiency and reducing risks. New forms of work are also more ubiquitous because digital transformation supports new work models such as remote work and hybrid work (Lang & Zhao, 2000; Kingma, 2019). These changes affect organizational design as work processes, communication channels and collaboration tools need to be redefined. In order to successfully implement digital transformation, organizations must invest in the development of employees' digital competencies. This often implies the creation of new roles and functions within the organization that are focused on managing digital tools and processes (Chang, 2011; Maragno et al., 2023; Wulff & Finnestrand, 2024). Modern digital technologies and the Fourth Industrial Revolution have significantly transformed the way organizations operate and interact with both their internal and external environments. The digitalization of business has led to the expansion of innovative business models, changes in work processes, and a redefinition of the relationship with employees (Barjaktarović, 2023).

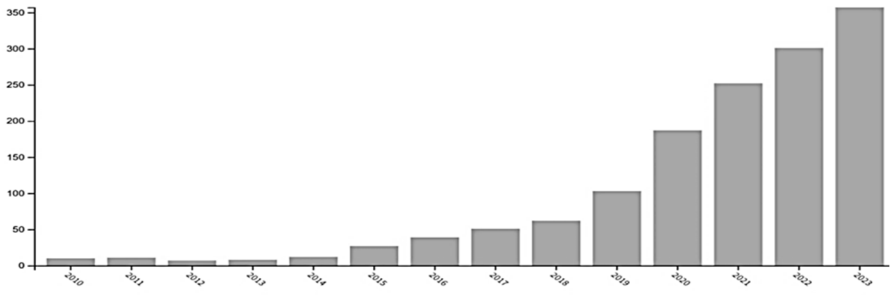
Changes occur in culture and leadership as digital transformation affects not only technology, but also organizational culture (Calhoun et al., 2008; Nold & Michel, 2016). Leaders should promote a culture of innovation, rapid adaptability and openness to new technologies, which changes traditional leadership styles (Kolbjornsrud, 2024). Using automation and digital tools can significantly reduce operational costs while improving efficiency. This requires the optimization of organizational processes through the application of digital solutions (Mabe et al., 2022; Roth & Farahmand, 2023). Also, digital transformation allows organizations to become more competitive in the market thanks to the speed of innovation, improved customer service and greater flexibility in business (Wulff & Finnestrand, 2024). In addition, there is a growing discussion of the evolution of managerial roles. Managers in digitally transformed organizations face the need to acquire new skills to effectively manage changes in the technological environment. These skills include not only understanding and using new technologies, but also the ability to lead hybrid teams, often working in a combination of physical and digital spaces. In such environments, managers must develop capabilities such as agility, digital literacy, effective remote communication, and managing diverse team dynamics to ensure team productivity and cohesion.

2. Methodology

The bibliometric methodology involves quantitative techniques applied to bibliographic data. Bibliometric analysis techniques can be divided into two main categories: performance analysis and science mapping (Donthu et al., 2021). Performance analysis includes assessing the contributions of various researchers, institutions, or countries in a specific field, based on

quantitative indicators such as the number of publications, citations, and impact indices. On the other hand, science mapping focuses on exploring the relationships and connections between different research actors, such as collaborations among scientists, thematic linkage of papers, and the development of knowledge networks within a specific discipline. Nowadays, these analyses are becoming increasingly popular due to the development of large databases such as Scopus and WOS. Bibliometric analysis is a comprehensive research method used for the systematic study of scientific literature and the development of various disciplines. The primary goal of this method is to provide objective and measurable data on the scientific performance and impact of researchers, papers, institutions, and countries, as well as on trends and relationships within specific research fields. While bibliometrics was first discussed in the 1950s, its impact on fields such as business, management, and social sciences has only grown recently (Donthu et al., 2020; Donthu et al., 2021). A search of the WOS CC database with the keyword "bibliometrics" from 2010 through 2023 shows an overall upward trend in the use of this methodology in Management and Business research (Figure 1).

Figure 1: Annual publication of bibliometric papers in the field of Management and Business



Source: the author's research

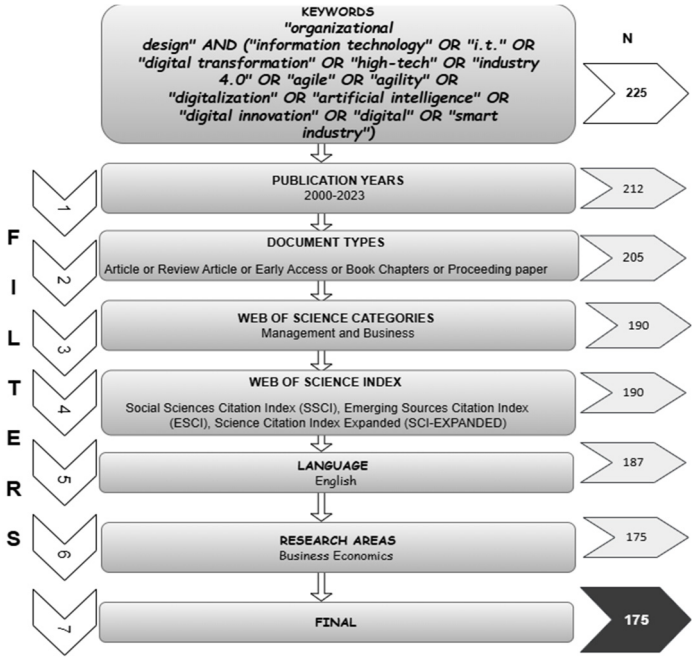
Data analysis usually uses specialized software tools such as VOSviewer, CiteSpace, or the Bibliometrix package in R. These tools allow visualization of citation networks, analysis of publication trends, identification of key papers and authors in specific scientific fields, and mapping of how scientific disciplines develop and intertwine. For the purposes of this research, Bibliometrix was used within the programming language R, which offers a wide range of functionalities for quantitative analysis of bibliographic data. Given its versatility and depth of analysis, Bibliometrix has become a popular tool among researchers engaged in this type of data analysis, providing powerful tools for in-depth understanding of scholarly communication. Bibliometrics is used not only in academia to assess research impact and trends, but also in industry, government agencies, and other sectors that rely on scientific discovery and innovation. The results of bibliometric analyses are used for policy formulation, strategic planning in education and research, as well as for evaluation and management of research performance.

Ramos-Rodríguez and Ruíz-Navarro (2004) contributed to the understanding of how bibliometric data can be used for an objective view of scientific production, which enables a

better understanding and management of knowledge inside and outside the academic community. Bibliometric research is designed to efficiently manage and analyze large amounts of data. These analyses include various metrics such as: citation count, which indicates how many times a paper has been cited and helps assess its impact; H-index, it is a measure that helps quantify the productivity and citation impact of individual scientists or researchers and co-citation or analysis that looks at how often certain papers are cited together, which can indicate related areas of research or collaboration between authors. For the purpose of this research, the WOS CC scientific database was searched and a total of 175 primary papers were collected, which were identified based on the set keywords.

The keywords used in this research on the impact of digital transformation on organizational design are "organizational design" AND ("information technology" OR "i.t." OR "digital transformation" OR "high-tech" OR "industry 4.0" OR "agile" OR "agility" OR "digitalization" OR "artificial intelligence" OR "digital innovation" OR "digital" OR "smart industry") where the end result was 175 scientific articles (with filters included). As a next step, the inclusion criteria will be presented to better illustrate how the database searches and the selection of papers were conducted (Figure 2). Those criteria include the choice of time frame of published publications, types of documents, Web of Science categories, language, WOS index and research areas.

Figure 2: The process of selecting documentation for bibliometric analysis



Source: the author's research

Our investigation of relevant papers in the field of bibliometric analysis provided insight into the number of documents required for this type of analysis. The sample is acceptable in light of the results from other similar studies. Thus, the authors Aria and Cuccurullo (2017) included 304 documents in their research for the purpose of bibliometric analysis for the period from 1985 to 2015, while the author Schad and his colleagues (2016) included 133 papers in the analysis for the period from 1990 to 2014.

After the selection of scientific documentation, the sources were imported into R studio, and then the Bibliometrix package was opened, based on which the following results will be displayed: descriptive analysis of publications from the sample and the introductory report, annual scientific production, scientific sources, average citations by year, the most relevant and the most productive authors, number of articles per author, frequency of scientific productivity distribution, author keywords, publication data by geographic area, map and network of collaboration between authors from different countries, as well as the selection of key clusters in digitalization research in the field of organizational design.

3. Results and discussion

The results of the study are presented in three main segments. The first part presents a performance analysis and a visualization of digitalization trends in the domain of organizational design. This section also analyzes the most cited publications in the observed time period from 2000 to 2023, as well as the most influential scientific journals and the most productive authors. The second part presents the mapping of science, which allows for the exploration of the conceptual and cognitive structures of research, the discovery of key themes and connections between different fields. Using techniques such as co-citation analysis, keyword analysis and citation analysis, a network of related studies, terms and authors is visualized, which helps to better understand the evolution of specific research topics. The third part presents a network analysis that provides insight into which scientists and organizations are most connected, where the largest collaborations occur, and what research benefits from international collaboration.

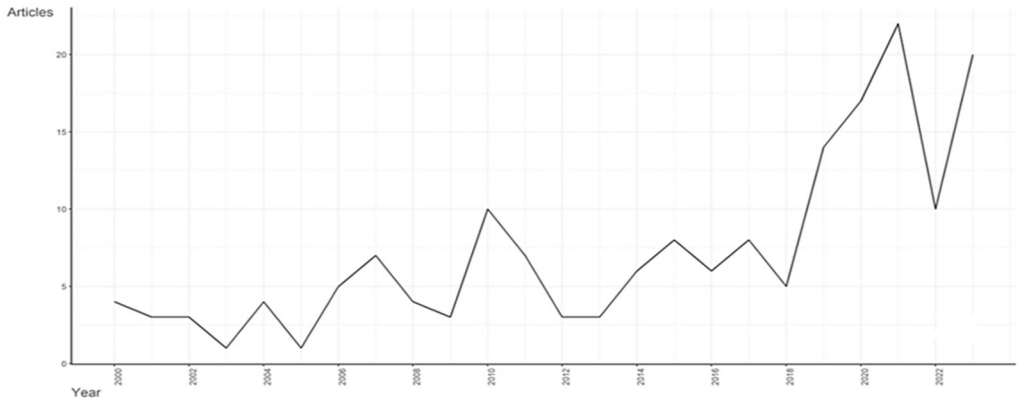
3.1. Performance analysis

Performance analysis is a key component of bibliometric analysis that focuses on the quantitative measurement of the contribution of researchers, institutions, countries or journals in a certain scientific field. It provides an insight into who are the most influential authors, which journals publish the most relevant papers, and which papers are most cited. A more detailed analysis of performance allows researchers to understand the bigger picture of how a scientific field is developing and what are the key points of progress (Donthu et al., 2021).

The first analysis report in Bibliometrix shows the introductory report or first information about all scientific publications. The publications cover the period from 2000 to 2023, and provide an overview of research during the last two decades. The data was collected from 135 different sources, reflecting the diversity of literature reviewed. The

annual growth rate of 7.25% shows that there was a constant growth in the number of published scientific documents during the analyzed time period. The average age of the documents is 8.5 years, which suggests that the documents are relatively current. Analyzing the years of publication and the number of publications per year, we can draw several conclusions about the trends and dynamics of publication on the topic of the impact of digital transformation on organizational design. The general trend of increasing the number of publications over time, especially since 2010 (number of documents: 10), is visible, which coincides with the research of the authors Omol et al. (2023). The number of publications on this topic declined significantly in 2012 (number of publication: 3). This is followed by the increase in the number of published articles (year: 2015, number of publication: 8). Despite a decline in 2018 (number of publication: 5), the number of published documents increased from 2019 onward (number of publication: 3). There is a growing interest in this topic, which may reflect an increasing understanding of how crucial digital transformation is to the modern business world. In addition, this period is called the beginning of the Big data and Deep learning era in the study authored by Martinovic and colleagues, while the period from 2000 to 2010 is called the Internet era. The largest increase in the number of publications was recorded at the beginning of 2021 (number of publication: 22), while at the beginning of 2022 publication numbers on the topic of digitization in organizations dropped sharply (number of publication: 10). A closer examination of the causes of that decline reveals that many researchers turned their attention to the post-covid situation and its impact on organizational design at that time. Already at the beginning of 2023, an enormous increase in the number of published publications was recorded (number of publication: 20), which is to some extent expected considering that the authors mostly researched the effects of artificial intelligence on organizational design. Therefore, we conclude that the end of 2022 marks the beginning of a new era called the Artificial Intelligence era.

Figure 3: Trend of published publications by year



Source: the author's research

Overall, the trend of an increasing number of publications suggests the increasing importance and recognition of the impact of digital transformation on organizational design.

It is an area that continues to attract academic and practitioner attention, encouraging further research into how technology is shaping modern organizational structures and processes.

A paper published in 2003 stands out with an exceptionally high average number of citations per article (370.00). Authored by Levin and Ross, the study highlights that companies outsource IT services due to cost advantages offered by external providers. However, it remains unclear whether providers can genuinely achieve these advantages, especially for large firms that could potentially replicate such benefits within their own operations. In IT outsourcing literature, client reasons for outsourcing and client-provider relationships are extensively examined, while the provider's perspective is underexplored. Their study analyzes supplier strategies and practices in a long-term successful engagement, revealing that provider success relies on developing core competencies that complement organizational design.

Papers from 2000 also show a high number of citations (161.00 per article), and their annual citation average (6.44) shows that they are still relevant. In 2000, the studies authored by Garicano and Sambamurthy and Zmud stand out. Garicano's study focuses on the ways knowledge is organized within manufacturing firms, specifically investigating how hierarchical structures affect the efficiency and distribution of knowledge. Garicano analyzes how knowledge and information are used in decision-making at different levels of the organization and how this affects the firm's performance. He also considers how technological advances, especially in information technology, can change traditional hierarchical structures and lead to more efficient management and organization of knowledge. In their research, Sambamurthy and Zmud represent an attempt to shed light on how companies should organize their IT resources to adapt to the demands of the digital economy, where rapid technological change and new business models are transforming the way companies operate. Special emphasis is placed on the concept of a platform as a means of structuring IT operations, which helps visualize how IT activities should be managed in the light of new organizational requirements. The idea is to rethink traditional approaches to management and resources and develop them into more complex structures that are in line with network architectures and basic IT capacities, thus offering a fresh perspective and new approaches to the management of the IT sector in modern firms. A 2007 study by Zammuto and colleagues examines the impact of information technology on the structure and functions of organizations.

Since the 1950s, interest in the relationship between technology and organizational structure has declined even as information technologies have become ubiquitous and significantly changed the way organizations function. Instead of a traditional hierarchical management model, today's organizations are increasingly organized around the possibilities provided by IT, enabling innovations such as visualization of work processes, flexibility in product and service development, virtual and mass collaboration, as well as advanced simulations. These changes are not only technological but the result of the interaction between IT and organizational practices. The authors suggest that existing theories of organization do not fully capture these changes, therefore they propose new approaches that consider the combined impact of IT and organizational characteristics on modern

organizations. Their research, which deals with the impact of IT on the organizational structure, shows that information technologies are no longer just tools, but key elements that shape the way of coordination and control within modern organizations (Zammuto et al., 2007).

Table 1: Top 15 most cited articles

Authors	Title of the article	Name of the source	Year of publication	Number of citations on WOS
Zammuto, RF; Griffith, TL; Majchrzak, A; Dougherty, DJ; Faraj, S	Information technology and the changing fabric of organization	Organization Science	2007	606
Garicano, L	Hierarchies and the organization of knowledge in production	Journal of Political Economy	2000	440
Levina, N; Ross, JW	From the vendor's perspective: Exploring the value proposition in information technology outsourcing	Mis Quarterly	2003	370
Leeflang, PSH; Verhoef, PC; Dahlström, P; Freundt, T	Challenges and solutions for marketing in a digital era	European Management Journal	2014	269
Amit, R; Han, X	Value Creation through Novel Resource Configurations in a Digitally Enabled World	Strategic Entrepreneurship Journal	2017	212
Sambamurthy, V; Zmud, RW	Research commentary: The organizing logic for an enterprise's IT activities in the digital era - A prognosis of practice and a call for research	Information Systems Research	2000	185
Straub, DW; Watson, RT	Research commentary: Transformational issues in researching IS and net-enabled organizations	Information Systems Research	2001	162
Teece, DJ; Linden, G	Business models, value capture, and the digital enterprise	Journal Of Organization Design	2017	149
Roh, J; Hong, P; Min, H	Implementation of a responsive supply chain strategy in global complexity: The case of manufacturing firms	International Journal of Production Economics	2014	136
Guadalupe, M; Wulf, J	The Flattening Firm and Product Market Competition:	American Economic	2010	115

	The Effect of Trade Liberalization on Corporate Hierarchies	Journal-Applied Economics		
Ancarani, A; Di Mauro, C; Mascali, F	Backshoring strategy and the adoption of Industry 4.0: Evidence from Europe	Journal of World Business	2019	112
Murray, A; Rhymer, J; Sirmon, DG	HUMANS AND TECHNOLOGY: FORMS OF CONJOINED AGENCY IN ORGANIZATIONS	Academy of Management Review	2021	105
Guadalupe, M; Li, HY; Wulf, J	Who Lives in the C-Suite? Organizational Structure and the Division of Labor in Top Management	Management Science	2014	98
Chalmers, D; MacKenzie, NG; Carter, S	Artificial Intelligence and Entrepreneurship: Implications for Venture Creation in the Fourth Industrial Revolution	Entrepreneurship Theory and Practice	2021	95

Source: the author's research

Authors Amit and Han propose a conceptual framework to examine how digitalization reshapes firms' resource configurations, emphasizing the need for a value-centered, systematic approach. Their analysis focuses on how digital-driven resource configurations allow firms to organize resources more efficiently and create new value through collaboration with partners and customers. They highlight the growing importance of digital business, which requires companies to adopt a value-creation-oriented perspective for designing and organizing resources. Murray, Rhymer, and Sirmon (2021) explore how advanced technologies, capable of analyzing large data sets and operating autonomously, impact organizational routines and development. They propose four interaction types between humans and technology: assistive, stop-gap, augmenting, and automation technologies. Each type influences how organizations adapt and evolve, affecting organizational routines and feedback responses over time, underscoring the need for strategic consideration of technological choices in organizational design. Leeflang, Verhoef, Dahlström and Freundt (2014) identify key challenges marketers face in a dynamic environment, including big data integration, digital channel management, and personalization in customer interactions. To address these challenges, they propose approaches such as data-driven decision-making, digital channel management, integration and automation, and customer engagement. Findings suggest that talent focus, adaptable organizational design, and practical metrics offer the greatest improvement opportunities for organizations. The article by Chalmers, MacKenzie and Carter examines how AI is transforming processes, practices, and outcomes in entrepreneurship, analyzing its effects on production and sales. They discuss how AI changes organizational design and enhances business activities, while also highlighting potential negative economic and social impacts, particularly on traditional small businesses at risk in an AI-driven economy. The article calls for a research focus on these challenges to better understand and address them in the future. Artificial intelligence (AI) is viewed as a transformative, general-purpose technology that, along with other Industry 4.0 technologies

such as machine learning, blockchain, and quantum computing, significantly impacts organizational development. These technologies not only shape business formation decisions but also affect the quality of life of founders. Author Villalba-Diez is primarily known for his research on Industry 4.0. One of his studies, conducted with Losada, Benito, and Gonzalez-Marcos, focuses on analyzing the impact of organizational structures in the context of Industry 4.0, specifically examining the issue of dual leadership and its coordination with the company's strategic goals. The study explores how a dual reporting line, where one subordinate reports to two leaders, affects the leaders' ability to align with the organization's strategic objectives. The implementation of quantum circuits as decision-making models enables the analysis of these dynamics through two scenarios: one where leaders do not communicate with each other and another where there is communication. Results from 500 quantum circuit simulations show that in the scenario without leader communication, alignment with strategic goals rarely occurs for both leaders simultaneously. However, in the communication scenario, there is a significantly higher probability that both leaders will align with the strategic goals, with alignment probability exceeding 90%. These findings emphasize the importance of effective communication and coordination between leaders in complex organizational structures, especially in dynamic and technologically advanced environments like Industry 4.0 (Villalba-Diez et al., 2021). Additionally, in one of his studies, Villalba-Diez analyzes the challenges of strategic organizational design in highly complex cyber-physical systems typical of Industry 4.0. In such environments, leaders often have to make decisions without complete certainty regarding the correctness and impact of those decisions on other parts of the organization (Villalba-Diez & Zheng, 2020).

The journal quality analysis shows that research on the impact of digitalization on organizational design is primarily published in high-ranking journals. The most articles in this analysis were published in "Management Science," indicating that it is a highly regarded journal in the field of organizational design and management. Journals in the Q1 quartile are usually the most cited and have the greatest influence in their respective fields.

Table 2: The most relevant sources

Sources	Articles	Category quartile
Management Science	7	Q1
Sustainability	5	Q2
Journal Of Organization Design	4	Q3
Mis Quarterly	4	Q1
Ieee Transactions on Engineering Management	3	Q1
Information Systems Research	3	Q1
Journal Of Business Research	3	Q1

Source: the author's research

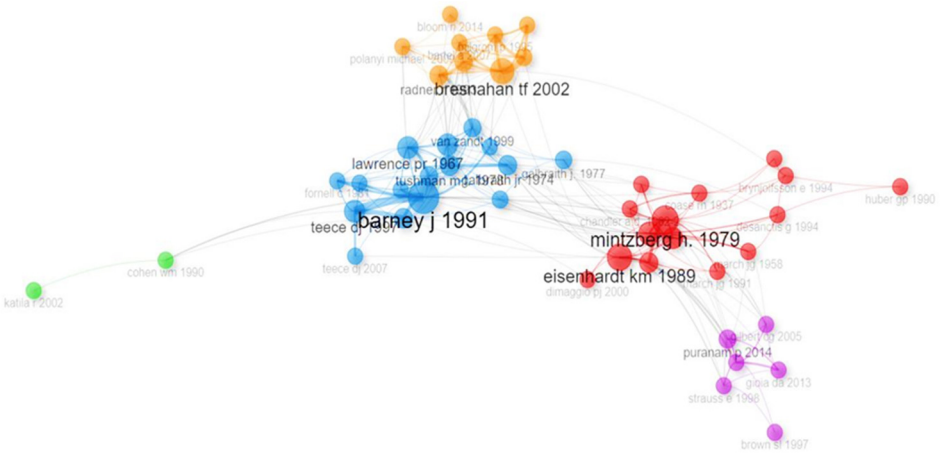
3.2. Science mapping

Science mapping is a technique used in bibliometric analysis to visualize and analyze the relationships between different research entities, such as authors, publications, topics, institutes or research areas. Unlike performance analysis, which focuses on quantifying the contributions of individuals or institutions, science mapping aims to identify and display

structural and dynamic relationships within scientific communities and disciplines (Tunger & Eulerich, 2018; Donthu et al., 2021). In this paper, two science mapping techniques were selected: (1) Co-citation analysis, and (2) Co-word analysis.

Co-citation analysis is a scholarly mapping technique used to reveal the intellectual structure of a research field by analyzing publications that are frequently cited together, the assumption being that publications that share common citations have a similar thematic orientation. Thus, this method enables the identification of basic themes and thematic clusters in a certain area of research (Rossetto et al., 2018; Donthu et al., 2021).

Figure 4: Co-citation Network



Source: the author's research

The co-citation network shows how specific papers are interconnected through shared citations, providing insights into key authors and topics within a research field. This map highlights a total of five clusters. The first cluster contains leading references, with 15 nodes, including papers like Eisenhardt (1989) and Mintzberg (1979), which are foundational contributions in organizational theory and strategic management. These papers are frequently cited as they offer fundamental conceptual frameworks for exploring the complexity of organizational structures and strategic management, making them key reference points for further theoretical and empirical studies in this field. The second cluster, with 16 references, includes works by Barney (1991) and Teece (1997), which focus on concepts crucial for understanding strategic resources and dynamic capabilities in organizations. Barney (1991) explores sources of sustainable competitive advantage in strategic management, while Teece (1997) examines how companies can adapt to changing market conditions through innovation and resource reorganization. These works are often cited for their deep insights into how organizations can sustain competitive advantage in dynamic and complex business environments. The third cluster consists of only two nodes, while the fourth cluster includes six nodes. Notable articles here are by Clark G. Gilbert (2005) and Puranam et al. (2014).

Gilbert analyzes two forms of inertia in organizations: resource rigidity (relating to unchangeable investment patterns) and routine rigidity (relating to inflexible organizational processes). Using data from news organizations facing the rise of digital media, he shows that a strong perception of threat can reduce resource rigidity but increase routine rigidity. Puranam et al. (2014) discuss whether new theories are needed to explain new forms of organizing or if existing theories can encompass them. The fifth and final cluster contains nine nodes, including works by Bresnahan (2002) and colleagues, who explore the role of information technology as an enabling technology. Without useful applications, IT has little value, but valuable applications often arise from IT innovations, pushing the boundaries of possibilities in the economy. IT is also defined as a general-purpose technology with broad applications across various sectors, meaning advancements in IT can have wide-ranging impacts on the economy.

Unlike other scientific mapping techniques, such as citation analysis, co-citation, and bibliographic coupling, which focus on publications, **keyword co-occurrence analysis (co-word analysis)** focuses on the content of the publications themselves, particularly the authors' keywords or words from titles, abstracts, or the entire text. This technique assumes that words that frequently appear together have a thematic relationship. It can also be used to predict future research directions by analyzing keywords related to recommendations and future guidelines from existing studies. In this way, the technique provides insight into the future of the research field (Burton et al., 2020; Donthu et al., 2022). Figure 5 illustrates the terminology that most frequently appears in research papers on the impact of digital transformation on organizational design.

Figure 5: TreeMap

Source: the author's research

The most commonly mentioned term indicates that management is a central theme in research concerning organizational design and digital transformation. This can include aspects such as change management, leadership, and strategic management. The high frequency of the term "performance" highlights the importance of evaluating organizational performance in the context of digital transformation. This may encompass business

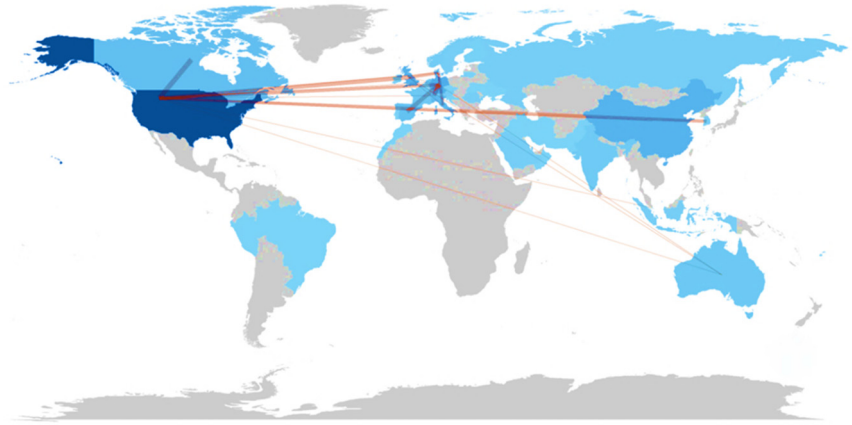
performance, productivity, and efficiency. The strong focus on information technology emphasizes its crucial role in enabling and supporting digital transformation processes. The frequent appearance of the term "innovation" underscores its significant role in research, particularly in how technological advancements can enable new ways of working and doing business.

3.3. Network analysis

Given the increasingly complex methodology and theoretical treatment of topics in research, co-author collaboration has become common, as the contribution of different authors can bring greater clarity and richer insights into research. Collaborating scientists form networks whose study can help advance scientific disciplines. This analysis helps identify research clusters from specific regions and can encourage collaboration in underrepresented parts of the world. It also enables the tracking of intellectual development through collaborative networks, providing scholars with the opportunity to identify key players in the field and potential future collaborators. Co-authorship analysis is an important tool for understanding the dynamics and evolution of research communities, as it indicates how collaborations can influence the development of new ideas, theories and methods within a scientific field (Cisneros et al., 2018; Donthu et al., 2021).

Figure 6 illustrates a network of international collaborations among different countries in research on the impacts of digital transformation on organizational design. This collaborative map highlights the interconnectedness and international nature of research and academic endeavors. Germany, the USA, the United Kingdom and Australia stand out as central hubs with many connections. These countries have the most extensive cooperation networks, which indicates their significant role in global research networks. Regional partnerships are evident, such as those between Germany and its European neighbors (Spain, Switzerland), which show frequent collaborations. The US exhibits a wide network of international cooperation, cooperating with a large number of countries including Australia (2), Canada (5), China (2), the United Kingdom (4), Germany (3), Croatia (1), Denmark and France (2), Korea (3), Switzerland (2) and other countries. Australia's collaborations with Austria (1), Fiji (1), Canada (1), Denmark (1), France (1), Germany (2), the USA (2) and the United Kingdom (2) demonstrate Australia's wider geographic diversification in partnerships, covering Europe, North America and the Pacific.

Figure 6: Countries' Collaboration World Map



Source: the author's research

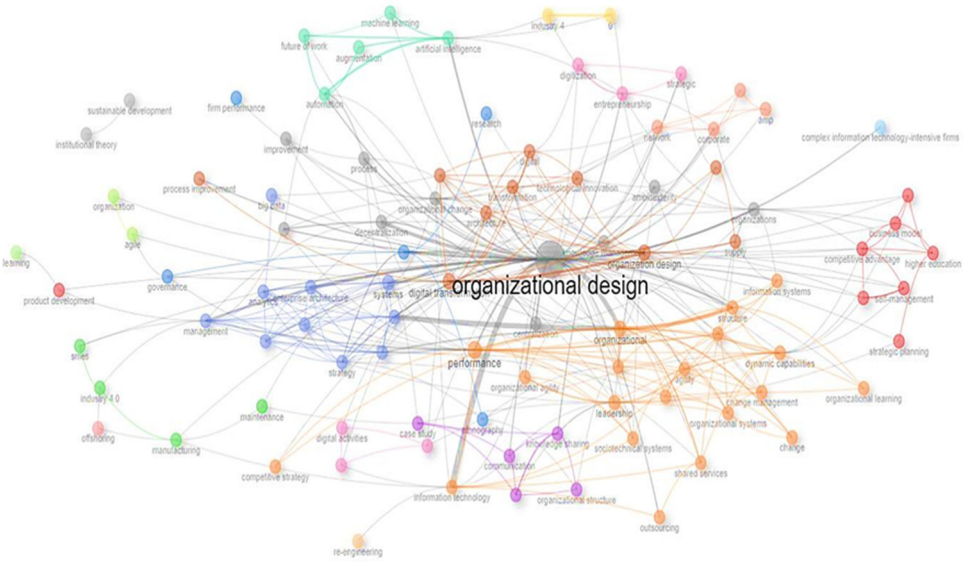
The countries with the richest cooperation with foreign authors are marked with the deepest blue color. Countries marked in gray have not cooperated at all with other countries in terms of research on the impacts of digital transformation on organizational design. The intensity of the color blue depends on the strength of the network that the authors of individual countries have created with other countries.

The thematic maps in the Bibliometrix software are used for the visual presentation of different clusters of related themes or keywords based on their frequency of co-occurrence in publications. The map highlights several key clusters (Figure 7), each representing a specific thematic focus in the analyzed literature:

- Cluster 1: Business Model – This cluster includes keywords such as "competitive advantage," "strategic planning," and "sustainability." It focuses on the structure of business models and their impact on competitive advantage and strategic planning within organizations.
- Cluster 2: Innovation – This cluster includes keywords such as "innovation," "management," and "ethnography," indicating the study of how innovation and management are connected, particularly in the context of organizational change and the adoption of new technologies.
- Cluster 3: Production – This cluster addresses terms like "production," "Industry 4.0," and "small and medium enterprises (SME)," focusing on production processes and the digital transformation in the industry.
- Cluster 4: Knowledge Sharing – This cluster covers terms such as "knowledge sharing," "organizational structure," and "communication," emphasizing the importance of organizational communication and knowledge management in improving performance and fostering innovation.

- Cluster 5: Organization – A large and significant cluster connecting terms like "information technology," "dynamic capabilities," "performance," "leadership," and "organizational culture." It focuses on the interrelationship between technology, leadership, and performance in shaping modern organizations.
- Cluster 6: Digital Transformation – Keywords such as "digital transformation," "organizational design," and "technological innovation" suggest how digital technologies are transforming organizational processes and design.
- Cluster 7: Entrepreneurship – Focused on entrepreneurship, this cluster includes terms like "digitization" and "strategic," emphasizing how digital innovations impact entrepreneurial strategies and the development of organizations.
- Cluster 8: Organizational Design – A large cluster that includes terms such as "organizational design," "organizational change," and "decentralization," exploring how organizations are structured and restructured in response to internal and external pressures.
- Cluster 9: Artificial Intelligence – Keywords such as "artificial intelligence," "automation," and "future of work" indicate the impact of AI and automation on organizational processes and workforce dynamics.

Figure 7: Thematic Map – Field: Author's keywords

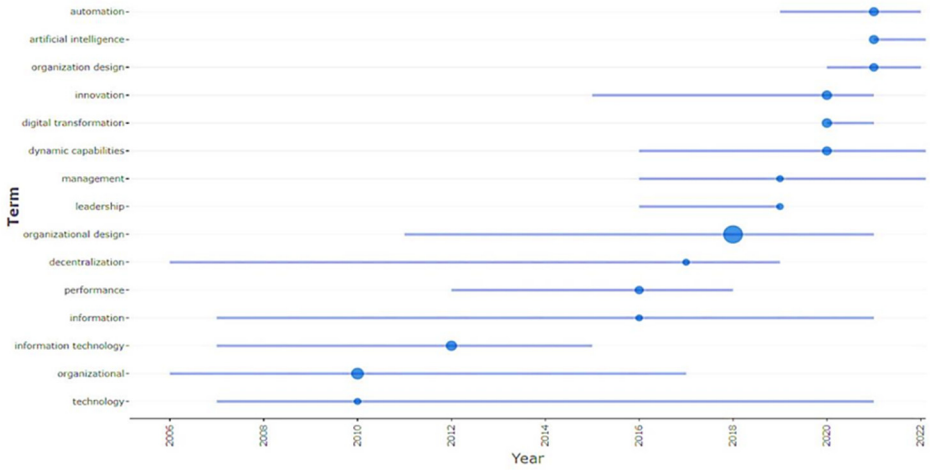


Source: the author's research

The trend analysis of key themes shows the evolution of various concepts over the period from 2006 to 2023 (Figure 8). The earliest terms such as "organizational" and

"decentralization" dominated from 2006 to 2017. In the following years, terms like "organizational design" and "information technology" became central, with the highest activity recorded between 2011 and 2021. A particularly significant increase is observed in the terms "digital transformation" and "artificial intelligence," which became dominant from 2020 onward, reflecting the current changes driven by digitization and automation. Additionally, themes such as "leadership," "dynamic capabilities," and "management" gained more prominence in recent years, particularly between 2016 and 2023. These trends indicate the growing influence of technology, particularly artificial intelligence and digital transformation, on organizational design and management. At the same time, traditional concepts like "performance" and "innovation" remain relevant, with a renewed focus on the innovations enabled by technology.

Figure 8: Trend topics



Source: the author's research

Trend analysis of the key topics leads to the conclusion that automation, AI, digital transformation, and adaptive capabilities will have a greater impact on organizational management and design in the future. Organizations have to adapt to these technological changes in order to be competitive since concepts such as "digital transformation" and "artificial intelligence" are relatively new and are growing rapidly. This implies that, at least with regard to technology, innovation will be integral to maintaining economic advantage and productivity. From these trends, one might deduce that future organizational studies and practices will focus on incorporating new technologies into regular business operations and, simultaneously, facilitate leadership and flexibility.

Conclusion

Digital transformation remains critical for the survival and development of contemporary organizations. As much as it presents challenges, its impact on organizational design leads to

significant improvements in operational efficiency, competitiveness, and adaptability to enable organizations to remain relevant in a dynamic market environment.

Villalba-Diez and co-authors explore how the principles of quantum computing can be used to enhance strategic organizational design in the context of Industry 4.0. This paper presents an innovative approach to strategic organizational design, using quantum computing to simulate decision-making networks expressed as quantum circuits. This enables not only faster information processing but also new possibilities for simulating and optimizing organizational structures in real-time. In addition to management applications, the proposed quantum-based approach can also be useful in technological domains that have been widely applied in recent years. In 2020, in their article, Villalba-Diez and co-authors examine the impact of the subordinate-leader relationship in Industry 4.0 using quantum simulations of decision-making networks. The results show that subordinates can influence leaders, and they also identified fractal behavior in these relationships, suggested by oscillations in the exchange of energy between the two agents, depending on interdependence parameters. These findings answer the research question of the study R.Q.1.

The most common key terms related to the research topic include innovation, performance, organizational management and decision-making, business process automation, strategy, and knowledge organization. Trend analysis shows that some topics such as "information technology," "organization", and "performance" have consistently appeared in research papers over time. This answers the research question R.Q.2.

Nevertheless, there are several limitations to this research. First, reliance on bibliometric data is limited to the publication output available. Second, digital transformation is a dynamically developing topic; therefore, some key trends cannot be captured by current databases. Third, the limitation comes with the choice of databases since different databases vary in their coverage, particularly when the subject matter is an interdisciplinary one like digital transformation. Therefore, a proposal for future research is to include publications from other databases, such as Scopus and similar ones. Fourth, long-term changes in terminology make tracking variation over time difficult. Other current topics on which future research in the field of digital transformation could focus are: first, research on artificial intelligence integration and its effects on structures, processes, and decision-making in organizations; second, a study of new demands for digital skills and how they shape teams and roles within organizations. Other important areas of research are hybrid organizational structures that merge telework and office work. Finally, blockchain technology is another candidate for deeper analysis in changing the ways in which organizations structure and manage resources.

The study highlights several unexplored directions for future research (R.Q.3), including the impact of digital transformation on managerial cognitive load and decision-making processes, changes in organizational hierarchies and power distribution due to AI adoption, the role of AI in supporting agile methodologies and adaptive business models, the long-term effects of hybrid and remote work on organizational culture and team cohesion, and the ethical and psychological challenges posed by AI-driven transformations. By

identifying these critical areas, this study lays the foundation for further empirical and theoretical research, advancing the understanding of digital transformation and its implications for modern organizations. Further research may also focus on changes affected by the integration of AI tools in decision-making at different levels of the organization. How is AI changing the roles and responsibilities of managers? What are the risks involved, and how can a company overcome them? Future research may also address the challenges and strategies of data security and privacy management in organizational environments that will be increasingly digital.

This study enhances the theoretical understanding of digital transformation in the context of organizational design through a bibliometric analysis that identifies key research streams, authors, and thematic areas. It provides a systematic literature review and maps the evolution of this research field, enabling a better conceptualization of the relationship between digital transformation and organizational structures. Additionally, the study highlights research gaps and suggests new directions for future studies, such as managerial cognitive load in digital environments, the impact of artificial intelligence on hierarchy and decision-making, and the long-term effects of hybrid work on organizational culture. The study offers practical insights for managers, policymakers, and researchers engaged in digital transformation within organizations. By identifying key research areas and trends, it helps in understanding the critical factors that influence the successful implementation of digital technologies in business processes. The findings can assist organizations in recognizing best practices for digital transformation, optimizing their structures and strategies in alignment with global trends, and addressing potential challenges associated with new technology adoption. Moreover, this study can serve as a guide for future empirical research and data-driven decision-making in management and organizational change.

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