



Key Determinants of Digital Transformation: A Preliminary Investigation into Essential Elements of Company Change

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Abstract: *Digital transformation (DT) involves strategic, customer-focused changes that utilize innovative applications of emerging information and communication technologies to create new or enhanced processes, products and/or services, and business models in today's organizations. Given the broad resonance of digital transformation, this paper provides a preliminary investigation into its key determinants, a concept frequently discussed in terms of enablers, factors, drivers, and pillars in existing research. Although these terms appear commonly in the literature, there is a need for a clearer understanding of previous studies and how these elements are recognized and defined in academic works. This paper aims to theoretically identify the key determinants of digital transformation that organizations must consider. By synthesizing existing literature, this study seeks to establish an initial categorization of the primary elements influencing digital transformation, laying a basis for further, in-depth research into how these determinants shape and facilitate transformation initiatives across industries.*

1. INTRODUCTION

Current market demands dictate changes, leaving organizations with the responsibility to optimize their interactions with key stakeholders such as customers, employees, and partners to unlock new revenue streams and improve operational efficiency. In recent years, the scientific and professional community has intensively explored the impact of digital transformation on various industrial sectors and the global environment. Digital transformation is the process by which organizations create customer-oriented value, leveraging digital technologies to implement innovative changes in organizational processes, products, services, and business models (Pihir et al., 2019).

It is not merely about adopting new technologies and solutions but emphasizes the importance of rethinking organizational strategies (Albukhitan, 2020; Kutnjak, 2021; Petrova et al., 2022) to enable organizations to harness the full potential of inevitable digital progress. Digital transformation transcends technology, encompassing strategic reinvention that highlights process flexibility, innovation, and the development of adaptable business models. It represents a crucial step towards strengthening competitiveness in national and global markets, fostering innovation (van Tonder et al., 2020) and necessitating adaptation to the conditions of the modern digital environment. The importance of digital transformation is particularly evident in its potential to significantly enhance organizational performance, driven by a shift in organizational thinking.

Despite promising opportunities, many organizations face significant challenges, issues, barriers, and problems in successfully implementing digital transformation initiatives (Kutnjak & Pihir, 2019). The need for constant adaptation to new digital technologies, the development and enhancement of digital skills, changes in culture and management practices, distrust in the process and execution of digital transformation, limitations due to insufficient legislative support

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and inadequate funding for digital initiatives, infrastructural deficiencies, resistance to change, and the lack of an appropriate digital strategy are just some of the difficulties organizations may encounter when launching digital transformation initiatives (Kutnjak, 2021).

It is important to note that the complexity of digital transformation also stems from the need to balance technological advancement with organizational readiness, market dynamics, and customer expectations. Designing new business models that align with customer expectations requires mastering complex interactions across multiple channels, as well as organizational agility to deliver value propositions (Brkić et al., 2020). Furthermore, the implementation of digital transformation demands significant changes in organizational culture, resource allocation, and capacity-building efforts (Bennett & McWhorter, 2021; Brkić et al., 2020; Sá & Serpa, 2020). While most organizations acknowledge the necessity of transformation, only a fraction manage to execute effective strategies (Calabrese et al., 2021) and seamlessly integrate new technologies into their existing frameworks (Wolf et al., 2018).

Although digital transformation brings notable performance improvements, many organizations remain anchored in traditional approaches and business practices, hindering their ability to adapt to rapid technological changes. Addressing these challenges requires a structured approach to identify and implement key elements aimed at effectively managing digital transformation. For this reason, the focus of this research is on identifying the necessary elements within an organization that facilitate and enable digital transformation. This study builds upon the research by Pihir et al. (2018) and Pihir et al. (2019) who identified key determinants of digital transformation. These determinants include: (i) *Strategy orientation*; (ii) *Customer centricity*; (iii) *ICT and process infrastructure*; (iv) *Talent, capability and capacity strengthening*; and (v) *Innovation culture and organizational commitment*, all of which, when cohesively applied, can influence the overall outcome of an organization's digital transformation.

To further investigate the determinants of digital transformation, this qualitative research is guided by the content analysis method, aimed at narratively describing the meaning of the observed content within a specific context (Drisko & Maschi, 2016; Elo & Kyngäs, 2008). This method applies clearly defined procedures to enable the derivation of valid, systematic, reliable, and reproducible conclusions from analyzed textual data, making it suitable for the purposes of this study (Bengtsson, 2016; Graneheim et al., 2017; Vaismoradi et al., 2013). Given the research framework, the study will follow a deductive coding approach, using themes derived from existing empirical research associated with the works of previously mentioned authors (Pihir et al., 2018, 2019). In this way, the application of themes (in this case, the determinants of digital transformation) will be tested on the collected data, specifically the gathered codes.

Accordingly, this paper is guided by the following research question: *Which (additional) determinants do authors identify as key for the successful implementation of digital transformation?* Building on this research question, the goal of the study is to explore existing determinants and assess their potential need for modification. The structure of this scientific paper consists of several key sections. The paper begins with an introductory chapter that explains the context and importance of the research, followed by a methodology section that provides a detailed description of the approach and research steps. Next, the results are presented, based on data collected through content analysis, while the discussion chapter provides a deeper interpretation of the results and places them in a broader context. Finally, the paper summarizes the key findings, highlights their importance for further development of research in the field of digital transformation, and proposes guidelines for future research.

2. METHODOLOGY

In previous research conducted by the author of this paper, it was found that different authors define the term “determinants” of digital transformation in various ways. Some of the terms identified in papers include drivers, enablers, factors, pillars, elements, components, essentials, and others. For this reason, to achieve the objective of this research and identify the determinants of digital transformation, the following research query was formulated: **article title** “digital transformation” AND (determinant* OR driver* OR enabler* OR factor* OR pillar* OR catalyst* OR element* OR component* OR lever* OR condition* OR requirement* OR antecedent* OR essential* OR prerequisites* OR foundation* OR influencer* OR facilitator* OR criteria) AND **keywords** “digital transformation” AND (determinant* OR driver* OR enabler* OR factor* OR pillar* OR catalyst* OR element* OR component* OR lever* OR condition* OR requirement* OR antecedent* OR essential* OR prerequisites* OR foundation* OR influencer* OR facilitator* OR criteria) AND **abstract** “digital transformation” AND (determinant* OR driver* OR enabler* OR factor* OR pillar* OR catalyst* OR element* OR component* OR lever* OR condition* OR requirement* OR antecedent* OR essential* OR prerequisites* OR foundation* OR influencer* OR facilitator* OR criteria).

As evident, the research query was strictly focused on scientific papers that mention some variation of the determinants of digital transformation in their titles, keywords, and abstracts to obtain the most relevant set of papers. The query included scientific papers published in the Scopus and Web of Science (WoS) databases, resulting in 213 papers from Scopus and 97 from WoS. In this initial screening of the relevance of the query and the suitability of the papers, only those with 15 or more citations in both databases were included. This yielded 39 papers from Scopus and 18 papers from WoS. Upon review, it was found that all the WoS papers overlapped with those from the Scopus database. A total of 39 papers were analyzed, focusing on the relevance of their titles, keywords, and abstracts to the research domain. Following this analysis, 17 papers were excluded due to their lack of alignment with the research topic, leaving a final set of 22 papers for further analysis. In these selected papers, content analysis was used to verify and/or determine the need for modifications to the existing determinants of digital transformation.

3. RESEARCH RESULTS

Below are the research results guided by content analysis. To begin, it is necessary to briefly explain the key terms that will be used throughout the paper. *The unit of analysis* refers to the content of 22 scientific papers in which it is necessary to identify the determinants of digital transformation. A *meaning unit* is a part of the content of a scientific paper that holds significance in the context of the analysis and represents the smallest semantic unit, such as a word, sentence, or paragraph, that aligns with the research question (Elo & Kyngäs, 2008; Graneheim et al., 2017). According to the same authors, a *condensed meaning unit* is a shortened version of the meaning unit that retains the essential meaning, simplifying the analyzed text. *Codes* represent keywords that summarize the content of the condensed meaning unit. These three concepts pertain to the manifest content of the unit of analysis (Graneheim et al., 2017). The most abstract level of content analysis is represented as *themes*, which reflect the main research conclusions derived from categorized data. Themes represent the latent, hidden content of the analyzed text (Graneheim et al., 2017). Accordingly, Table 1 shows an excerpt from the first step of the content analysis conducted on 22 scientific papers.

Table 1. Process of conducting content analysis of scientific papers – first step

No.	Authors	Meaning unit	Condensed meaning unit	Codes
1.	(Schallmo et al., 2017)	Four categories for enablers and applications/services are digital data, automation, digital customer access and networking, all based on technologies.	Digital data, process automation, digital customer access, networking, and technologies are the drivers of digital transformation.	Data; process automation; customer-oriented approach; stakeholder networking; technologies.
2.	(Jafari-Sadeghi et al., 2023)	Accordingly, our analysis led to the selection of the seven most critical and relevant micro-foundations nurturing digital transformation from SME entrepreneurs' perspectives. They include (1) developing digital literacy to create their analytics, (2) obtaining information from specialised market surveys, (3) capacity toward creativity and innovativeness, (4) ability to explore and exploit new business opportunities, (5) skills and the ability for developing the employees' performance, (6) communication capacities towards boosting the employees' commitment, and (7) ability to manage projects with high performance.	Seven key micro-foundations were identified, including digital literacy, information generation, innovativeness, opportunity exploration, employee skills and capacity, communication capabilities, and project management.	Digital literacy; information generation; innovativeness; opportunity exploration; employee skills; communication capabilities; project management.
3.	(Zhang et al., 2022)	This study empirically examines the impact mechanism of seven key resources from three dimensions of technology (IT infrastructure and IT management capacity), organization (digital strategy, top management, employee skills), and environment (government support and partnership) on DT.	Seven key resources: IT infrastructure, IT management capacity, digital strategy, top management, employee skills, government support, partnership.	IT infrastructure; IT management capacity; digital strategy; top management; employee skills; government support; partnership.
N..
21.	(Xiao et al., 2022)	The research results showed that technological readiness (digital infrastructure; investments in infrastructure), organizational efficiency (support for technology-based processes, strengthening communication and interaction), citizen expectations (higher demands), and top-down pressure ("management behavior"; the influence of government policies) actively influenced the intention of local governments on their path toward digital transformation.	The driving factors are digital infrastructure; infrastructure investments, support for technology-based processes, strengthening communication and interaction; higher user demands, management behavior; the influence of government policies.	Digital infrastructure; infrastructure investments; support for technology-based processes; strengthening communication and interaction; higher user demands; management behavior; influence of government policies.
22.	(Escobar et al., 2023)	Success factors are strategy, people, organization, customers, ecosystem, technology and innovation.	DT factors are strategy, people, organization, customers, ecosystem, technology and innovation.	Strategy; people; organization; customers; ecosystem; technology; innovation.

Source: Own research

The result of the first step of content analysis (Table 1) identified a total of 175 codes, which in the next step needed to be examined in the context of identifying themes emerging in scientific papers. In the first iteration of code processing, the codes were assigned to identified themes (determinants of digital transformation) from previous research (Pihir et al., 2018, 2019) to evaluate the suitability of the themes and determine the need for modifying the existing determinants recognized by the aforementioned group of authors (Table 2). Since there were codes that required the expansion

and modification of the current themes or determinants, a second iteration was conducted, during which the themes were adjusted to meet the needs of the analysis and fully reveal the latent content of the analyzed scientific papers (Table 2).

Table 2. Process of conducting content analysis of scientific papers – second step

No.	Authors / term	Codes	Themes (first iteration)	Themes (second iteration)
1.	(Schallmo et al., 2017) / Enablers	<i>data</i>	ICT and process infrastructure	<i>Technical, technological, data, and process infrastructure</i>
1.		<i>process automation</i>	ICT and process infrastructure	
1.		customer-oriented approach	Customer centricity	Customer centricity
1.		stakeholder networking	Strategy orientation	
1.		<i>technologies</i>	ICT and process infrastructure	
2.	(Jafari-Sadeghi et al., 2023) / Foundations	digital literacy	Talent, capability and capacity strengthening	Talent, capability and capacity strengthening
2.		information generation	ICT and process infrastructure	
2.		<i>innovativeness</i>	Innovation culture and organizational commitment	<i>Organizational commitment and innovation development culture</i>
2.		opportunity exploration	Innovation culture and organizational commitment	
2.		employee skills	Talent, capability and capacity strengthening	
2.		communication capabilities	Talent, capability and capacity strengthening	
2.		<i>project management</i>	Strategy orientation	<i>Strategic approach and leadership</i>
N..	
22.	(Escobar et al., 2023) / Factors	strategy	Strategy orientation	
22.		people	Talent, capability and capacity strengthening	
22.		organization	Innovation culture and organizational commitment	
22.		customers	Customer centricity	
22.		<i>ecosystem</i>	Strategy orientation	
22.		technology	ICT and process infrastructure	
22.		innovation	Innovation culture and organizational commitment	

Source: Own research

As shown in Table 2, out of the five themes (determinants of digital transformation), two remain completely unchanged. These determinants are *Customer centricity* and *Talent, capability and capacity strengthening*. Since the content analysis did not reveal any additional codes requiring expansion or modification of these two determinants, they remain unaltered. On the other hand, the content analysis identified certain codes that necessitate slight or significant modifications to the determinants. The first modification concerns the existing theme ICT and process infrastructure, which has been expanded and renamed to *Technical, technological, data, and process infrastructure*. In the analyzed papers, codes such as data, technologies, data-driven agility, IT and process integration, adequate technological infrastructure, harmony of business and technological environments, and others (Ebert & Duarte, 2016; Jonathan, 2020; Jović et al., 2022; Kostakis & Kargas, 2021; Morakanyane et al., 2020; Muehlburger et al., 2019; Petrova et al., 2022; Tarute et al., 2018; Van Dyk & Van Belle, 2019; Werth et al., 2020; Xiao et al., 2022) required modifying the current determinant to place a clear emphasis on technological infrastructure, data, and processes in its name. Furthermore, the existing theme Innovation culture and organizational commitment, has been slightly modified to *Organizational commitment and innovation development culture*.

This change was made because, in the analyzed papers, codes such as organizational structure, flexibility, agility, and commitment were recognized as the foundation for developing and enhancing the innovation culture within organizations. Lastly, the theme (determinant) Strategy orientation was modified to *Strategic approach and leadership*. In the analyzed papers (Ebert & Duarte, 2016; Escobar et al., 2023; Jonathan, 2020; Koseoglu et al., 2019; Lammers et al., 2019; Li et al., 2022; Morakanyane et al., 2020; Muehlburger et al., 2019; Petrova et al., 2022; Rueckel et al., 2020; Tangi et al., 2020; Tarute et al., 2018; Van Dyk & Van Belle, 2019; Wang & Su, 2021; Wolf et al., 2018) codes such as stakeholder networking, digital strategy, strength of internal leadership, collaborative partnership, change in management mindset, collaboration with external stakeholders, leadership traits, ecosystem, and others indicated the need to expand the narrowly focused theme that previously only included strategy, by enriching it with a leadership component (Table 3).

Table 3. Codes and their assignment to modified themes – third step

Codes	Themes
<i>data</i> ; process automation; <i>technologies</i> ; <i>information</i> generation; interoperability; <i>data-driven agility</i> ; process infrastructure; IT and process integration; <i>digital technologies</i> ; <i>big data and analytics</i> ; adequate <i>technological</i> infrastructure; <i>technology</i> ; harmony of business and <i>technological environments</i> ; business processes...	<i>Technical, technological, data, and process infrastructure</i>
<i>stakeholder networking</i> ; digital strategy; <i>top management</i> ; strength of <i>internal leadership</i> ; collaborative <i>partnership</i> ; change in <i>management mindset</i> ; change management; <i>leadership engagement</i> ; collaboration with <i>external stakeholders</i> ; leadership traits; management practices; digital leadership; creation of strategic alliances; ecosystem...	<i>Strategic approach and leadership</i>
digital literacy; employee skills; IT management capacity; collaborative work environment; networking; skills development program; internal collaboration; employee creativity and innovativeness; employee ICT literacy; internal collaboration; technological skills and employee education; technological competence; IT skills...	Talent, capability and capacity strengthening
<i>innovativeness</i> ; opportunity exploration; organizational <i>structure</i> ; commitment; <i>innovation policy</i> ; motivation to try new things; flexible <i>architecture</i> that responds to changing user demands; digital culture; appropriate organizational <i>structure</i> ; company culture; innovative organizational culture; organizational <i>agility</i> ; innovation processes; technological innovations...	<i>Organizational commitment and innovation development culture</i>
customer-oriented approach; expected benefits for end users; user participation in product/service creation; stakeholder involvement; customer-focused value; targeted value proposition; interaction with clients; relationships and impacts on customers; customer satisfaction; customer orientation; strategic focus on the customer; changing client demands; higher user demands; customers...	Customer centricity

Source: Own research

After conducting the content analysis, the research results reveal the number of codes associated with each identified theme or determinant of digital transformation (Table 4). The table shows that authors in the analyzed papers most frequently mention codes that can be assigned to the theme *Technical, technological, data, and process infrastructure*, followed by codes related to *Strategic approach and leadership*.

Table 4. Number of codes per theme identified in scientific papers

Themes	Number of codes
Technical, technological, data, and process infrastructure	43
Strategic approach and leadership	41
Talent, capability and capacity strengthening	33
Organizational commitment and innovation development culture	27
Customer centricity	17
Various external factors (not suitable for this research)	14
Total	175

Source: Own research

4. DISCUSSION

The foundation of successful digital transformation lies in robust *technical, technological, data, and process infrastructure*. These elements enable the creation of open systems that foster sustainability and resource sharing, crucial for the development of innovative digital products and services. Open systems facilitate interoperability and scalability, ensuring organizations can efficiently adapt to changing market demands. By investing in modern infrastructure, organizations position themselves to harness the full potential of digital transformation, ensuring long-term value creation and operational excellence. A *strategic approach* is indispensable for navigating the complexities of digital transformation. *Leadership* plays a pivotal role in aligning products and services with an organization's vision, mission, and goals, while emphasizing the importance of ecosystems and partnerships. Strong leadership helps organizations remain resilient in the face of disruptions, turning challenges into opportunities for innovation and growth. By fostering a clear strategic vision and establishing collaborative ecosystems, organizations can effectively leverage technological advancements to maintain a competitive advantage.

The dynamic nature of digital environments necessitates continuous investment in *talent development*. *Strengthening digital competencies* through ongoing learning and fostering a culture of collaboration and knowledge sharing are essential to remain competitive. Employees must be equipped with the skills and adaptability to thrive in global and digital contexts. This approach ensures that organizations not only build capacity but also develop leaders capable of driving digital transformation initiatives with efficiency and creativity. A *commitment to innovation* is rooted in an organizational structure that prioritizes flexibility, agility, and a robust *digital culture*. Such structures eliminate administrative bottlenecks and empower teams to operate sustainably and dynamically. By embedding innovation into the organizational ethos, companies can cultivate a culture of continuous improvement, allowing them to respond effectively to market changes. This requires not just a structural redesign but also a mindset shift, where employees embrace digital tools and methodologies as enablers of growth and creativity. At the heart of digital transformation is *customer centrality*, which underscores the importance of delivering value through well-defined value propositions. Enhancing the customer experience involves a deep understanding of customer behavior, leveraging data insights, and utilizing social platforms and virtual communities for meaningful engagement. Organizations that prioritize customer needs and focus on delivering quality through innovative digital means are better positioned to foster loyalty, build trust, and sustain long-term success in competitive markets.

Considering the aforementioned determinants of digital transformation, organizations can identify key internal elements to support and facilitate the essential changes required to meet market demands. The results of this research indicate that the determinants of digital transformation are well-defined (Pihir et al., 2018, 2019), although some required slight modifications. This effectively addresses the research question posed at the beginning of this paper.

5. CONCLUDING REMARKS AND FUTURE RESEARCH DIRECTIONS

Digital transformation is an imperative for organizations aiming to thrive in today's rapidly evolving market landscape. This study underscores the importance of adopting a strategic approach to digital transformation, emphasizing the balance between leveraging disruptive innovations and enabling agility to adapt to dynamic market conditions. Success lies in prioritizing customers, investing in robust technological infrastructure, and enhancing digital competencies within the organization. These efforts must be aligned with creating tangible value through clear value propositions and exceptional customer experience management.

The research identifies internal success factors critical to achieving effective digital transformation. However, the findings are not exhaustive, as certain studies were excluded due to citation threshold criteria. Future research will build on these insights by incorporating excluded papers, allowing for a more comprehensive understanding of the determinants driving digital transformation. Such exploration is expected to offer richer, more precise guidance for organizations navigating their digital transformation journeys.

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