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Towards the Path of Process Digitalization: A Systematic Literature Review

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ABSTRACT

Organizations continue to have difficulty achieving the full potential of digital transformation (DT). DT can be conceived as a process of change in the business model, driven by digital innovation and the intensive use of ICTs to add value to the customer, processes and the business itself in way to change, threaten or complement the market. This research aims to review the literature on digital transformation and create a framework for the description of its benefits, challenges, critical success factors, and digital technologies. The framework was developed from a set of 112 articles retrieved by a systematic literature review that underwent bibliometric analysis. The most frequently cited technologies were cloud computing, artificial intelligence, the Internet of Things, and Big Data. Their impact on organizations' processes is discussed. Agility is the critical factor that stood out from the rest. The main benefit identified was innovation. The main challenges identified were resistance to change and a lack of skills. The framework helps better predict how internal processes will be affected by digital transformation.

KEYWORDS

Business Process Management, Digital Technologies, Digital Transformation, Process Digitalization

INTRODUCTION

The world is becoming more and more digital, even outside organizational environments, as technology becomes part of our daily lives (Barba-Sánchez et al., 2024) and continues to advance at an increasing pace, having an impact on organizations and the market itself. In 2018, research predicted that 75% of all businesses would be digital by 2020 (Ochara et al., 2018), and recent studies have confirmed that percentage is now 91% (Sultan, 2024).

With the business environment changing into a digital one (Li et al., 2021; Lichtenthaler, 2021), organizations need to adapt their business processes and work rhythms. Moreover, technology is progressing in a disruptive way, and today its impact is even more significant (Liyanaarachchi et al.,

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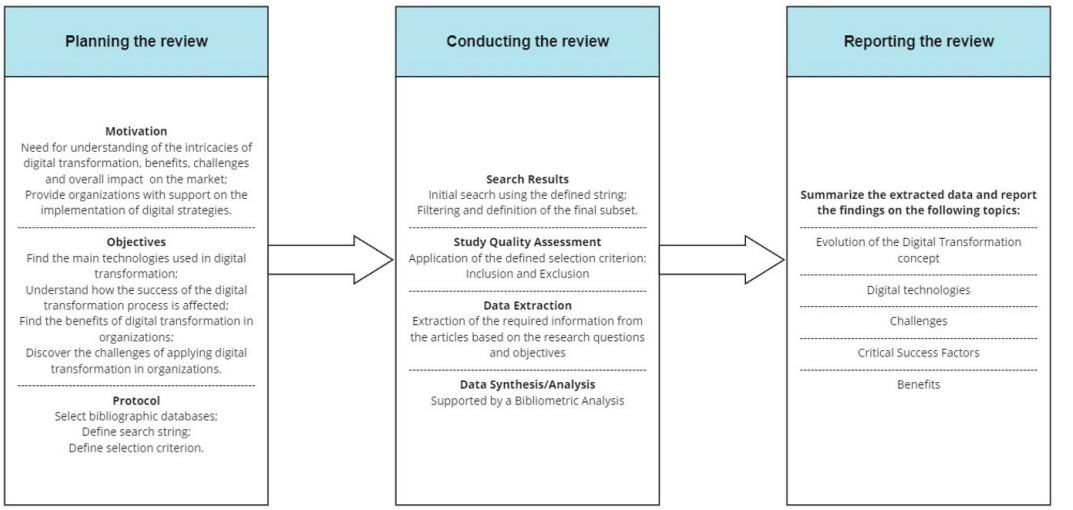
Figure 1. Diagram of the stages of the systematic literature review



2024). Different technologies are being used and implemented, leading to changes in business models and management aspects and an increased emphasis on the concept of *digital transformation* (DT), which continues to evolve and is attract more interest (Cubillas-Para et al., 2024; Urbinati et al., 2021).

The phenomenon of DT has effects in many areas and is significant to all aspects of business (Kao et al., 2024; Matkovic et al., 2018), human life (Shirokova et al., 2020), and society (Ershova et al., 2018; . The concept has become extremely popular (Shirokova et al., 2020), and it is now difficult to find an area that has not been affected by it (Matkovic et al., 2018).

Despite the widespread pervasiveness of DT, many companies still have difficulties achieving the digital innovation and competitiveness that can be obtained by embracing it (Urbinati et al., 2021). Although 75% of companies were expected to become digital, transitioning from traditional methods to digital approaches in various aspects of business or personal practice by 2020, only 30% were expected to be successful (Ochara et al., 2018), and a new study has confirmed that, in fact, only 24% have been successful (Urbinati et al., 2021)

Given DT's enormous importance and the significance of its impact (Bianchi et al., 2023; Matkovic et al., 2018) on the changes in an organization's processes and business models and ability to successfully take advantage of it, there is a need to understand all aspects of DT so that organizations can be provided with the proper support in implementing DT.

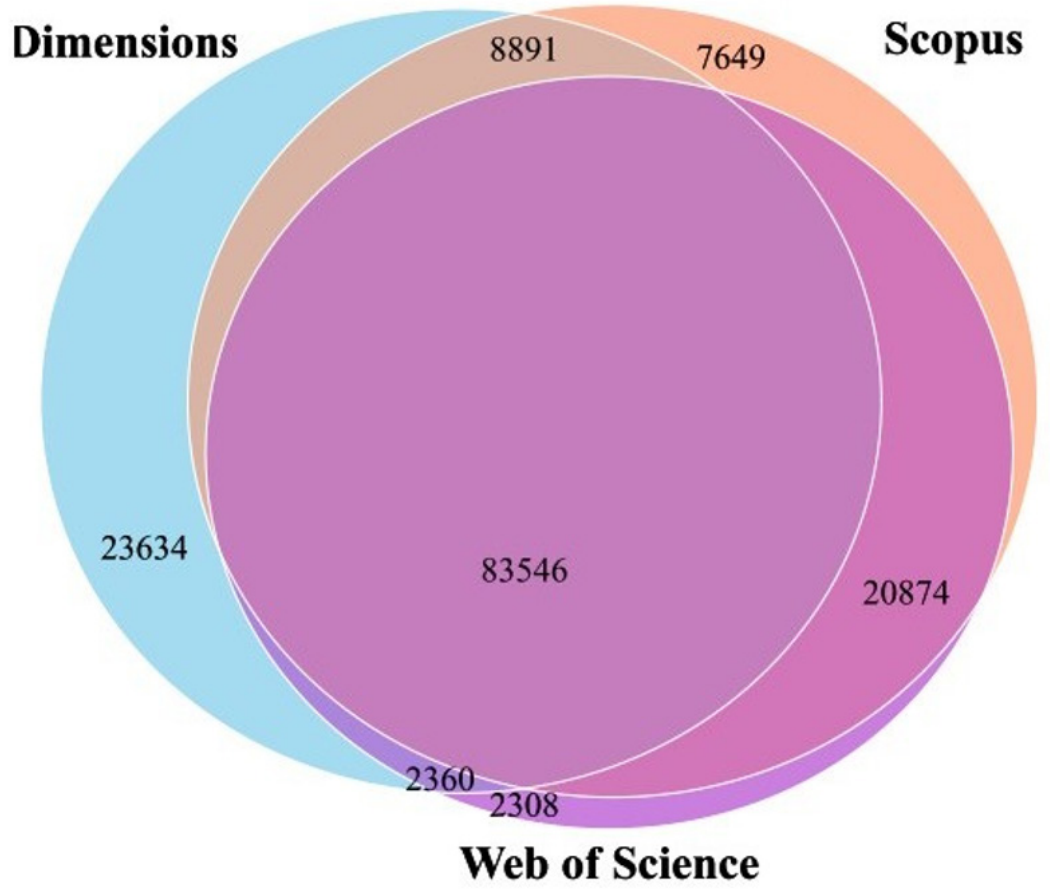
The purpose of this research was to deepen the study of DT from an organizational perspective and gain an understanding of the effects that these transformations and changes have on organizations' processes. A systematic literature review was performed to obtain an overview of the digital technologies, critical success factors, challenges, and benefits involved in DT.

RESEARCH METHODOLOGY

The protocol used in this review follows a classic approach developed by Kitchenham (2004) that consists of three main phases: (a) planning, (b) conducting, and (c) reporting. These are represented in Figure 1.

To obtain the intended information, the objectives were deconstructed into four re- search questions (RQs). Each one represents a branch of analysis:

Figure 2. The number of exclusive and duplicate German 2016 publications among the web of science, scopus, and dimensions databases



Note. Adapted from Stahlschmidt and Stephen (2020).

- **RQ1**: What main technologies are being used in digitalization, and how are they affecting processes in organizations? (Digital Technologies)
- **RQ2**: What critical factors affect the success of DT and digitalization? (Critical Success Factors)
- **RQ3**: How are processes in organizations benefited by DT and digitalization? (Benefits)
- **RQ4**: What are the challenges that arise from digitalizing processes through DT in organizations? (Challenges)

Using the Mendeley tool to aggregate and organize the articles, the search string ((“digital transformation” AND process) OR “process digitalization” OR “digital process”)) was applied in each one of the following databases: Scopus, Web of Science (Clarivate), IEEE, Association for Computing Machinery, EBSCO.

As shown in Figure 2, although there is a notably large intersection between the publications among the existing databases, some articles can be missed if one uses only one database, which can compromise the research.

The exclusion and inclusion criteria used to select the articles are listed in Table 1 and Table 2. Table 3 lists the results of the initial search when the defined search string and the progressive

Table 1. Inclusion criteria (IC)

Criterion	Description
IC1	Articles published after 2018
IC2	Journal and research articles
IC3	Computer science–related articles
IC4	Articles focused on organizations

Table 2. Exclusion criteria (EC)

Criterion	Description
EC1	Articles not in English
EC2	Does not match any of this literature review objectives
EC3	Duplicate reports of the same study
EC4	Articles that could not be accessed
EC5	Articles related to business process chains
EC6	Articles highly focused on a certain business sector

Table 3. Execution of search string KW1 in the chosen databases

KW	Scopus	IEEE	ACM	EBSCO	Web of Science
Initial	20,914	1,238	1,093	23,338	3,515
Filter 1	4,518	793	109	3,652	2,257
Filter 2	369	57	5	248	192
Filter 3	222	32	3	201	112
Filter 4	186	31	3	109	100
Filter 5	164	31	3	108	94
Filter 6	138	31	3	99	79
Filter 7	166				
Filter 8	112				

Note. KW = Keywords IEEE = Institute of Electrical and Electronics Engineers; ACM = Association for Computing Machinery; Filter 1 = abstract; Filter 2 = title; Filter 3 = publication date earlier than 2018; Filter 4 = articles in English; Filter 5 = content type; Filter 6 = accessibility; Filter 7 = duplicate; Filter 8 = relevance.

application of the filters were used. After applying the filters explained earlier, the sum of all the obtained articles amounted to a set of 350 articles.

After the search was executed according to the defined protocol and the selection criteria were applied, 112 unique articles comprised the final set for this literature review.

REPORT AND FRAMEWORK

DTs (RQ 1)

Table 4 illustrates the most referenced DTs and is based on the main concepts identified in the literature. It lists all the articles that referenced the concept, allowing for verification of the popularity of each of the DTs.

Table 4. References of the main identified technologies

Technology	Number of articles
Cloud computing	47
Artificial intelligence	46
Internet of Things	42
Big Data	36
ERP	24
Blockchain	23
Augmented reality	20
Machine learning	17
Digital twin	14
RPA	11
Deep learning	5

Note. ERP = enterprise resource planning; RPA = robot process automation.

Cloud Computing

The impact of cloud computing on process digitalization and DT has been identified by many authors, making it the most referenced technology in the analyzed literature. This technology has been growing and helping young digital firms by providing them with new tools for rapid scaling (Branco et al., 2019; Warner & Wäger, 2019). Firms are increasingly recognizing the ability of cloud computing to transform their businesses, which has caused a rapid increase in market spending on cloud infrastructures, from USD 3.5 billion in 2011 to USD 120 billion in 2020 (Volpe et al., 2021). Researchers predicted that by 2023 cloud infrastructure would be used to deploy 40% of complete enterprise workloads (Kholiya et al., 2021).

Removing the need for sophisticated hardware is one of the main reasons many organizations are adopting cloud computing (Butt, 2020). By providing on-demand access to a shared pool of configurable computing resources (Gaffley & Pelser, 2021), this technology allows for more flexible and convenient collaboration between geographically distributed infrastructures (Butt, 2020). The resources can be rapidly accessed in different locations, and there is minimal effort required for the release of the information, thereby providing opportunities to reduce costs and increase scalability at a global scale with high speeds and reliable exchanges of data and thus enhancing performance and productivity. Internal processes can be connected to intelligent business process sequences with the integration of cloud-based services, which creates great value for the organization (Stjepić et al., 2020). Cloud-based services are also useful for integrating data and making them visible (Junge, 2019).

Artificial Intelligence

The second most referenced technology in the literature is artificial intelligence (AI): intelligence demonstrated by a nonhuman form or by organisms that can be referred to as *virtual assistants* (Correa & Frate, 2021) or *robots* (Siderska, 2020). The increasing interest in and use of AI are mainly directed toward the changes that it can provide for business processes. Since the advent of the age of digitalization, this technology has changed traditional business practices (Chatterjee et al., 2022) and is involved in contemporary businesses (Li et al., 2021). AI can create effective and quick solutions to solve complex entrepreneurial problems and increase every organization's productivity (Burakhanova et al., 2023; Hajishirzi & Costa, 2021), which is a major game-changer.

AI is designed to mirror human intelligence with algorithms that use data and are able to perform functions that are usually performed by real humans. AI can learn new skills and perform decision-making tasks (Siderska, 2020).Through rule-based action, the algorithms can reach conclusions that otherwise would not be reached by humans. An important aspect of the intelligent software systems that constitute AI is that they are constantly learning, which means they are continuously achieving better results over time.

Automation is considered one of the main advantages of AI. It is used by some authors in the definition of automation of work and self-regulatory systems. Automation enabled by AI can reduce error rates, increase speed, and reduce the operating costs of several processes (Trunugraha Aji & Priyono, 2021). Intelligent manufacturing, intelligent products, and intelligent supply chains are some of the opportunities that AI can provide in Industry 4.0. Industry 4.0 refers on integrating technologies such as IoT, AI, and automation into manufacturing to create smart, interconnected systems. These technologies enable real-time communication and decision-making between machines and processes. The goal is to enhance efficiency, flexibility, and innovation in production (Al-Edenat, 2023).

Business processes in several areas, such as marketing, human resources (HR), finance, and logistics, require powerful strategic tools to improve and use the vast amount of data produced, and AI is one of the best options (Correa & Frate, 2021). In HR departments, AI has created value in the process of candidate analysis (Correa & Frate, 2021). By assigning scores to the job position and the candidate, an algorithm can form a semantic analysis of the candidates' curriculum Vitae and résumés and compare those with the intended selection criteria. It can be used as a pre-selector to reduce the number of curricula that continue in the hiring process.

Other influences on the use of AI have occurred in the medical sector in the search for cures and vaccines (Travar et al., 2021) and in the control and management of seed processing (Sukhanova et al., 2021). Seed processing has changed thanks to an artificial cognitive system that can be used on a tablet or smartphone and allows the operator to control the seed treatment process. The intelligent built-in system allows the adjustment and regulation of the entire process, reducing difficulties and simplifying the operator's job while increasing the safety and quality indicators of the process.

Machine Learning

AI includes other fundamental functions. such as machine learning (ML; Hajishirzi & Costa, 2021; Hartley & Sawaya, 2019). The base of this concept lies in the autonomous training of the algorithms. In ML algorithms, vast amounts of data are fed to computers or software, and the algorithms train themselves by practicing multiple iterations (Hajishirzi & Costa, 2021), which means that the algorithms will get better as more time passes and more data are inputted.

Considering the continuous advances that have been made through the years in computational speed, data storage, quantity, and algorithms, the predictions made by ML–based systems are now more accurate and create a way for organizations to circumvent cognitive limits and discover new trends in the data (Warner & Wäger, 2019). This allows for improvement in decision making (Sobczak, 2022) inside organizations and the significant creation of value (Larsson & Wallin, 2020) in business processes.

Organizations can improve their supply chains by applying ML algorithms to processes such as demand planning, scheduling warehouse picks, analyzing weather data to improve transportation management, predicting time delays, or optimizing routing for delivery vehicles (Hartley & Sawaya, 2019). The efficiency of these processes can be improved by providing data from previous interactions and occurrences to the ML algorithms, thus allowing the algorithm to learn and make new predictions.

Deep Learning

Another subset of AI is deep learning. This technology is related to ML and takes advantage of neural networks with many layers to process the data received as input (Hajishirzi & Costa, 2021). Although it is not as widely referenced as its parent technology, deep learning still presents

a significant amount of references considering that it is not one of the ruling technologies and is inherent in another technology.

Internet of Things

The Internet of Things (IoT) has been growing with the arrival of the era of digitalization (Li et al., 2021) and has caused serious disruptions to various business models (Al-Edenat, 2023) and practices (Chatterjee et al., 2022). IoT represents a system of interconnected devices implanted with other digital components, such as sensors, software, and electronics (Butt, 2020). The devices have the purpose of initiating exchanges and collating data that are transferred over the internet (Ulas, 2019) into another system. By integrating several technologies and communication solutions, this digital technology can provide interaction that leads to the identification and tracking of the collected data (Urbinati et al., 2021).

With the emergence of new concepts in the manufacturing sector, such as Industry 4.0, IoT earned new potential and was immediately considered one of the leading technologies in the development and uprising of the concept of Industry 4.0 (Al-Edenat, 2023; Butt, 2020). The use of IoT in an industrial setting is also beneficial for operational risk management by providing a source of data from devices in the field that can effectively affect operational decisions (Jones, 2019). In the manufacturing sector, IoT can be used to educate mechanical and industrial engineering students (Lindner et al., 2021) by providing real-time data on manufacturing components, such as machines, allowing students to have practical examples and actualized data to help them learn about the industry.

IoT can also be used to create opportunities to solve several problems and aid in the digitalization of bicycle rental processes (Segooa & Kalema, 2024). One organization had successful results in increasing the popularity of their service by implementing sensors in the rental bicycles that were able to generate data about problems with the bicycles and subsequently analyze the data. This generated faster responses and decision making.

Big Data

Big Data is one of the primary technologies found in the literature. The increasing flow of information created by the digital era provides a challenge for the successful implementation of DT, especially in organizations where several departments need to collaborate with the same data that flow between them (Seegoa & Kalema, 2024). Big Data can bridge this challenge (Ochara et al., 2018) because it has the ability to change the entire business. This technology fosters growth, performance, and competitiveness (Omar & Almaghthawi, 2020) and has had a significant impact on Industry 4.0 (Butt, 2020).

The use of Big Data capabilities has improved the performance of organizations' programs (Sobczak, 2022). The concept is also associated with knowledge management (Bresciani et al., 2021) and demonstrates a positive correlation with other influential factors in the management of information by providing the ability to collect and analyze substantial quantities of data.

There are opportunities for the application of Big Data in operational risk management (Jones, 2019). The software used for risk management in organizations seeks safe and effective operational decisions. Big Data can have a beneficial impact on decision making (Urbinati et al., 2021), which makes this technology the right candidate for changing the process of operational risk management by providing actionable insight into operational risks and the ability to analyze trends among a substantial quantity of data (Jones, 2019).

As Russia is evolving in DT, the agricultural sector is one of the targets in which to implement technology. At a national level, Big Data is being used to perform predictive analysis in agriculture (Novoselova & Solodovnikova, 2022). In quality management, there is a need for reliable and accurate data, and the use of Big Data provides the ability to better assess customer needs in order to improve the quality of products and services. The analytic capabilities of Big Data can also be used to create opportunities to solve bicycle rental problems (Galyom & Shchenikov, 2019).

Enterprise Resource Planning

Enterprise resource planning (ERP) has been used in companies to manage business processes for many years (Hajishirzi & Costa, 2021) and is considered the backbone of DT (Stjepić et al., 2020). Some organizations incorporate a vast amount of business processes that require an adequate information flow (Stjepić et al., 2020) and need quality ERP systems (Ivancic et al., 2019) that guarantee the efficiency of those processes.

ERP systems focus on relatively stable back-office processes, such as finance, HR, and warehouse management (Kirchmer & Franz, 2020). This technology plays an important role in the HR departments of many enterprises, specifically in talent management (Martínez-Morán et al., 2021). ERP systems were identified as the most frequently used tools in talent management and have a significant impact on improving an organization's selection processes. This tool is mainly used in organizations with a larger number of employees compared with organizations with fewer employees, where simple databases such as Excel or Access are mainly used.

Universities have started integrating the study of ERP into learning activities. Because ERP is a complex topic, its learning has been integrated with virtual environments (Pridmore & Godin, 2021). High Commercial Studies of Montreal (HEC) has developed a simulation game called "ERP-Sim" that allows students to operate a firm that is based on a real integrated ERP system (Loeffler et al., 2018). This simulation game is helpful for students in that it provides insights into how information systems are connected inside enterprises, how business strategies are implemented, and how these systems and technologies can affect the decision making that is involved in the design of business processes.

Blockchain

Another well-referenced digital technology in the literature is blockchain. This technology has been intensely discussed (Volpe et al., 2021) in several areas, such as information technology (Hofbauer & Sangl, 2019), business management (Hofbauer & Sangl, 2019), business processes (Chatterjee et al., 2022; Schlegel & Kraus, 2023; Sosin et al., 2020), supply chains (Hartley & Sawaya, 2019; Hofbauer & Sangl, 2019; Junge, 2020), logistics (Junge, 2020), and finance (Hofbauer & Sangl, 2019; Sosin et al., 2020). Some articles that reference this new technology recognize its ability to foster innovation (Hofbauer & Sangl, 2019), affect entrepreneurial processes, and change business practices (Chatterjee et al., 2022). The novelty of this technology is transparent, and it is believed that the growth of its use will continue at a pace of 42.5% per year, meaning that it will reach a market cap of USD 1.29 billion by 2024 (Sosin et al., 2020).

Blockchain functions as a secure ledger to record transactions between parties (Volpe et al., 2021). It uses distributed ledger technology, which means that even if there is no centralized institution involved, the many participants involved can still reach a consensus on the correct documentation (Hofbauer & Sangl, 2019). The blockchain stores transaction data in the form of tables that can be verified by the participants of the system in every part of the world (Sosin et al., 2020).

Security is the main reason for the use of blockchain technology (Hofbauer & Sangl, 2019). The data are stored in such a way that it is impossible to removed or replaced them, allowing the transactions between the participants to not be forced to rely on trust (Skotnica et al., 2021), making them more secure. This solution protects the validity of the data (Volpe et al., 2021) by providing traceability (Hofbauer & Sangl, 2019; Skotnica et al., 2021) to the transactions executed by the participants, which increases their security.

Blockchain also encounters countless opportunities in the manufacturing sector, especially in supply chain processes (Hofbauer & Sangl, 2019). One process that was found to benefit from the technology was the management of orders. All the information about the orders, including the damage to goods, can be stored in the blockchain, which allows the inspectors to have secure and transparent access to the information ahead of time and improve the logistics process.

Although blockchain is considered to have great benefits and is very promising in several areas, Skotnica et al. (2021) claimed that the technology is still not fully matured becauses of the complexity

that it withholds. They argued that a lot more research must be conducted before organizations should consider adopting and fully depending on this technology. Other challenges also exist, such as the difficulty of calculating the cost of the upgrades generated by blockchain and ensuring confidentiality and encryption (Sosin et al., 2020).

Augmented Reality

As was proven by the analysis done in the table 4, this technology is not the most recognized and cited in according to the systematic literature conduced, and although it has a consistent representation, it is not as important as the main identified technologies. Researchers also recognize it as an enabler of change (Nakano et al., 2021) when incorporated into the ecosystem of digitalization (Ershova et al., 2018).

Augmented reality (AR) is the extension of physical reality by adding several layers of information, generated by a computer, to a real environment (Ulas, 2019). This technology allows information to be consumed in a more interactive manner (Ulas, 2019), thus opening a variety of opportunities to change processes and services inside organizations and for the development of new products. Virtual reality is associated with AR but has the ability to create an artificial environment that is accepted by the user as a real environment (Butt, 2020).

AR has an immense impact on the acceleration of the manufacturing sector, which is one of its main applications (Butt, 2020). It can support autonomous logistics paired with additive manufacturing (Junge, 2020). Some examples of processes that can be changed by this technology in the manufacturing sector are product development, equipment maintenance, workforce training, production floor issues, process flow, and quality assurance (Butt, 2020). AR has the potential to raise the efficiency of these processes and have a positive impact on their execution by providing flexibility, rapidity, and quality.

Another application of AR is in the freight industry. It can be used to improve the loading of trucks (Hartley & Sawaya, 2019) by providing the drivers with the ability to assess problems with the vehicle through visual insights without the presence of a skilled technician. Breakdowns and glitches can also be identified with this technology, changing the process of truck loading. AR is also being used in the medical sector, being adopted preoperatively and intraoperatively, to assist medics in a virtually assisted visualization of the operation (Butt, 2020).

Digital Twin

One important concept that emerged from the literature as a digital technology being used for process digitalization is the digital twin. This concept has been growing in the topic of Industry 4.0 (Hofbauer & Sangl, 2019) and is useful for the simulation of machining processes. This technology has been used in multiple sectors because of the wide range of possibilities for its use (Butt, 2020) and its capabilities for interoperability with other technologies.

The main definition of the concept of a digital twin is the digital representation of a real object or system through a virtual component (Rechkalov et al., 2021). A digital twin represents, in the digital world, the digital copy of a physical product in the real world (Rechkalov et al., 2021). It combines the behavioral and physical attributes of the product, providing synchronization of the data and facilitating the engineers' jobs in data analysis (de Beer & Depew, 2021). These virtual systems are examples of augmented simulation capabilities fostered by the evolution of computational power and technological solutions (Dias et al., 2022). Other definitions of digital twins highlight the importance of the *live component* of the models (Larsson & Wallin, 2020), which refers to their capability to transmit live data to digital platforms, allowing for their immediate use.

The use of digital twins can serve a variety of purposes. It can minimize risks when organizations are trying to integrate new processes by allowing an analysis of the cost overruns and delays that it would cause, thus making process simulation a key ingredient of this system (de Beer & Depew, 2021), as seen in Figure 3. For the simulation to be successful, the models need to perform calculations that are based on the raw data received. To ensure safe integration, several models can be created and used

while having their results saved separately, which avoids data overwriting and prevents mistakes when studying the various possibilities for the process being created (Hanelt et al., 2021). Robust digital twins can have great effects on the manufacturing sector. One study showed positive results of these effects, providing a framework that was based on how digital twins improved energy efficiency by 84% and reduced 93% of the machines queueing time (Adeniji & Schoop, 2021).

Robotic Process Automation

Robot process automation (RPA) is not as frequently referenced as other technologies in the literature, but it is considered by many authors as one of the most important digitalization technologies and one of the main enablers of Industry 4.0 and DT (Siderska, 2020). Research has shown that implementing this technology is often a company's first step into DT (Hartley & Sawaya, 2019) and that the trend for its use remains persistent (Kholiya et al., 2021). The value of the RPA market has been increasing every year in various fields (Siderska, 2020; Turcu & Turcu, 2021) at a rapid pace, and it was acknowledged in 2020 as the fastest growing segment of the global software market (Siderska, 2020; Sobczak, 2022) for the second straight year (Turcu & Turcu, 2021). Its value rose 38.9% during those same years, reaching USD 1.9 billion in 2020 (Sobczak, 2022; Turcu & Turcu, 2021). This increase is even more significant when compared with the year 2016, when the RPA market was valued at only USD 250 million (Siderska, 2020). The RPA market will continue to increase as large organizations seek to digitally empower their business processes, and it is expected by Transforma Insights to reach USD 13 billion in 2030 (Turcu & Turcu, 2021).

The attention that RPA has been getting in the digital economy over the years is evidenced by its enormous potential to automate multiple business processes and activities (Schlegel & Kraus, 2023). This technology is used to automate data-intensive and repetitive tasks (Santos et al., 2020) for improved process efficiency (Siderska, 2020).

RPA is also defined as preconfigured software that uses rule-based activities and allows for the automated execution of a combination of processes in one or more software systems without human operation (Turcu & Turcu, 2021).

The automation of processes can reduce the manual work performed by employees (Turcu & Turcu, 2021), which enables them to perform other tasks that are more complicated and creative and not able to be automatized (Siderska, 2020). Although the employees can be relieved of some tasks, they still need to be actively involved with the automation process, which has led to a major reskilling demand from organizations in order to teach the operators about RPA.

One fundamental risk when implementing process automation is the incorrect interpretation of its goals (Sobczak, 2022) for the organization. This can lead to an inappropriate approach that is often associated with incorrect identification of the processes that are to be automated (Siderska, 2020).Thus, it is critical to assess the right processes to be automated in order to extract the most benefit from the implementation of RPA (Siderska, 2020). The selection of the candidate processes to be automated is based on the frequency of the process and its complexity. Processes with a high frequency of occurrence are typically the best targets for automation, especially if their complexity is low. Although these processes are the typical targets, their automation can be achieved through other, simpler automation methods. The intermediate section of the chart,which visually represents processes, workflows, or data related to automation represents the ideal candidates for automation that can get the most benefit out of RPA. The complexity of the processes includes the cognitive requirements for their function (Siderska, 2020) processes must require low cognitive skills and focus on more rule-based requirements to improve RPA

Supply chains from various organizations benefit from RPA because of their many repetitive tasks. Some processes that can be improved include creating and sending requests, creating purchase orders, processing payments, setting up supplier systems, and sharing documents (Hartley & Sawaya, 2019). These operations and logistics processes are easily automated and benefit from the implementation of RPA. RPA is also being implemented in HR departments, where it can reduce the manual work

Table 5. Number of references for the main identified factors

Factor	No. of references
Agility	37
Interoperability	28
Digital maturity	24
Digital economy	23
Change management	20
Business process management	20

involved in the screening of employment candidates by filtering resumes, scheduling interviews, and simplifying the integration process (Turcu & Turcu, 2021).

Avariation of RPA is considered its evolution and is called *intelligent process automation* (IPA) (Kholiya et al., 2021).. IPA guides businesses in automating processes by using various types of data. It combines process enhancements and next-generation tools to reduce repetitive and regular processes by imitating human behavior (Kholiya et al., 2021).

Two technologies, RPA and AI, are the main pillars of IPA, along with business process management (BPM), which is also considered a pillar because of the possibility of automating workflows and improving interactions. AI is crucial to providing meaningful predictions with the available data leveraged by RPA when automating complex processes (Kholiya et al., 2021).

One major advantage that IPA offers compared with RPA is the possibility of handling structured and unstructured data while also being able to support decision making, which is not possible with the solo use of RPA. Another substantial advantage is that it can learn and understand context, thus performing better than humans compared with the simple mimicking of human behavior that RPA provides.

Critical Success Factors (RQ2)

The critical success factors identified in this research are represented in Table 5. These concepts are considered extremely significant to the success of digitalization and DT.

Agility

Because DT is a continuous process that requires profound changes over time, agility is considered one of the requirements for its success (Fischer et al., 2020). A few authors, such as Dias et al. (2022), also recognize agility as a characteristic that can be enhanced through digitalization, which means that it can also be viewed as a benefit. The ongoing characteristics of transformation and the dynamic characteristics of the digital environment (Fischer et al., 2020) require agility as a core mechanism for strategic renewal (Warner & Wäger, 2019) and for coping with continuous changes inside organizations.

Agility is defined as an organization's capacity to be efficient when creating value while facing external and internal circumstances (Warner & Wäger, 2019). It translates to the ability to identify and anticipate changes (Li et al., 2021) and includes other concepts, such as alertness, flexibility, adaptability, and responsiveness. Organizations need to be responsive to detect market changes and notice opportunities to gain advantages, which translates to alertness and a necessity to perform the proper activities that respond to the changes in the environment, which translates to the responsiveness component of agility. Given the importance of agility to the success of DT, more agile teams and approaches are required, and organizations are gaining interest in agile methodologies. Applying digitalization also requires skills for multiple digital technologies, and workers need to foster agility for the interoperability of different technologies through agile methodologies (Hadjielias et al., 2021).

Agile practices have become common, especially in software development, and offer a hybridization of project management methodologies (Kozarkiewicz, 2020). Traditional waterfall approaches have been replaced by agile methods. These practices represent an iterative development approach that is best applied in environments with quick changes, where uncertainty and speed are essential (Rummel et al., 2022).

Interoperability

Interoperability emerged in the literature as a factor that affects DT and that consists of the connections among technologies, information, and systems, which need to operate together to provide the most value for the organization. The definition of *interoperability* is stated as the established connectivity to open the exchange of information between systems. It is considered one of the design principles in Industry 4.0 (Butt, 2020).

As organizations implement new technologies and adopt new systems, the information sources must be connected, and the already-existing systems must operate harmoniously with the new ones (Keidel & Eichstädt, 2021). The flow of information between systems must occur safely given that theft of individual data from databases often occurs inside organizations (Butt, 2020), which means that ensuring interoperability involves not only ensuring the flow of information between systems but also its safety.

There are several examples in the literature of how different technologies can interoperate. In the seed processing industry, a system for control and management of the technological process was developed that involved an AI system that interacts with tablets and smartphones (Sukhanova et al., 2021). IoT is used to complete the flow of information generated by the AI algorithm that constitutes the intelligent control system. Cloud computing is viewed as another enabler of interoperability (Junge, 2019) because it allows for the information to be available without a physical connection and integrated with several other technologies.

The main example of interoperability presented in this literature and described in this research is IPA. This technology allows organizations to create systems that can integrate RPA and AI technologies with a complex flow of information. RPA is a technology that shows great potential for interoperability with existing systems, and its ability to automate increasingly complex processes when integrated with complementary technologies, such as AI, ML, or BPM, is recognized (Kholiya et al., 2021; Siderska, 2020).

Digital Economy

DT has different outcomes across different market sectors and is highly dependent on the context of the organization in question. The digital economy is a concept that has yet to be fully defined at an international level (Ershova et al., 2018). It is a complex phenomenon, which explains the lack of clear definitions. Some authors say that it can be placed higher in the digital hierarchy than the concept of DT, which means that DT is a subset of the digital economy (Bresciani et al., 2021). In attempts to define and quantify this concept, some European countries have used an index called the *Digital Economy and Society Index*, which summarizes important indicators of digital performance and is used to track digital progress and competitiveness (Rados & Babić, 2020).

The digital economy can also be interpreted as the stage or platform where DT happens. This means that it is an environment that is constantly changing (Sehlin et al., 2019) and one where DT needs to happen for organizations to remain competitive. The digital economy is not only a business environment for DT; it also includes other characteristics that define the digital evolution of organizations, including institutions, laws, human capital (Rautenbach et al., 2019), research and development, digital infrastructures (Ershova et al., 2018), and digital technologies. These technologies are considered by some authors to be the main factor that affects the digital economy (Gaffley & Pelser, 2021; Stjepić et al., 2020) because they can affect not only the competitiveness of organizations

in the market but also the way firms are internally organized and how they use the technologies to change their internal functions (Trunugraha Aji & Priyono, 2021).

When studying business processes, there is a notable difference that affects digitalization between big organizations and small and medium-sized enterprises (SMEs). Because of their organizational complexity, big companies are usually better prepared for DT than SMEs, and MEs typically have a more sizable human component (Bresciani et al., 2021) and are run by individuals, households, or small business entities (Mamduh & Pratikto, 2021). According to the literature, these organizations have adopted fewer technologies (Kankaanhuhta et al., 2021) and lack organizational initiative (Fischer et al., 2020) because they have fewer capabilities, limited resources, and less technically skilled employees (Anim-Yeboah et al., 2020). Implementing digital technologies also requires financial investments to which SMEs might not have access (Trunugraha Aji & Priyono, 2021) compared with larger organizations, which can also present a challenge.

Therefore, an organization's size and resources affect its digital strategy when trying to implement digitalization. This highlights the relevance of analyzing organizational context as a critical success factor.

Several references to the manufacturing industry were also found in the literature, especially with the growth of the concept of Industry 4.0. The term "Industry 4.0" was introduced in 2011 (Lindner et al., 2021) and is also named the *fourth industrial revolution* (Rautenbach et al., 2019). This concept refers to the complex and digital evolution of the industrial sector (Savastano et al., 2019) and represents the fundamental changes that have occurred in manufacturing organizations.

Manufacturing processes can benefit from digitalization with the use of technologies such as cloud computing (Savastano et al., 2019), AI (Hofbauer & Sangl, 2019), IoT (Al-Edenat, 2023), Big Data (Butt, 2020), blockchain (Volpe et al., 2021), AR (Butt, 2020), digital twin (Hofbauer & Sangl, 2019), and RPA (Siderska, 2020). These technologies provide numerous possibilities for the existing structures, machining, and production planning phases (Lindner et al., 2021), such as the intelligent interconnection of machines (Lindner et al., 2021), the connection of sources of information, and automation (Hanelt et al., 2021), which can increase the productivity of processes in a product's entire life cycle.

Change Management

Implementing change management is a requirement for successful DT (Ryan et al., 2019) and has a significant impact on digitalization. The basis of transformation as a concept implies changes. The technologies being implemented in organizations have a direct impact on their business processes by causing changes that can bring improvements and create value for the organization. *Change management* can be considered a collective term to refer to the approach to helping individuals, teams, and organizations prepare for organizational changes (Al-Edenat, 2023).

This concept is highly connected to resistance to change, one of the challenges identified in this review. *Resistance to change* describes a natural phenomenon that will occur when trying to implement the changes needed for transformation. This phenomenon can be diminished by having proper change management, allowing the people affected by the changes to feel cared for and rightly instructed (Arbaiza, 2018). For change management to be well performed, the motivation for the change needs to be highlighted, stakeholders must have a proactive opinion, the impact must fit the strategic goals, and data about previous changes must be taken into account (Al-Edenat, 2023). This fosters a mindset of acceptance of the changes and contributes to less resistance to change.

Digital technologies are considered to have a disruptive nature (Chatterjee et al., 2022). This disruptiveness is mostly identified in the literature as having a negative connotation, with some authors describing it as comprising "surprises" that cause unstable execution and functioning (Al-Edenat, 2023). This elevates the need for proper change management that can strengthen these changes and provide an adequate response and strategy (Kozarkiewicz, 2020). Although these disruptive changes will happen, they can provide a major benefit to organizations. One important conclusion related to

change management is that organizations strive more in changing environments (Al-Edenat, 2023). One study about the disruptive changes created by transformation concluded that changes act as motivators to find new ways to innovate (Al-Edenat, 2023). Organizational changes that are created by external and internal factors lead the organization to respond and adapt to those changes by finding ways to improve and become more efficient, and the tool to achieve this is innovation, which fosters an environment in which companies are constantly improving and innovating in response to changes.

BPM

BPM is viewed in the literature as being directly and highly correlated with the successful delivery of DT (Pridmore & Godin, 2021; Stjepić et al., 2020) and with being able to present a baseline for it (Fischer et al., 2020), which highlights BPM as a critical success factor. BPM has become so relevant that a lack of knowledge of it presents a problem for organizations, and universities have started incorporating its study (Pridmore & Godin, 2021). The market for BPM was expected to grow 14% between 2017 and 2023 (Stjepić et al., 2020).

BPM refers to a management discipline (Butt, 2020) that can support process-oriented organizations by providing governance through several defined principles, methods, and tools (Skotnica et al., 2021). These methods include the discovery, analysis, redesign, implementation, and monitoring of business processes, and they aim to improve operational performance (Butt, 2020). The use of BPM has changed from a strategic focus to the improvement of modeling techniques (Baiyere et al., 2020), which can have a significant impact on the creation of value through digitalization (Kirchmer & Franz, 2020).

In today's market, multiple vendors provide software solutions for BPM. These solutions are evolving to fix existing issues in traditional BPM approaches, such as lack of information fusion, the model–reality divide, and the loss of innovations. The loss of innovations is associated with not including employees in the BPM model, which gave birth to the concept of *social BPM*, which represents the integration of people into the business process life cycle to foster engagement and communication (Suša et al., 2019). There are also references in the literature to BPM platforms, BPM suites, and intelligent business process management suites (iBPMS). These three concepts represent different platforms associated with BPM software solutions and are ordered by their level of complexity, where iBPMS is the most complex and includes advanced analytics and operational intelligence tools that bring great benefit to organizations. Only 50% of organizations are satisfied with their BPM software solution (Suša et al., 2019) and, given the importance that these models have for their DTs, it is crucial to study and select the best possible option.

Included in the concept of BPM is the modeling of business processes. One well-referenced method is business process modeling and notation, which helps set up models or simulations of business processes (Seitz & Vogel-Heuser, 2020) and evaluate possible adjustments, thus making the use and impact of digital technologies more transparent (Kirchmer, 2021). This method has become a widely used standard for process modeling (Skotnica et al., 2021) by organizations to create and provide an overview of their structures and operations (Fischer et al., 2020).

Benefits (RQ3)

Digitalizing processes and embracing DT can bring several benefits to organizations. It is important to identify the main benefits that these transformations can have in order to set expectations for the expected results. Identifying these benefits supports the decision to embark on digital changes and allows the adjustment of the DT strategy to the improvements in the processes that an organization expects. Four main benefits were identified in the literature and are presented in Table 6.

Innovation

Much like agility, the concept of innovation is also viewed as a requirement for DT (Fischer et al., 2020), despite the fact that most authors view agility as a benefit that arises from DT. Innovation is

Table 6. Number of references for the main identified benefits

Benefit	No of. references
Innovation	62
Competitiveness	49
Flexibility	45
Value creation	42

referenced as one of the characteristics of the digital economy (Ershova et al., 2018), and embracing innovation is considered one of the main areas of DT (Stjepić et al., 2020). DT functions as a core driver for innovation (Hadjielias et al., 2021) in organizations, especially with the digitalization of business processes.

The definition of innovation includes more than the creation of new products (Sehlin et al., 2019). It also includes a continuous process of improvement that involves renewing the organization itself by transforming knowledge (Mamduh & Pratikto, 2021) to create and improve products, services, and, most important, business processes (Hadjielias et al., 2021). Digital innovation is also depicted in the literature as a tool that contains reprogrammability, data homogenization, and the self-referential nature of digital technology (Warner & Wäger, 2019) as characteristics that allow the organization to the changes in the digital environment (Al-Edenat, 2023).

Many organizations face the challenge of engaging in digital innovation (Urbinati et al., 2021), which can be facilitated by digitalization. By introducing new technologies, digitalization becomes the key to fostering innovation in an organization's business processes (Øvrelid et al., 2018). It does this by providing capabilities to innovate and thus giving them the flexibility to improve products and meet the expectations of the digital economy's changing market (Mamduh & Pratikto, 2021). Technology orientation is viewed as an enabler for increasing innovation capabilities, which explains how digitalization can foster innovation (Mamduh & Pratikto, 2021).

Competitiveness

The business environment has changed into a digital one (Li et al., 2021), and companies that want to be successful need to adapt to the changes in business processes and the rhythm of work. New technologies that can automate processes and reduce the time required to do a certain task have caused a change in the pace of the business environment, which consequently increases the demand for faster responses by organizations in the market (Sehlin et al., 2019). As companies start to adopt these new technologies, they generate new ways of gaining a competitive advantage over the competition (Ochara et al., 2018). This means that companies are obligated to adopt emerging technologies to maintain their competitive level and keep up with the evolving market. Digitalization allows organizations to achieve valuable competitiveness.

Flexibility

Flexibility is another benefit that can result from digitalization. Implementing digital technologies improves an organization's processes, allowing those processes to more easily respond to changes in the market (Stjepić et al., 2020).

Value Creation

Value creation is not only the aim of DT (Kozarkiewicz, 2020); it also is inserted into its concept in such a way that DT presupposes value creation (Junge, 2020). This concept is also considered one of the four dimensions of DT such as technology, data, process, people and culture (Hadjielias et al., 2021; Stjepić et al., 2020). The creation of value is extremely relevant to the topic of process

Table 7. Number of references for the main identified challenges

Challenge	No. of references
Lack of skills	32
Resistance to change	15
COVID-19 impact	13

digitalization because integrating value-adding activities is the central action of process management (Sehlin et al., 2019)

Digital technologies are the enablers of value creation (Junge, 2019). Their potential enhances processes in a way that creates and adds value to the organization. These new technologies are constantly creating value for customers (Sehlin et al., 2019), which is recognized as a strategic response to the market for organizations that wish to remain competitive (Kozarkiewicz, 2020). The full potential value that technology can provide is, however, a struggle for organizations to achieve (Rautenbach et al., 2019), which creates the need to understand how to use it correctly.

Value creation has been studied in the literature from different perspectives. It can be depicted as the value added to the final product with the help of digital technologies (Dobrović, 2021), or it can be seen from the perspective of the value chain. Improving the business processes of an organization with digitalization will also create value for each stage of the production line and for the entire functioning of the organization. Improving the flow of information, collaboration, and teamwork can also be considered value-creation activities that directly affect the organization's performance (Arbaiza, 2018).

Challenges (RQ4)

Although process digitalization has diverse benefits for organizations, no enjoyment comes without difficulty. Implementing DT is accompanied by several challenges that have been identified in the literature. These challenges are presented in Table 7.

Lack of Skills

Organizations' workforces need to be prepared for the necessary changes in skills. A lack of skills is considered by many authors to be one of the major challenges of DT (Hartley & Sawaya, 2019). Some authors also consider the digital skills of employees as one of the crucial elements of DT (Nakano et al., 2021), which, in contrast, also refers to the lack of skills, the inability or insufficient ability to effectively use digital tools, technologies, and platforms. The importance of a lack of skills can be explained by the fact that DT implies the implementation of digital technologies, which require new skills and capabilities before one can benefit from them (Maiwald, 2020). When developing their digitalization strategies, organizations need to include the acquisition of new skills and capabilities that match the requirements of their new technologies (Junge, 2020).

Some authors recognize people as one of the main resources involved in the DT process (Butt, 2020; Ivancic et al., 2019), describing them as the sociotechnical character of the transformation (Rolland & Hanseth, 2021). **Connectivity**, Use of Internet Services, **Integration of Digital Technology**, Digital Public Services and Human capital are considered one of the five dimensions of the Digital Economy and Society Index (Rados & Babić, 2020). The term refers to the skills and advanced skills of internet users, including them in the calculation of the index that tracks digital performance in Europe.

Implementing digital technologies to digitalize processes directly affects the workers of an organization in several ways. Automation technologies such as RPA can reduce repetitive tasks, which reduces the involvement of workers in the automated tasks and allows them to focus on more complicated and creative tasks (Siderska, 2020). Although this is a positive benefit created by this

technology, it implies a major reskilling of the workforce (Schlegel & Kraus, 2023) so that the workers have a set of skills that are capable of executing the new tasks.

Digitalization also affects workers by changing the capabilities they need to continue their work. One necessary capability is flexibility (Junge, 2020): Workers have to be able to match the evolution of technology over time. This factor has been referenced by some authors, along with the concept of knowledge management. For new skills to be developed dynamically, knowledge needs to circulate inside the organization (Trunugraha Aji & Priyono, 2021). Other skills, such as adaptability, creativity, resilience, innovation, and skills related to information, communication, collaboration, critical thinking (Belousova et al., 2021), creativity, and problem solving (Dias et al., 2022), are also newly required in organizations that mean to cope with changes in processes. Many other authors also have referenced the need for new leadership skills (Larsson & Wallin, 2020). The necessity of technical skills (e.g., programming) has also been identified in the literature. A study of a sample of 120 companies showed that 43.7% required programming skills, with the leading languages being Visual Basic, C/C++, JavaScript, and Python (Schlegel & Kraus, 2023). In the same study, 43 companies requested skills for RPA, mostly on tools such as Blue Prism (28.6%), UiPath (25.2%), and other automation tools (18.5%; Schlegel & Kraus, 2023). Companies also requested expertise in AI or ML.

Resistance to Change

For transformation to occur, managers and employees need to be willing to change. This poses one of the biggest challenges to DT and digitalization (Sehlin et al., 2019), because change is needed when improving processes and implementing new technologies. Resistance to change has been studied in the context of change management; teams can provide the required knowledge about the changes that will occur in order to alleviate any anxiety employees may feel that can lead to a decreased willingness to adopt those changes (Arbaiza, 2018).There is a need for measurements to assess the impact of change resistance (Khanboubi & Boulmakoul, 2021).

Resisting change has been studied throughout the literature as a natural phenomenon that is unconscious to human beings in general (Butt, 2020). Human beings first enter a phase of resistance before understanding and accepting transformations, which leads researchers to consider this concept as involving a behavioral, emotional, or cognitive reaction (Khanboubi & Boulmakoul, 2021). With this idea in mind, organizations cannot avoid an initial resistance to change; instead, they should focus on providing accurate knowledge to reduce the intensity of the resistance. When previous projects fail, people start showing resistance to implementing more changes (Wengler et al., 2021). This enhances the importance of having well-defined strategies when implementing digitalization as well as sufficient knowledge to implement the necessary changes accurately.

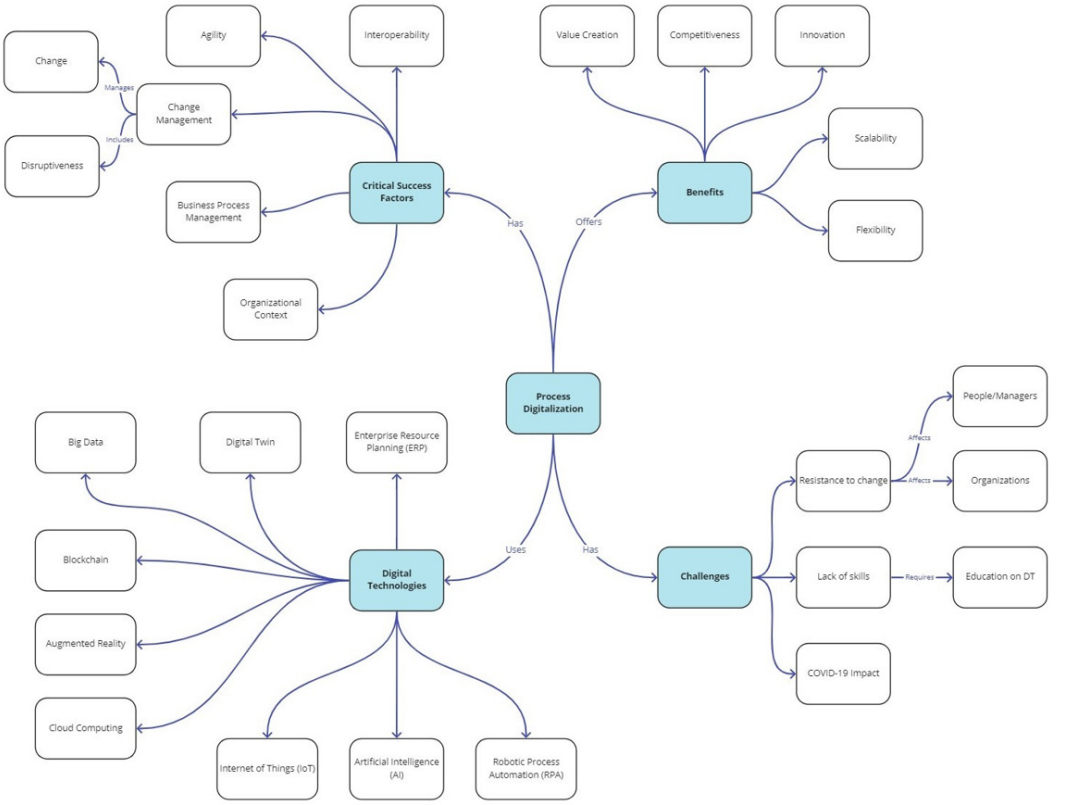
Automation technologies can also cause resistance to change by presupposing the idea that having fewer processes because of process automation will reduce the number of jobs in the organization (Rautenbach et al., 2019). This creates a fear that is connected to a lack of skills in the organizations, as discussed previously New jobs emerge from automation, and workers need to be informed and educated so they can perform more challenging jobs.

COVID-19 Impact

The recent COVID-19 pandemic affected the entire world. Its impact has been studied in the literature and is relevant to the challenges involved in DT and digitalization. Although DT was already growing and evolving, this spontaneous event accelerated its growth by forcing companies to change and react, causing significant changes in the business environment (Butt, 2020).

The pandemic obligated people to stay home, which changed most enterprises' course of action. The economy could not entirely stop, and organizations had to find different digital ways to do business. Because digital technologies allow businesses to function in a nonphysical manner, organizations were forced to begin embracing DT (Al-Edenat, 2023) at a rapid pace . Naturally, organizations with

Figure 3. Framework for the four vectors of the analysis



already-automated digital processes had an easier response to the outbreak (Sobczak, 2022) than companies that were not already engaged in DT.

Proposed Framework

To synthesize the findings discussed in this article, Figure 3 details the proposed framework. The goal of this framework is to achieve an initial visualization of the main concepts present in each branch; therefore, it is presented with a more general approach. The four branches are discussed in the more detail in the sections that follow and contain the subconcepts that are included in each concept.

This proposed framework can help organizations implement various technologies in the DT process. SMEs have greatly benefited from these technologies to optimize their operations, create value for customers, and innovate.

CONCLUSION

The research discussed in this article identified the most relevant digital technologies used in digitalization within organizations and discovered that four technologies (cloud computing, AI, IoT, and Big Data) stood out as the main ones used in digitalization. This review indicates that the following concepts are the critical success factors for DT and digitalization: agility, interoperability, organizational context, change management, and BPM. The most frequently cited concept throughout the literature was innovation, which, along with value creation, flexibility, and competitiveness, are considered the benefits of digitalization. Organizations need to be mindful of several challenges

when preparing for digitalizing processes; the main ones are a lack of skills, resistance to change, and the impact of COVID-19.

With regard to the concept of interoperability, there are opportunities to develop a system that is fully digital. The use of several technologies interoperating with one each other in a large organization that has many different business processes could result in a 100% digitally transformed organization. This could provide an understanding of the technologies that could achieve this creation and how the flow of data between processes and technologies would work. If one takes into consideration the identified concepts, which concepts can be considered the most popular, and the framework created, one sees that there are possibilities for future research. This research can be used to produce questionnaires or other means by which organizations can cross-reference the information obtained and generate new conclusions about the popularity of the concepts identified.

FUTURE TRENDS AND THE POTENTIAL EVOLUTION OF DT

DT offers small businesses the means to automate tasks, streamline processes, and enhance operations through technologies such as RPA. By embracing cloud computing alongside software tools, data analytics, and management systems, companies can mitigate errors, boost team productivity, and conserve valuable time and resources. This operational efficiency serves as a competitive edge, empowering small businesses to swiftly adapt to market demands.

Furthermore, DT significantly elevates the customer experience. In today's hyperconnected and demanding consumer landscape, swift and personalized interactions are expected across all communication channels. Technologies such as 5G and IoT facilitate this expectation, fostering closer relationships between consumers and brands. SMEs are leveraging AI to heighten customer experience, improve efficiency, productivity, and ensure business continuity. Automated solutions, such as customer service chatbots on platforms like WhatsApp and Telegram, as well as generative AI solutions, such as ChatGPT, exemplify this trend.

The innovation potential of DT for small businesses continually evolves, offering avenues for novel business models, products, and services. By embracing DT, SMEs can explore fresh approaches to meet customer needs, identify untapped market niches, and craft innovative solutions. This adaptability and innovation are indispensable for thriving in today's business landscape.

However, it is essential to note that DT encompasses more than just technology; it necessitates a profound cultural and mindset shift within organizations and among individuals. Although technologies play a pivotal role, people remain the primary agents in the DT journey. Therefore, entrepreneurs and business owners must stay abreast of the latest trends and adopt tools and platforms that enhance communication, collaboration, and productivity within their organizations.

Moreover, cybersecurity emerges as a critical aspect of DT, in particular for SMEs, which are often prime targets for cyber threats. Using technologies like blockchain in contracts and transactions can bolster security and safeguard sensitive data and systems.

In addition to established technologies, staying attuned to emerging trends, such as AI, ML, IoT, cybersecurity, quantum computing, and blockchain, is imperative for all type and size of organizations. These technologies hold the potential to reshape entire sectors and unlock new business opportunities.

Technology and DT are indispensable for the success of SMEs in today's business environment. However, the journey toward DT requires not only technological prowess but also a fundamental shift in organizational culture and mindset.

Limitations and Future Research

This research has some limitations. This study was a systematic literature review and thus is limited with regard to the number of article analyzed as well as the databases searched. Future studies should validate the critical success factors, benefits, and challenges in digital technologies through case studies in different countries and cultural contexts. A longitudinal case study that analyzes

the critical success factors, benefits, and challenges would be interesting. In-depth studies will be necessary to strengthen the outcomes and thus validate them through interviews and survey with experts in organizations of all sizes and with all types of control. For example, the impact of the adoption of blockchain, IoT, cloud computing, AI, Big Data in digitalization for SMEs and how to overcome these challenges could be examined. Other studies could focus on the main challenges in the adoption and implementation of each technology and the ensuing benefits.

These proposed tasks should encourage researchers to carry out more studies on this organization type given that studies in this field are still scarce and limited. However, it is a huge concern for researcher to investigate these topic, especially in SMEs.

For future research, it is recommended to investigate the specific impact of each technology on organizational performance, as well as its contribution to value creation and innovation, particularly within small and medium-sized enterprises (SMEs) in emerging economies. Furthermore, studies focusing on artificial intelligence are essential to determine which technologies most effectively influence digital transformation and the ways in which organizations derive benefits from their implementation. A comparative analysis of the maturity levels of AI adoption in the context of digitalization and its subsequent impact on business performance across diverse cultural settings, represents a critical avenue for further academic investigation.

CONFLICTS OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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