

Digital Transformation of Management Processes: A Comprehensive Review of Key Factors

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Abstract. *The process of digitalization has become an increasingly prominent concern in contemporary times. Despite the considerable investments made by national governments and international organizations, there remains a limited understanding of the success rate of digitalization initiatives, with only a third of such processes demonstrating notable achievements. The purpose of this study is to identify the main factors influencing the digitalization of managerial processes and the effects they have in the different stages of adoption, implementation, development, and post-implementation of organizational digitization strategies. We classified these factors into distinct categories to find barriers, determinants, challenges, decision-making, influence, risk, and critical success factors. The research analyzed 2590 papers extracted from the Web of Science database. Our methodological approach integrates bibliometric analysis with systematic literature review, following a rigorous 17-step process outlined in the Prisma P methodology 2020. Upon conducting our study, we identified 175 factors influencing digitalization decisions and their outcomes. We structured them by combining the PESTLE analysis, which evaluates external factors, such as politics, economics, socials, technological, legal, and environmental, with analysis of organizational factors, internal, by organizational structure, organizational culture, human resources, internal processes, business strategies, and management skills. The approach of the analysis and interpretation of the results gives the paper originality. The information provided through this research is helpful to practitioners in developing digitalization strategies and researchers as a basis for future studies.*

Keywords: Factor, Management, Digitalization, Digital Transformation, Challenges

Introduction

Modern society is oriented toward the transfer to the digital economy, where traditional processes are affected by technological changes, to which organizations must adapt to grow in a highly competitive market (Poliakova et al., 2020). Under these circumstances, digitalization is an active management concern seeking to increase performance through innovation (Cazoni et al., 2023). Most studies discuss the potential and prospects of digitalization processes (Jeske et al., 2018). The concept of digitalization has evolved over time toward digital transformation (DT), which involves the constant strategic renewal of organizations' processes using innovative digital technologies, which redefine business models, organizational culture, and collaborative approach (Kraus et al., 2022; Warner & Wäger, 2019). However, the changes involved in organizations' DT are extremely profound and complex, targeting both technology and human resources. For this reason, some authors consider it wrong to regard DT as a panacea (Gromoff, 2019).

Based on the supposed benefits of DT, 89% of the major global companies have implemented various technologies (Schwertner, 2017). Case studies demonstrated that they saw cost decreases of only 25% of expected value, while revenue increases were only 31% of expected revenue (Lamarre et al., 2023). However, very few studies demonstrate the efficiency and effectiveness of digitalization in the medium and long term. Furthermore, some researchers claim that, despite a triple helix created by governments, corporations, and academia that supports digitalization, only 30% of the digitalization processes performed are successful, with a difference of 70% being spectacular failures (Ramesh & Delen, 2018) and extremely expensive (Temnikov & Podshivalova, 2022). A Forbes study in 2018 shows that of the \$1.3 trillion invested in digitalization, 70%, which means \$900 billion, is wasted because they did not achieve their goals due to mismanagement (ZoBell, 2018). Some studies have shown that the failure rate in digitalization reaches a threshold of 90% (Ramesh & Delen, 2018).

This has created a paradox in the digitalization of companies, which finds that anticipated effects are not achieved (Gebauer et al., 2020). Despite this reality and with the wave of the digitalization trend in full swing, the forecasts of the amounts invested in digitalization processes for 2030 show that their volume is three to six times higher than that in 2020, depending on the field of activity (Statista, 2023). For their success, the solution identified is to transform this Triple helix into a Penta helix consisting of industry, academia, government, entrepreneurs, and the venture capital market, which together create an ecosystem meant to support digitalization and lead to the efficient and effective exploitation of its benefits (Capetillo et al., 2021). Creating this ideal ecosystem for scaling businesses through digitalization (Razavi et al., 2008) involves identifying all factors influencing decision-making (Jacobs & Gaver, 1998) and digitalization processes (Agarwal & Lakhera, 2023), but also a strategic approach (Novikov & Sazonov, 2021), which prepares both companies and people to reach the threshold of digital maturity, through sustainable and results-centered DT (Efanov, 2022). Although the DT process is challenging due to the radical changes it brings (Astafeva et al., 2019), it is appreciated as crucial in optimizing organizational functions through the support it provides in highlighting growth opportunities, facilitating business processes, making decisions, and communicating with stakeholders (Bryukhanova & Efimova, 2022). Therefore, this research aims to find factors influencing the DT process as an essential step to ensure success and reach the digital maturity threshold to implement new business models, assisted by a digital management system.

To highlight the main ideas identified in the literature, in the introduction, we synthesized the current context and the importance of the topic. Then, we presented the key concepts, ideas collected from the principal authors, and the main gaps identified in the literature. The third section of the paper presents the specific objectives of the research and the methodology used in the literature review. The main results of the research are extensively presented in the fourth section of the article, while in the fifth section, we summarize the main conclusions drawn from the research.

Literature review

Before diving into the central theme of this paper, it is essential to understand the fundamental concepts and their interpretations in the specialized literature used to support the paper.

Initially, digitalization was perceived as a process of converting information from physical to virtual format by automating various operations with the aid of innovative technologies. The benefits derived from digitalization stem from the solutions that emerge from integrating these technologies (Göçer, 2018). Implementing information systems in organizational processes has led to the transformation of business concepts (Göçer, 2018) and has ushered in a new era of digital globalization (Manyika et al., 2016). Technology integration aims to automate repetitive operations, reducing costs, creating shorter timeframes, increasing quality, and eliminating errors, thereby providing competitive advantages (Mugurusi et al., 2021). Although technology is utilized in digitalization, the primary beneficiaries of DT are individuals (Tabrizi et al., 2019). Externally, end users or final recipients of products and services are targeted, while internally, employees require an agile, risk-tolerant, and experiment-oriented organizational culture (Kane et al., 2019). The success of digitalization is contingent upon various factors, which the Explanatory Dictionary of the Romanian Language defines as "*elements, conditions, or circumstances that determine the occurrence of a process, action, or phenomenon.*" In digitalization, organizations must analyze internal and external factors to identify critical elements that affect their businesses and their challenges and opportunities to execute development strategies.

While factors are variables that influence or favor the emergence or development of the phenomenon of digitalization, their presence is not mandatory for the phenomenon's occurrence; the determinants are the variables that contribute directly. They have a decisive influence on the digitalization decision (Rasskazova & Yurgenson, 2021).

Numerous studies show that the organization's dynamic capacity is one of the most important determinants of the DT process's success (Witschel et al., 2019). It is defined by the entity's ability to adapt to environmental changes, internal and external, by integrating, reconstructing, and rearranging internal processes so that it can detect and exploit opportunities and threats, turn weaknesses into strengths, and maintain competitiveness through modernization (Yudistira et al., 2022). Modernization involves implementing a DT strategy, which, in turn, is defined as a dynamic and complex process for adopting emerging technologies across the organization (Tang, 2021). In this way, company operations are modified to bring value to customers (Pihir et al., 2019).

While digital technologies are the driving force behind transformation (Gebayew et al., 2018), the development of dynamic capabilities is necessary for institutions to assimilate and capitalize on new technologies (McLaughlin, 2017), driven by digital leadership (DL) (Mihardjo & Rukmana, 2018). This concept includes aspects of the technical side of digital technologies, the

need for a minimum level of knowledge, and basic technical skills, especially a digital mentality (Zupancic et al., 2018).

All this leads to the formation of DL, which, in its journey to efficiency, faces five paradoxes, which involve at the same time agility, precision, acuity, and individualism, but also community, flexibility, and adaptability to a large volume of changes coming from all directions (Pulley & Sessa, 2001).

In this context, digital technologies are only "possibility factors" that aim to increase customer satisfaction by developing innovative products and services (Lancioni, 2005). The first steps to make an optimal transition in the DT process involve identifying optimal technological partnerships (Aguar et al., 2021) and conducting continuous internal and external audit processes to intercept and remedy deficiencies in time (Pepe & Pavone, 2021). Despite the growing interest in digitalization, there is still a lack of understanding of the specific factors that influence the decision to digitize management processes and how these factors interact with each other. This lack of understanding causes digitalization processes to fail. A gap in research on digitalization in management is the lack of understanding of how digital technologies can be adopted into existing business processes and systems. More research is needed on implementing digital solutions in organizations effectively and ensuring they align with business goals and objectives. Another gap is the limited understanding of the impact of digitalization on employees and their roles within the organization. There is a need for more research on managing the changes caused by digitalization and ensuring that employees are prepared with the necessary skills and knowledge to succeed in a digital environment. Another gap is around data management and privacy. The increasing use of digital technologies creates new challenges in collecting, storing, and using personal data. There is a need to know how to ensure that data are collected and used responsibly and ethically and how to protect the privacy of individuals in a digital world. Finally, another gap is in measurement and evaluation. Many organizations are trying to measure the impact of digitalization on their business, and more research is needed on how to evaluate the success of digital initiatives. This includes developing metrics and KPIs appropriate for different types of digital projects and understanding how to interpret and use the results of these evaluations.

From the literature studied, we identified 12 existing barriers in the DT process and six categories of factors. The 12 barriers in the DT process are the lack of digital culture and specifically qualified personnel, knowledge deficiencies in the field, and the limitations of IT systems. These are poor competition, poor communication, insufficient funding, lack of defining clear roles in the activities carried out, and lack of vision (Aguar et al., 2021). The six factors influencing digitalization processes can be systematized into technological, organizational, environmental, individual, service, and customer-related factors.

Technological factors include technologies based on artificial intelligence (AI), building information modeling (BIM), Big Data, Industry 4.0 (I4.0), and digital platforms, the implementation of which has the effect of developing new business models. The organizational factors concern the dynamics of adoption of digital technologies at the micro and macro levels, diffusion of innovation within organizations (Mhlungu et al., 2019), systemic understanding of adoption in complex environments, organizational preparation, and implementation of training programs. Environmental factors include market-level initiatives and policies, government support policies for DT, and sociotechnical environments. Individual factors include the behavior and ability of users to adopt technologies, the perceived value and benefits of the consumer or customer, technological capacity, financial capacity of organizations, data quality and their integration capacity, and support necessary for the subsequent administration of digitized systems. Service

factors include maintenance, which involves costs, knowledge, and system maintenance experience. It creates feelings of tangibility and reliability, which must also provide elements of entertainment, empathy, and interactivity. Customers are seen as factors influencing digitalization processes (Mhlungu et al., 2019), interested in perceived emotional value, quality, risk, and price.

These factors collectively contribute to digitalization in various industries and sectors, including hospitality, construction, information systems, commerce, and logistics. Understanding and correctly addressing these factors is crucial for developing successful DT initiatives.

Objectives and methodology

The purpose of this research is to identify the factors that influence the digitization of management processes, their classification into categories, and the determination of success factors using the systematic literature review (SLR) method.

The research objectives are the following:

- O1: Identification of existing barriers in the digitization process
- O2: Identifying the determinants of DT.
- O3: Identifying the challenges encountered in the digitization process.
- O4: Identification of risks that arise in the organizational integration of technologies.
- O5. Identifying success factors in digitalizing managerial processes
- O6: Identification of impact factors.
- O7: Identification of decision-making factors that determine digitalization decisions.

The research hypothesis states that several internal and external factors influence the digitalization of management processes, including organizational culture, leadership, technological infrastructure, market competition, and regulatory requirements. To find the answer to these questions, we conducted an SLR, based on the Prisma P 2020 protocol, to identify the level of knowledge in the field through critical analysis of relevant articles identified in the literature.

The SLR is the ideal method to identify the state of knowledge and answer research questions through critical analysis of previous research (Amin et al., 2022). The three stages of conducting an SLR are planning, coordinating, and reporting data (Apóstolo et al., 2020). In the planning stage, search terms are chosen by identifying relevant keywords, starting from the formulated basic terms of the research question, to which we added the most used synonyms in a similar context.

Also, in previous research, it was found that the most used terms in the context of digitization of managerial processes are: "digitization", "digital transformation", "challenges", "decision making", and "management" (Cazoni et al., 2023). To these keywords, we have added the central theme of this study: "factor", "determinants", and "barrier", along with the most used similar notions of their effects, "challenge", and "influence".

When selecting the database, we considered choosing a database with a wide scope in terms of the number of articles and years and ensuring the quality of the research. We chose the Web of Science (WoS) database, which has the longest period, is over 33 years old, has over 85.9 million research papers displayed, and has high-quality standards for acceptance for publication (Clarivate, 2023). The focus on journal articles and conferences is determined by the degree of novelty they bring to research, with more speed and frequency than in the case of books. Keyword search by topic ensures a better concentration of the resulting themes, depending on the focus on the central topic of the theme. The second essential step in literature review is implementing a review protocol

that sets objectives and methods. This stage ensures the transparency and the accuracy of the study's data.

The inclusion and exclusion criteria ensure the relevance of the extracted studies. We chose English because it is the most popular, with more than 96% of articles written in this language. On the other hand, translating studies from other languages into the mother tongue or another language of international circulation known to the authors carries the risk of losing the meaning of words and expressions, leading to a poor understanding of the author's message. The exclusion of 2024 was made because the year is just beginning, and the number of published articles is not representative of the researchers compared to the rest of the studies in the database. Subsequently, the results were filtered by applying relevance criteria. The lack of them led to the exclusion of additional materials. Data verification for duplicate items was performed using the Zotero application, which imported data in text format. This identified one duplicate item that was removed. The database was cleaned, leaving 2425 papers that were bibliometrically analyzed. During the identification stage, keywords were searched in the database extracted from the WoS using quotation marks to identify exact expressions and establish their correspondence with the source journal from which the articles originate. We analyzed this database using the R Studio computer application with the bibliometrix interface (Aria & Cuccurullo, 2017).

To identify the factors that influence the digitalization of management, an SLR was carried out according to the research methodology and related procedures established by the Prisma P 2020 system, ensuring the quality of the research. The Prisma P method of systematic literature analysis follows the 17 steps of SLR. After these, 2425 articles were considered eligible for further qualitative analysis, and 74 were considered relevant for SLR. In the next stage, we performed the bibliometric analysis of the resulting data. We identified the principal authors, reference articles, the most important publishing houses, the nations most involved in supporting research in the field, and the connections between authors. Through keyword analysis, we determined the key themes explored by researchers over time and current research directions, after which we performed a content analysis of relevant articles. The stages of the investigation are shown schematically in Figure 1.

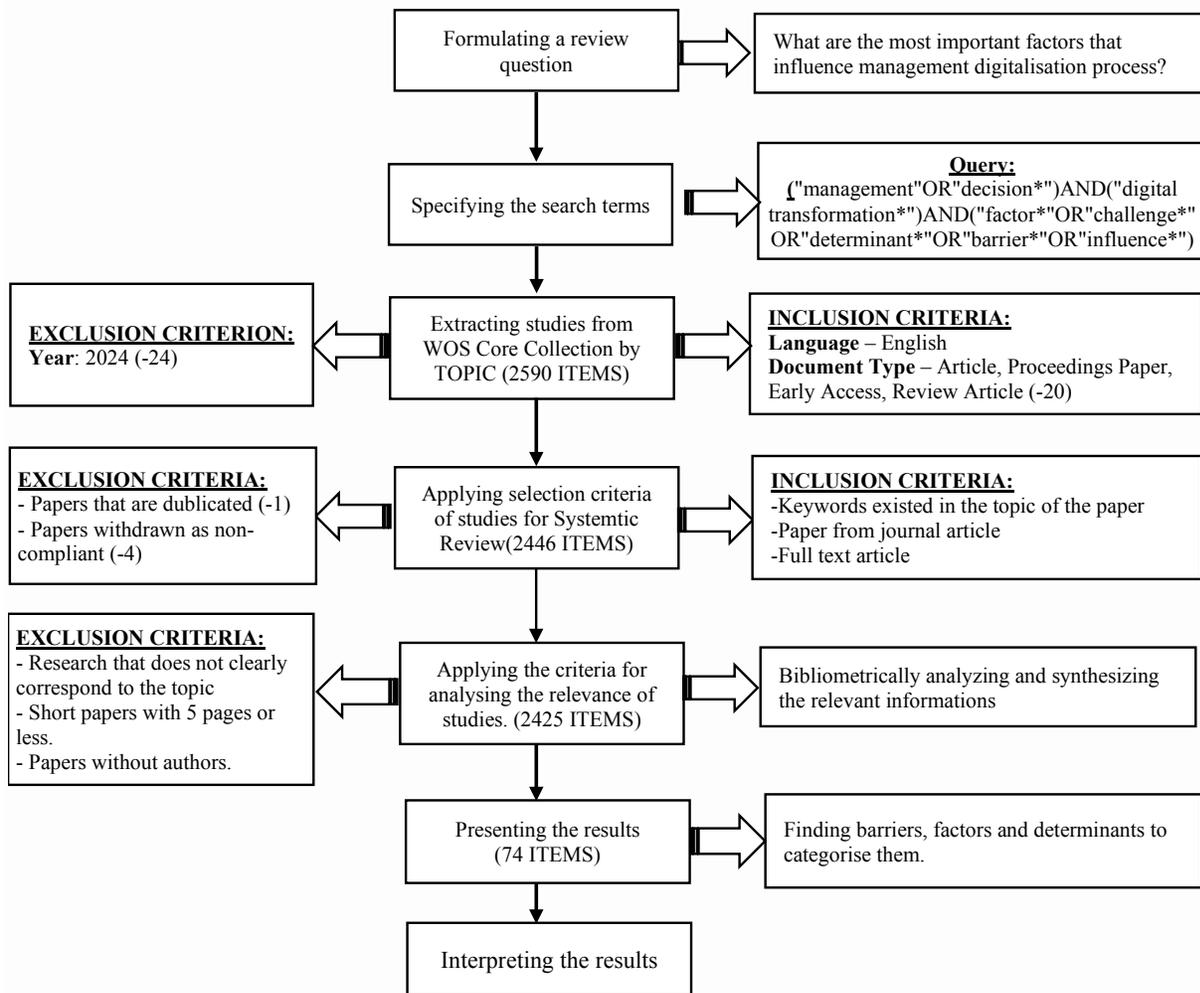


Figure 1. Stages of choosing the database for SLR

Source: Authors' own research.

We systematically reviewed 74 articles published in specialized journals and listed in the WoS database during 2019-2023. We extracted the theoretical contributions of these articles on the issues addressed, the methods of analysis addressed, the problems and challenges highlighted, their solutions, research limitations, and researchers' recommendations. Following these analyses, this article contributes to research by updating the level of knowledge in the field, summarizing the main results of previous research conducted in the field of digitalization of management processes, and clearly explaining which factors influence the digitalization of management processes, how they can affect the digitalization decision and its results, when these factors act, problems encountered in implementation, and how they can be avoided. This study is helpful for researchers and practitioners by providing concrete elements of the essential steps to consider in digitalization. The key points within it are also highlighted. All these elements will support researchers and practitioners in developing new approaches to digitizing management processes to increase the success rate of digitalizing management processes.

Results and Discussions

The resulting database was bibliometrically analyzed in the first stage after applying the inclusion and exclusion criteria, from which 2425 items were obtained. Subsequently, we systematically analyzed the literature on articles that resulted from applying qualitative criteria for selecting articles. The 74 articles evaluated by content were classified into nine categories, according to the theme of central interest, as follows: 32 analyze general influencing factors, nine success factors, six impact, seven barriers, six determinants, five decisions, two challenges, four other influences, and three risks of digitization of management processes.

Bibliometric analysis

Data processing with the *bibliometrix* application resulted in 2425 unique articles from 1139 journals, in which 8144 authors from 304 countries collaborated, from 2004 to 2023.

Analysis of the annual production of articles reveals that interest in the importance of factors influencing the digitalization of management processes began to increase after 2015. The peak was reached in 2023, when 707 articles were published in the field, compared to 630 in 2022 and 378 in 2021 (Figure 2).

The most cited research articles were published between 2006 and 2011, with a peak in average citations in 2006, when the average citations per year were approximately two times higher than in 2020 or 2021 and three times higher than the papers published in 2019. The mean top citation per article was higher in 2006, with 9.66 citations per article, followed by 2011, with 8.04 mean TC per article, and in 2004, with 4.71.

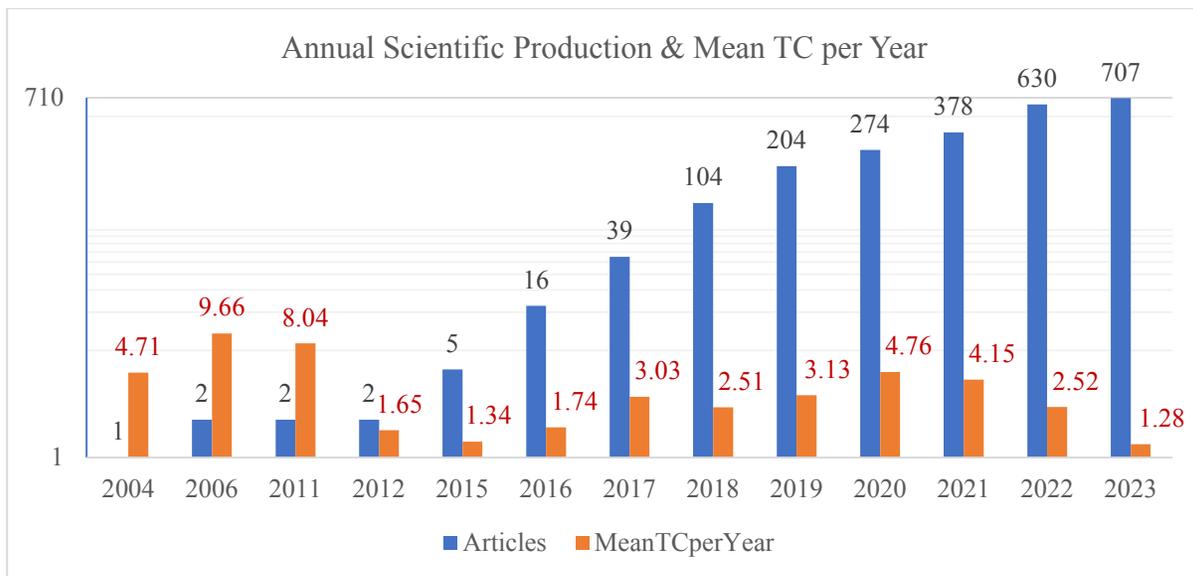


Figure 2: Graphical representation of the annual article production trend

Source: Authors’ own research, based on data from WOS processing with bibliometrix.

Analysis of the authors' productivity by the number of articles they wrote shows that of the 8144 authors who participated in the analyzed research papers, 90% of the authors wrote one article. All others participated in a tiny percentage of writing multiple research articles in the field (Table 1).

Table 1. Authors productivity through Lotka Low

Documents written	No. of Authors	Proportion of Authors
1	7135	0.90031546
2	617	0.07785489
3	102	0.01287066
4	42	0.00529968
5	13	0.00164038
6	12	0.0015142
7	2	0.00025237
9	1	0.00012618
11	1	0.00012618

Source: Authors' own research, with Bibliometrix, based on data from WOS.

The most relevant authors published their articles between 2018 and 2023. They addressed topics such as identifying risks in the digitalization of the construction sector (Aghimien et al., 2022) and the supply chain (Rauniyar et al., 2022), identifying potential and existing barriers (Vafadarnikjoo et al., 2021) in digitalization of production and management operations (Lohmer & Lasch, 2020) in procurement chains (Flechsigt et al., 2020; Cheng et al., 2023), identifying transformative factors in the digitization of supply chains (Aamer et al., 2022; Samaranayake et al., 2022), the consequences that digitization has on human factors (Altrock et al., 2023), but also the impact that digitalization has on managerial skills (Giraud et al., 2023).

The most cited articles by relevant authors assess the influence of AI on business value (Perifanis & Kitsios, 2023), employees in I4.0 (Malik et al., 2021), and innovation research (Mariani et al., 2023), success factors and how they influence DT in SMEs (Zhang et al., 2022), the relationship between digital technology adoption, digital dynamic capacity, and transformation performance (Lei et al., 2021), the role of big data and social media analytics in business sustainability (Sivarajah et al., 2020), strategic archetypes in DT (Fischer et al., 2020), as well as the role of ChatGPT in research, practice, and policy (Dwivedi et al., 2023). Furthermore, another category of authors analyzed industrial DT in different fields (Abbate et al., 2023; Kumar et al., 2023), sustainability (Taneja et al., 2023), the role of organizational culture (Chaudhuri et al., 2023), the link between DT performance and managerial myopia (Guo et al., 2023) and the role of strategic DT and business model innovation in reaching the performance threshold (Dong & Wang, 2022).

The most relevant authors published between six and eleven articles (Figure 3). The longest-serving author is Deschamps, who published research between 2018 and 2023 on existing barriers to digitizing management processes, followed by Gupta, Zhang, and Dwivedi, with articles published between 2018 and 2023 on the impact of digitalization on human resources, identifying the risks occurring in the field and their possible approaches.

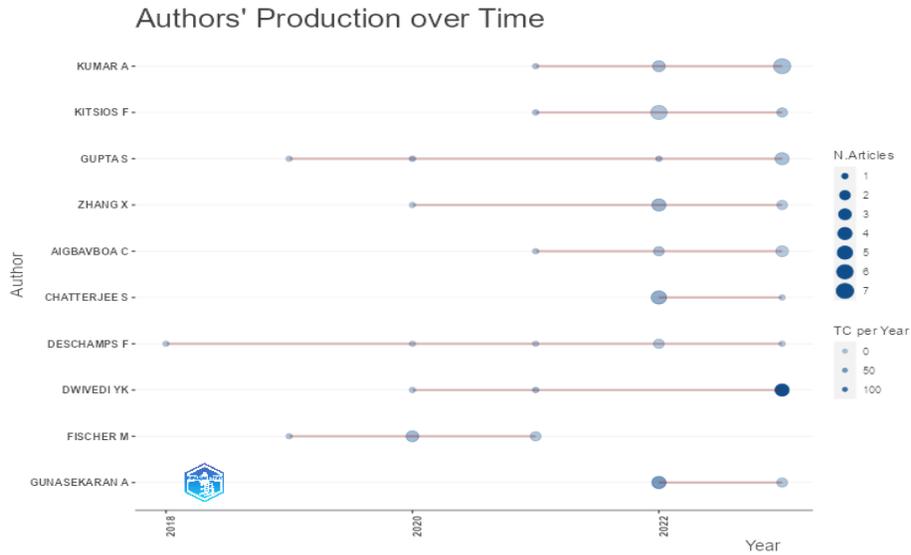


Figure 3. Graphical representation of authors' output over time

Source: Authors' own research, with Bibliometrix, based on data from WOS.

The most important sources are the journals in which these authors published their articles, topping Sustainability with 176 articles published in 2023, almost six times more than the research published by the following leading journals (Figure 4). Sustainability is also the journal with the greatest local impact, having twice as many citations as the next-top publications, and it is also the journal with the most articles published overtime on the factors influencing DT.

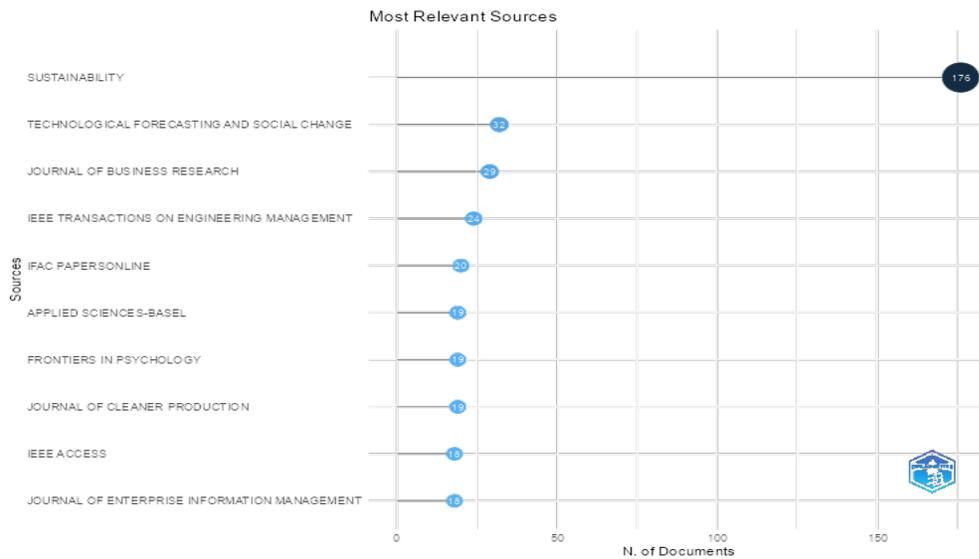


Figure 4. Most relevant sources

Source: Authors' own research, with Bibliometrix, based on data from WOS

After the distribution of the national affiliation of the most cited authors, we find that the inherent area of our theme is global, being an active concern at the European, American, or Asian level. However, analysis by national affiliation shows that 80% of the research in the top ten belongs to European researchers, followed by Asian and American researchers. The topics they

approached concern organizational agility, identifying barriers and determinants acting on digitization processes, and organizational issues of identifying best-practice policies and personnel organizational chart, as well as identifying optimal technologies in operational and management processes (Table 2).

Table 2. Most globally cited documents

Authors	Year	Journal	Title	Total Citations
(Warner & Wäger, 2019)	2019	Long Range Planning	Building dynamic capabilities for DT: An ongoing process of strategic renewal	706
(Horváth & Szabó, 2019)	2019	Technological Forecasting and Social Change	Driving forces and barriers of I4.0: Do multinational and small and medium companies have equal opportunities?	459
(Zhu et al., 2006)	2006	European Journal of Information Systems	Innovation diffusion in global contexts: determinants of post-adoption DT of European companies	373
Bogers et al., (2018)	2018	California Management Review	Open innovation: Research, practices, and policies	325
(Iivari et al., 2020)	2020	International Journal of Information Management	DT of everyday life - How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care?	321
(Singh et al., 2020)	2017	Strategic Information Management	How Chief Digital Officers Promote the DT of their Companies	268
(Culot et al., 2020)	2020	International Journal of Production Economics	Behind the definition of I4.0: Analysis and open questions	268
(Dwivedi et al., 2023)	2023	International Journal of Information Management	“So what if ChatGPT wrote it?” Multidisciplinary perspectives on opportunities, challenges, and implications of generative conversational AI for research, practice, and policy	254
(Li et al., 2019)	2019	Automation in Construction	Blockchain in the built environment and construction industry: A systematic review, conceptual models and practical use cases	250
(Trantopoulos et al., 2017)	2017	MIS Quarterly	External knowledge and information technology: implications for process innovation performance	213
(Osterrieder et al., 2020)	2020	International Journal of Production Economics	The smart factory as a key construct of I4.0: A systematic literature review	201

Source: Authors’ own research, based on the data from WoS.

Figure 5 shows a three-field graph describing the connections between sources, authors, and research fields. The vertical dimensions of the rectangles are directly linked to the frequency of occurrence of a particular reference, author, or field in the graphical representation of the collaboration network. The width of the link lines is proportional to the frequency of connections. The figure reveals that Kitsios, Vrontis, Kumar, Carayannis, and Chatterjee are the primary authors who have researched industrial DT, digital technologies, technologies used, and the role of change management in this context. The three leading journals they have published are Sustainability, IEEE Transaction, and Journal of Business Research.

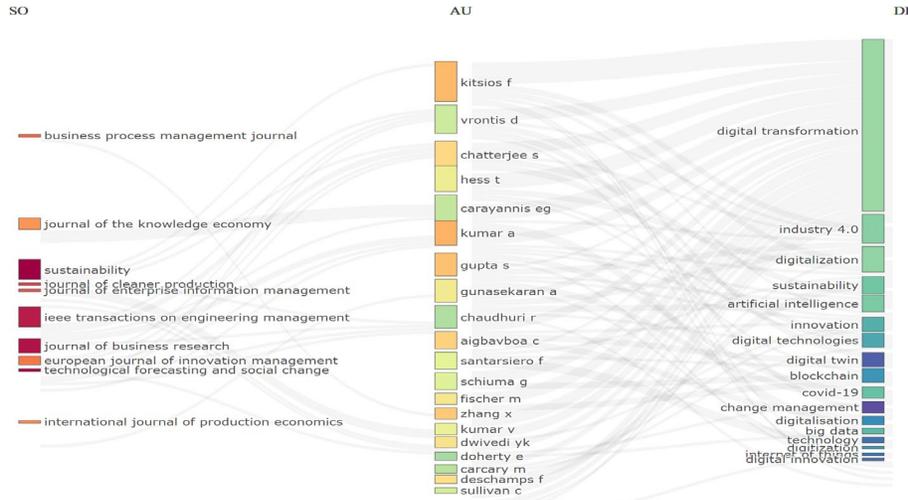


Figure 5: Three Fields Plot

Source: Authors' own research, processing with Bibliometrix based on the data from WoS.

Analysis of the most common words after the authors' keywords shows their preoccupation with digitalization, DT, digital technology, I4.0, AI, innovation, and sustainability.

Analysis of thematic evolution reveals that digitalization, DT, and changing business models have been an active concern for researchers since 2004. Interest in this topic increased after 2015 when topics related to the factors influencing the success of digitization, the identification of new technologies, the adoption of innovation in management, the need to implement business management processes, and the development of digital skills were addressed. Cyber security, the dynamic capacity of organizations, and the need to develop a digital business architecture are topics that have taken shape in the same period. The crisis created by Covid 19 has made DT, implementing I4.0, and creating digital platforms a priority. The year 2023 maintained the previous trend, but the research topic diversified, focusing on the digitization of management decision-making processes using AI, the need for an increased level of digital education, the development of a digital strategy, and business models based on digital governance (Figure 6).

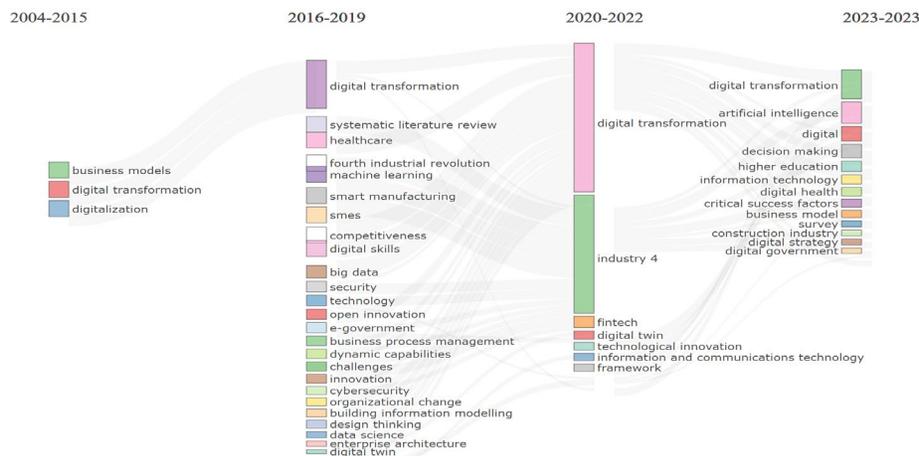


Figure 6: Thematic evolution of the research topics

Source: Authors' own research, processing with Bibliometrix based on the data from WoS.

Analysis of database content

The digitalization of companies is a complex phenomenon, influenced by many factors that can serve as accelerators or inhibitors of DT. Barriers and drivers reflect opposite aspects of the DT process. On the other hand, determinants (or enablers) are elements or conditions that support or accelerate the adoption and effect of DT. These may include strong leadership, an organizational culture that is open to innovation, adequate financial resources, advanced infrastructure and technology, and favorable regulations. Although barriers must be identified and overcome, drivers must be recognized and harnessed to ensure efficient and sustainable progress in DT. When analyzing any change process, it is essential to assess barriers and drivers to develop a balanced strategy that addresses challenges and capitalizes on support points.

Barriers

Barriers and challenges can hinder or delay implementing digital technologies and innovation processes (Cambridge, 2024). These are technological, organizational, cultural, or legal and can take various forms, such as inadequate IT infrastructure, resistance to change of employees, or uncertain regulations.

In DT, technology is seen as an essential driving force and a possible barrier, such as outdated technologies that can hinder progress and bring security risks (Tsiavos & Kitsios, 2022). New technologies define new possibilities, but they also have a greenhouse of limitations. Blockchain can potentially increase transparency and efficiency in business through its interaction with IoT. However, the adoption of this technology is limited by a lack of expertise, legal uncertainties, and insufficient infrastructure, suggesting improved security and interoperability to boost use (Lohmer & Lasch, 2020). The study conducted on the challenges of blockchain adoption in supply chains in emerging economies led to the identification of transaction uncertainties as the main obstacle and proposed a framework for validating the use of the technology (Vafadarnikjoo et al., 2021). Integration of other technologies, such as RPA adoption, into procurement and supply management is still in its infancy, especially in the public sector, and they have identified barriers, such as IT infrastructure and human resources, highlighting the need for digital readiness for RPA success (Flechsig et al., 2020). A systematic review of the literature on data use strategies to identify facilitators and barriers to adopting data-driving strategies led to identifying four key themes: data quality, technology, organizational culture, and business value. (Redd et al., 2022).

In healthcare, the obstacles to effectively integrating new technologies into the supply chain are more behavioral and organizational than financial or technological, requiring the address of the motivational barrier and resistance to change (Benevento et al., 2023). Furthermore, research within the organizational framework on how formal hierarchies influence communication in the workplace has led to the conclusion that communication technology can mitigate formal barriers and improve information sharing in the digital environment, regardless of the distance of cultural power (Meske et al., 2020).

Although the analysis is not exhaustive, the classification and ordering of these barriers in DT can be structured into four main categories: technological, organizational, cultural, and legal. Depending on its development stage, it can affect the DT process (Table 3).

These barriers are not independent of each other and often intertwine. Organizational or cultural barriers can enhance technological barriers. An effective DT strategy must be devised based on determinants to overcome these obstacles.

Table 3. Barriers to digitalization

Implementation phase	Type of factors	Factors	Effect	Source
Initiation	Technological	Insufficient technological infrastructure	Prevent the DT process from starting	Lohmer & Lasch (2020)
		Outdated technologies	Limit innovation and efficiency.	Tsiavos & Kitsios (2022)
	Legal	Legal uncertainties	It complicates the adoption of new technologies, such as blockchain	Lohmer & Lasch (2020); Vafadarnikjoo et al. (2021)
Planning and Design	Technological	Inadequate IT infrastructure for new technologies	Difficulties in process automation, such as for RPA	Flechsigg et al. (2020)
		Poor data quality	Undermines data-driven decisions	Reddy et al. (2022)
	Organizers	Lack of expertise	Make it difficult to use new technologies efficiently	Lohmer and Lasch, (2020)
		Unskilled human resources	Challenges in the efficient implementation of new technologies	Dehghani et al. (2021)
Implementation and Integration	Technological	Technological complexity	It can be a barrier to effective implementation	Tiwari et al. (2023)
	Organizers	Formal hierarchies and rigid structures	Prevents quick and flexible adaptation	Meske et al. (2020)
	Cultural	Change-resistant organizational culture	Slows down or even stops DT initiatives	Reddy et al. (2022)
		Hierarchical distance	It leads to ineffective communication and slow acceptance of change	Meske et al. (2020)
Adoption and Adaptation	Cultural	Change-resistant organizational behaviors	Hinder the adoption of new technologies and progress	Benevento et al. (2023)

Source: Authors' own research.

Determinants

Many experts see digitalization as necessary, as it allows companies to remain competitive and relevant in a dynamic world influenced by several factors that can accelerate or hinder the adoption of digital technologies. This process is necessary in the modern economy and a strategic imperative for long-term survival and prosperity in an ever-changing business environment. The reasons for this need result from competitive pressure, which forces companies to adapt quickly to remain relevant in the market and not be overtaken by competitors (Tiwari et al., 2023), the evolution of customer expectations (Nikopoulou et al., 2023), who are increasingly oriented toward personalized and instantly accessible digital experiences (Lian, 2021). Moreover, technological innovation continues to advance and open up new opportunities for efficiency, data analytics, and new business models (Al-khatib, 2023). These drivers work together to push companies toward innovation through DT.

Factors form a complex system in which constraint factors can determine the immediate need for change, while psychological and cognition factors can influence the speed and depth of the change.

Constraining determinants are generally related to resources and infrastructure, while psychological, emotional, and cognition factors are associated with human thinking and behavior (table 4).

Table 4. Determinants

Implementation phase	Type of factors	Factors	Effect	Source
Awareness and Initiation	Market Factors	Customer demand and expectations	Determine the need to start the digitization process	Peruchi et al. (2022)
		Competitive pressure	The need to adopt new technologies to remain competitive	Tiwari et al. (2023)
		Market regulations	They impose new requirements that require digitalization	Nikopoulou et al. (2023)
	Internal Decision Makers	Management attitude	Recognizing the importance and benefits of digitalization	Park et al. (2022)
		Level of digital literacy	Influences the ability to assess and start the digitalization process	Nikopoulou et al. (2023)
Planning and Design	Acceptance and Awareness Factors	Organizational culture	A culture open to change facilitates implementation	Nikopoulou et al. (2023)
		Employee perceptions and attitudes	Employee acceptance of technology is critical to success	Park et al. (2022)
	Resources & Capabilities	Availability of financial resources	It is essential to allocate the necessary budget for technology	Nikopoulou et al. (2023)
		The firm's ability to test	Enables testing of technologies before large-scale deployment	Nikopoulou et al. (2023)
Implementation and Integration	Economic and Technical Constraints	Associated costs	Influences decisions on the scale and speed of implementation	Park et al. (2022)
		Technological complexity	It can be a barrier to practical implementation.	Tiwari et al. (2023)
	Organizational and Environmental Factors	Infrastructure	Needed to support new technologies	Nikopoulou et al. (2023)
		Human resources	Training and skills development of employees are essential	Nikopoulou et al. (2023)
Adoption and Post-Implementation	Mediators and Moderators	Satisfaction as a mediator	Customer and employee satisfaction can influence the continued success of digitalization.	Lian (2021)
		Supply chain agility as a moderating factor	The ability to respond quickly to change can determine how well new technologies integrate.	Al-khatib (2023)
	The impact of global events	COVID-19 pandemic	It has demonstrated the importance of digitalization and can accelerate the adoption of technologies.	Nikopoulou et al. (2023)
	Domain Specific Factors	Company size	Influence the ability to adapt and scale digital solutions	Tiwari et al. (2023)
	Test Capability	The ability to experiment with technology	Allows the organization to adjust and optimize its processes following feedback obtained during tests	Tiwari et al. (2023)

Source: Authors' own research.

Constraining factors include financial resources, technology infrastructure, and market regulation, and they can be both barriers and catalysts in the DT process. The costs associated with adopting digital technology are substantial, so small companies have difficulty identifying the necessary financial sources for digitization (Park et al., 2022). Outdated technology infrastructure also requires costly upgrades to be compatible with new digital solutions (Tiwari et al., 2023). Additionally, market regulations can impose specific standards and requirements that complicate digitization. (Nikopoulou et al., 2023).

Psychological and emotional factors often relate to individual attitudes and perceptions towards change. Resistance to change is a natural human reaction that constitutes a barrier, a significant obstacle to adopting technology. Negative attitudes or anxiety towards technology reduce the speed and efficiency with which digitalization is implemented. In contrast, an organizational culture that promotes innovation by being open to technological experimentation facilitates a smoother digital transition. (Park et al., 2022).

Knowledge factors refer to the degree of familiarity and technological skills that employees and managers possess. A robust comprehension of the advantages and possible potentials of technology is crucial to encourage adoption (Nikopoulou et al., 2023). Continuing education and training are imperative to develop the necessary skills and ensure that employees are equipped to work effectively in a digitalized environment.

Constraining factors can act as a catalyst for change, forcing organizations to recognize the need to adapt. Psychological and knowledge factors can determine the pace and success of implementing change. Companies that align these factors and cultivate a culture of continuous learning and adaptability will thrive in the digital age (Nikopoulou et al., 2023; Park et al., 2022; Tiwari et al., 2023).

Challenges

Global challenges in the agricultural and forest sectors have prioritized DT. Studies related to I4.0 and process modeling provide essential information about the directions and challenges in these areas.

Holzinger et al. (2022) emphasize integrating AI and machine learning (ML) into agriculture and forestry, highlighting the need for reliable and robust AI. However, a symbiosis must be achieved between AI and human expertise by creating human-centered AI (HCAI). This approach aims to enrich human performance through technology, not replace it. Three critical research areas that need to be prioritized have been identified: intelligent fusion of information, robotics, and decision support. They are presented as stages of technological development, from the implementation of existing technologies to advanced adaptations, which require a combination of the education and experience of specialists with the new possibilities offered by AI (Holzinger et al., 2022) (Table 5).

At the same time, I4.0 research related to process modeling in smart factories shows that existing modeling languages, like Business Process Model and Notation (BPMN), Petri Net, and Unified Modeling Language (UML) are insufficient to cope with the increased complexity of these environments. That is why developing new modeling languages or extending current ones is necessary to improve dynamism and interoperability in smart factories (Sott et al., 2021).

Table 5. Challenges of digitalization

Implementation phase	Type of factors	Factors	Effect
Implement	Technological factors	Integration of AI with Human Expertise	Creating Human-Centered AI (HCAI) that improves human performance, not replaces it.
	Organizational factors	Education and Experience in AI Development	The need to integrate foresters' education and experience into AI development to support and facilitate human work
	Social Factors	Human Centering of AI (HCAI)	Creating AI that improves human performance
Development	Technological factors	Intelligent Fusion of Information	Development of technologies for intelligent fusion of information for decision support
		Augmented and Explainable Decision Support	Increasing the need for augmented and explainable decision support systems
	Organizational factors	Explainable and Robust AI	Developing an explainable and robust AI that is effectively and ethically integrated with human expertise
		Robotics	Progress in robotics to improve efficiency and precision in agriculture and forestry
		Interoperability and Complexity	Managing increased complexity and ensuring interoperability in innovative production environments
	Social factors	User interface design	Creating interfaces that are intuitive and efficient for users
		Ethics and Responsibility	Ensuring that digital technologies are developed and used in an ethical and responsible manner

Source: Authors after Holzinger et al. (2022).

Decision-making factors

Analysis of studies provides insight into how decisions are shaped and influenced by different factors depending on the stage of action (Barton & Love, 2000).

At the beginning of the decision chain, in the need identification stage, Yeo et al. (2022) found that AI alters consumer perceptions in the fashion industry. Analyzing Malaysian users' behavior on Instagram, the authors found that AI-generated electronic word-of-mouth (eWOM), along with the emotional value and perceived quality of products, encourages purchasing decisions. In contrast, AI does not significantly influence traditional factors such as price and perceived risk. (Yeo et al., 2022).

In the option assessment stage, Xin et al. (2022) show that the adoption of emerging technologies such as I4.0 in the supply chain and its transformation into Supply Chain 4.0 (SC 4.0) in the circular economy is hampered by obstacles such as lack of strategic vision and poor technology infrastructure. These factors are critical in the assessment stage, where decisions need to be well-informed and systematic to overcome these challenges. (Xin et al., 2022)

According to Provost & Fawcett's (2013) study, implementation is marked by the importance of data-driven decisions in business. Companies such as Amazon and Walmart are demonstrating that a data-driven approach can lead to better performance, especially in the face of unexpected events. Here, decisions must capitalize on real-time data analysis and decentralized production systems, central elements of I4.0 (Provost & Fawcett, 2013).

Post-assessment and monitoring are analyzed, illustrating how the textile industry, by adopting I4.0, can use data-driven production reprogramming to respond to environmental pressures and strict regulations. Although initially expensive, investment in I4.0 technologies demonstrates cost-effectiveness by improving sustainability and efficiency (Ghaleb et al., 2020).

Ljepava (2022) shows that AI transforms marketing decisions, optimizes the marketing mix, and understands consumer behavior. However, AI has not eliminated the need for human discernment and expertise; instead, it has emphasized the importance of collaboration between data and human intuition for relevant marketing decisions (Ljepava, 2022). In the healthcare industry, the analysis conducted indicates that although AI-based clinical decision support systems (DDSS) are on the rise, there are challenges to their widespread adoption (Bertl et al., 2023). Each action stage encounters specific factors that are influenced or modified by AI and I4.0, and recognizing and adapting to these factors is essential (Tabel 6).

Table 6. Decision-making factors

Implementation Phase	Category	Subcategory	Factor Name	Author
Awareness and Initiation	Technological factors	Technical and Infrastructural Challenges	Lack of Internet-based infrastructure and networks (B21)	
			Poor quality of existing data (B22)	
			Security issues (B1)	
			Lack of global standards and data exchange protocols (B9)	
			Lack of Internet-based infrastructure and networks	
			Legal aspects	
			Lack of government and policy support	
Planning and Design	Organizational factors	Management and Strategic Planning	Lack of vision and strategy (B6)	Xin et al. (2022)
			Unclear economic benefits of digital investment (B4)	
			Low understanding of the implications of I4.0 (B19)	
	Technological factors	Integration and Automation	Lack of planning (B12)	
			Lack of integration (B17)	
	Cultural factors	Collaboration	Insufficient collaboration	
	Organizational factors	Development of Organizational Skills and Culture	Lack of knowledge (B10)	
			Lack of digital literacy (B11)	
			Lack of collaboration and coordination (B20)	
			Low management support and dedication (B16)	
Profiling issues and complexity				
Implementation and Integration	Electronic Public Opinion (eWOM)	Related AI	Systems for analyzing eWOM and providing personalized recommendations	Yeo et al. (2022)
		Smart Recognition	Understanding user preferences	
			Lack of Internet-based infrastructure and networks	Xin et al. (2022)

Implementation Phase	Category	Subcategory	Factor Name	Author
		Risk	Lack of global standards and data exchange protocols	
			Security issues	
			Overtrust in suppliers	
			Silver bullet tracking	
Adoption and Post-Implementation	Organizational factors	Optimization and Continuous Innovation	Poor R&D on I4.0 adoption	
			Agility and flexibility	
Continuous development	Emotional value	The contribution of AI	Creating interactive and visual content through AI that resonates on an emotional level	Yeo et al. (2022), Chouaibi et al. (2022)
	Perceived quality	AI and Quality	Detailed product overview	
		Personalized suggestions	ML algorithms for personalized product suggestions	
		Customer Support	Intelligent chatbots and virtual assistants for instant customer support	
	The role of AI in Shopping	Impact on the Purchase Decision	Rising AI technologies impacting eWOM, emotional value, and perceived quality	
		Credibility and Brand Image	AI helps to strengthen brand credibility and image through positive eWOM.	
Advanced Adaptation	Perceived Risk and Perceived Price	AI Mitigation of Risk	AI technologies to reduce perceived risk and price transparency	Xin et al. (2022)
		Optimization and Continuous Innovation	Agility and flexibility	

Source: Authors' own research.

Influence Factors

DT is a complex and multiphase process in which various influencing factors act at different stages of digitalization. In this regard, recent academic research provides insight into how these factors contribute to successfully implementing digital technologies in various sectors.

The initial phase of adopting digital technologies emphasizes the importance of psychological processes that manifest themselves at the level of individual users and are influenced by management practices. It suggests that before an organization embarks on digital change, leadership must ensure that employees are ready and embrace change, which requires effective communication and inspirational leadership (Kohnke et al., 2023).

As organizations move to the stages of innovation and differentiation through digitalization, they identify the need for advanced technology and transformative leadership within small knowledge-based service companies. This stage involves a cultural and organizational transformation, where leaders must promote a strategic vision and facilitate the adoption of new technology-based business models (Marino-Romero et al., 2022).

Once organizations have implemented digital technologies, a significant challenge is managing continuous change and ensuring that the organization remains adaptable and innovative. Emphasizes that DL is essential for successfully navigating technological change in the service sector. DL competencies include understanding and applying new technologies and developing personal and organizational capital to support continuous innovation (Brunner et al., 2023).

Finally, in the context of a dynamic and often uncertain business environment, such as that caused by the COVID-19 pandemic, it shows that supply chain agility and adaptability are essential for business performance. This final stage aims to continuously optimize and streamline digital processes so companies can respond fast to market changes and maintain a strong advantage (Cheng et al., 2023).

Therefore, these articles provide a comprehensive framework of influential factors and key stages in the digitalization process, from preparing and accepting change to innovation and continuous adaptation, highlighting the role of management and leadership in all these phases (Table 7).

Table 7. Factors that influence organizational digitalization

Implementation Phase	Category	Subcategories	Factor Name	Effect	Author	
Diagnosis and Adoption	Innovation	Big Data Technologies	Implementation of technological tools	Effective diagnosis and integration of information	Marino-Romero et al. (2022), Provost & Fawcett (2013)	
		IT and Cybersecurity Technologies	IT applications and cybersecurity software	Information security and digital management		
		Technology infrastructure	Technological development of public administrations	Promoting eGovernment and value networking		
	Behavior	Leadership		Leadership Transformative	Positive impact on innovation and organizational performance	Weber et al. (2022); Gebauer et al. (2020)
				Digital Leadership (DL)	A new paradigm in leadership to manage technology-driven change through service innovation.	
				Leadership Capabilities	Personal, social, and organizational capital as capabilities related to DL.	
				Strategic Change	DL capabilities drive strategic change in DT contexts.	
		Knowledge Management	Involvement of company members in digital processes	Efficiency of DT processes	Marino-Romero et al. (2022)	
	Professional Associations	The role of professional associations	Collaboration for technological development and DT in Kibs companies			

Implementation Phase	Category	Subcategories	Factor Name	Effect	Author
Implementation	Organizational	Management of Digital Adoption (MDA)	Digital Adoption Framework	Managing digital adoption effectively	Kohnke, et al. (2023)
	Behavioral	User behavior	Change user behavior	The impact of management factors and psychological processes on digital adoption	
	Technological	Digital maturity	Digital maturity level	Understanding and assessing the state of digitalization for further development	Marino-Romero et al. (2022)
	Educational	DT Learning	DT learning process	Continuous adaptation and learning in the digital environment	
	Dynamic	Change management	Dynamic Capabilities (DCs)	Contributes to adaptability and agility, leading to improved performance.	Cheng et al. (2023)
	Finance	Finance	Supply Chain Finance (SCF)	Indirect impact on supply chain effectiveness by mediating the effects of dynamic capacities.	
	Organizers	Operational	Supply Chain Efficiency (SCE)	Direct and indirect impact on the economic performance of firms.	
	Strategic	Context	Environmental dynamism (ED)	It moderates the relationship between supply chain adaptability and agility, finance, and effectiveness.	

Source: Authors' own research.

Critical Success Factors (CSF)

According to Sony et al. (2021), identifying success factors is an essential step that lays the foundation for any successful initiative. They highlighted how benefits, such as reducing defects and increasing customer satisfaction, can be achieved by adhering to the principles of quality and efficiency in the manufacturing and service sector through digitalization. The challenges are high costs and resistance to change. Starting from the importance of customer orientation and access to vital resources for organizations, Mhlungu et al. (2019) proposed a set of assessment tools to guide implementation. Furthermore, in identifying success factors in food e-commerce, Mazzucchelli et al. (2021) brought to attention another aspect of food-sharing platforms, where familiarity with the platform and social responsibility are key factors that can propel success.

In the next implementation stage, Singhal & Singhal (2022) studied banking digitalization in India. They stressed that regulations and government support, together with the involvement of senior management, are imperative for the digitalization of the banking sector. Tortorella et al. (2022) also showed that I4.0 readiness and pre-existing manufacturing strategies can significantly influence the adoption of emerging technologies in the manufacturing industry. In SMEs, Brodeur et al. (2022) noted the importance of a structured methodology and a "champion of transformation" to guide the context-adapted digitalization process.

From the analysis of previous articles, we find that the success of DT depends on continuous adaptation and learning. Success factors are not static and evolve with technology and society. The factors are presented in Table 8.

Table 8. Critical Success Factors in the digitalization process

Implementation Phase	Category	Factor Name	Impact	Author
Adoption	Change management	SME champion	Support in transformation	Brodeur et al. (2022)
Assessment	Transformation process	Management methodology and CSF support	Continuous adaptation	
	Culture	Integration of human elements	Increasing resistance to change is necessary for later stages of DT	Philippart (2022)
	Governance	Clarity in roles and responsibilities	Foundation for building a successful coalition and clear vision	
Development	Culture	Adapting corporate culture	Essential to accepting and implementing the changes necessary for transformation	
	Governance	Empowering cross-functional teams	Crucial for collaboration and developing practical solutions	
Initiation	Social and Environmental Responsibility	Perception of Social and Environmental Responsibility	Building on the success of food-sharing	Mazzucchelli et al. (2021); Brodeur et al. (2022)
	Awareness and Responsibility	Consumer familiarity	Improving consumer behavioral response	
DT Research	Technological	Digitalization of banking services	Business growth, customer retention	Singhal & Singhal. (2022)
	Legal	Regulations	Technological implementation in the banking sector	
	Organizational	Top management support	Successful technology implementation	
	Economic/Social	Liberalization of the banking industry	Pressure to implement technology	
	Organizational and Environmental	Organizational and environmental factors	Digital procurement (DP) adoption	Luo et al. (2022)
	Technological	Acquisition Technology from H Tech	DP practices in construction	
Initialization	Company preparation	Level of readiness for I4.0	Determine the success of I4.0 adoption	Tortorella et al. (2022)
Planning	Production strategies	High customization and low volume	Favors adoption of I4.0	Sony et al. (2021); Kohnke et al. (2023)
	Quality Management	Defect reduction	Increasing customer satisfaction	
	Customer satisfaction	Improved services	Increasing fidelity	
	Strategy and Planning	DT	Reducing production costs, working time	
Implementation	Culture	Accepting ambiguity	Encouraging the adoption of an agile mindset and adaptability to continuous changes	Philippart (2022)

Implementation Phase	Category	Factor Name	Impact	Author
Implementation Phase	Governance	Strategic relationships and definition of partners	Essential for effective governance in a digitalized environment and long-term success	Zarco et al. (2020);
	Culture and Governance	Motivation of interested parties	Improving engagement and contribution to transformation success	Philippart (2022)
	Governance	Ensuring effective communication	Key to aligning all stakeholders and large-scale deployment	
	Governance	Transparency and integration of human concerns	Improves trust and acceptance of change among all stakeholders	
	Evaluation and Governance	Governance	Impact on the overall success of the Organisational digital transformation (ODT) initiative	Mhlungu et al., (2019)
	Innovation and Development	Innovation		
	Resource Optimization	Resource Tapping		
	User Orientation	Customer centricity		
	I4.0 Technologies	Implementation of IoT, big data, etc.	Expansion in prepared companies	Tortorella, et al. (2022)
Execution	Technological Innovation	Using Big Data	Optimization of the supply chain, production, and logistics optimization	Sony et al. (2021)
	Decision-making management	Data-driven decisions	A solid foundation for more informed and objective decisions, reducing uncertainty and subjectivity	
	Change Management	Managing resistance to change	Modern technologies help to effectively communicate the benefits of change, facilitate employee education, and reduce resilience.	
	Skills and Training	I4.0 understanding and know-how	Increasing skills through specialized training so that the workforce remains competitive	
	Technology infrastructure	Data Security	Protecting against security breaches and cyberattacks ensures data privacy and integrity.	
	Technology infrastructure	Internet connectivity	Enables faster and more reliable data exchange, essential for cloud computing and IoT	
	Post-implementation	Quality Management	Continuous improvement of product quality	
Relationship Management		Customer relationship management (CRM)	CRM anticipates customer needs and improves loyalty and retention	
Monitoring	Alignment of goals	Alignment with I4.0 strategy	Improves performance	Brodeur et al. (2022)

Implementation Phase	Category	Factor Name	Impact	Author
	Culture	Culture of continuous improvement	Enables continuous adaptation to new data and improvement of AI models	Philippart (2022)
	Governance	Early integration of ethics and quality	Promotes rigorous data validation processes and ethical accountability	
Development	Social Support	Community Social Support	Improving consumer behavioral response	Mazzucchelli et al. (2021), Singhal & Singhal (2022)

Source: Authors' own research.

Evaluating success factors is decisive in ensuring that the chosen path is correct and are achieved the desired results. Luo et al. (2022), in China's construction industry, advocated for more objective assessment methods, while Escobar et al. (2022), in the public sector, identified 51 key factors, highlighting the need to minimize risks to improve the success of DT projects. Philippart (2022) emphasized the role of governance and corporate culture in the four stages of DT, highlighting the need to adapt quickly to continuous changes. It presented a four-step DT process and highlighted that achieving success in one stage does not guarantee overall success. Philippart (2022) proposed a new relationship model with suppliers and emphasized the importance of adapting to changes to increase the chances of success in the era of artificial intelligence.

Risk factors

Although studies do not provide specific details on each stage, we have made a classification based on the context of the stages in which risk factors manifest, as highlighted in the analyzed literature.

In the awareness and preparation phase of the DT process in construction in North Africa, Aghimien et al. (2022) highlighted the importance of identifying risks before starting the DT process. Through a quantitative analysis, they discovered five main risk factors: human and financial, technological, legal and security, operational, and socioeconomic, four of which have significant direct relationships with digitalization (Aghimien et al., 2022).

For the strategic planning phase, Chouaibi et al. (2022) studied the impact of DT on organizational performance in Tunisia. They concluded that when potential risks must be considered, management skills must be developed to manage the DT process and the advanced technology needed to achieve expected benefits (Chouaibi et al., 2022).

In the implementation and adoption phase of the DT strategy, Dey (2023) focuses on retail investor adoption and behavior in mobile stock trading (MoST), exploring the factors influencing investors' decisions to use digital and mobile trading platforms. Analysis of risk mitigators, technology acceptance model (TAM), and the relationship between perceptual financial costs and technology adoption provides information on how companies and consumers adjust their behavior to embrace digital technologies. The study uses a mixed methodology to test a framework that includes cognitive factors that mitigate risks, risk perception, perceived financial cost, and the technology acceptance model (TAM). The results indicate the importance of information quality, privacy, and security in mitigating perceived risk in mobile trading. The author concludes that risk

perception mediates the relationship between cognitive factors and the intention to adopt MoST, and perceived financial cost moderates this relationship (Dey, 2023).

These investigations aim to provide a different perspective on DT in the specific context of each sector and understand how digitalization can be managed and optimized, aiming to maximize benefits and minimize risks (Table 9).

Table 9. The main risks in the digitalization process

Domain	Implementation Phase	Category	Factor Name	Impact	Author
Investing & Trading	Adoption and Use	Psychological and Behavioral	Psychological aspects of BI	Influence decisions	Dey (2023)
		Technological	Quality of information	Athens PR	
		Legal & Privacy	Privacy and security	Athens PR	
		Cognitive and Risk Perception	Risk perception (PR)	Mediate MoST adoption	
		Finance	Perceived Financial Cost (PFC)	Moderate PR	
		Technology and Acceptance	Technology Acceptance Model (TAM)	Relationship with BIs	
Construction and Digitization	Awareness	Human and Financial	Human and financial risk factors	Affects DT	Aghimien et al. (2022)
		Technological	Technological issues	Direct impact on digitalization	
		Legal & Security	Legal and security risks	Direct impact on digitalization	
		Operational	Operations	Direct impact on digitalization	
		Socioeconomic	Socio-economic aspects	Direct impact on digitalization	
DT in Emerging Economies	Strategic Planning	Organizational and Performance	Performance impact	Potential improvement	Chouaibi et al. (2022), Perifanis & Kitsios (2023)
		Technology and Management	Management skills	Needed for DT	
		Technology & Infrastructure	Advanced technology	Required for expected results	
		Finance & Costs	Conversion costs	Impact on budget	
		Risk General	Potential risks	It affects the adoption of digitalization	

Source: Authors' own research.

Conclusions

The main topics addressed concern DT management processes, integration of innovative technologies in activity, development of a digitization architecture and strategy, and the impact of digitization on organizations. Through the analysis of their research, we determined the main areas of activity addressed, the influence of various factors in digitization processes, and the targeted technologies. Our research highlights that various factors, with different and contradictory influences, are analyzed differently, and there is no unified approach to them.

Our work brings the novelty of grouping by different categories and association with the phases of the DT process. Structuring factors is helpful for a systematic and efficient approach to the digitalization process. This study is conducted by investigating a single database, which represents a potential limitation. Future research may consider expanding the literature review by using additional sources to complement the information obtained from this investigation.

This research has practical implications for researchers and practitioners, providing the essential data needed to develop future research and digitalization initiatives from a new perspective, thus increasing the chances of success. The originality and value of this article are ensured by our systematic research approach, based on established quality principles, as well as by the novelty of our research idea and approach to this topic.

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