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Digital transformation: literature review and research outlook

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Abstract:

The fast development of emerging technologies such as cloud computing, big data, artificial intelligence, and the Internet of Things (IoT), has provided robust technical support for the digital transformation of corporations. Concurrently, the literature on digital transformation is also increasing, reflecting the gradual progress of this phenomenon. A systematic review and summary of digital transformation is presented in this paper, based on a sample of 54 papers published in UTD24 and FT50. The results of the research are as below: (1) the number of published papers on digital transformation shows a dynamic growth trend; (2) resource, organizational, and environmental factors trigger and shape digital transformation; (3) the influence mechanism of digital transformation mainly includes innovation and integration; (4) digital transformation is a double-edged sword, and its impact consequences include positive and negative effects. Finally, a research framework for digital transformation is constructed, and ideas for future research are provided.

Keywords: digital transformation;literature review;UTD24; FT50;research framework.

1. Introduction.

The advent of the digital economy and the exponential growth of digital technologies, comprising artificial intelligence, big data, cloud computing, and blockchain, has resulted in a rapid and unpredictable transformation of digital technologies, which in turn is reconfiguring organizations and their environments. The distribution of digital activities across domains and their coordination by data, algorithms, and machines (Alaimo 2022) have significant implications for economic and social development (Bailey et al., 2022). In spite of the growing importance of digital transformation for business and societal development, there is a question of knowledge about the challenges associated with such practices, their nature, and effective management strategies (Gregory et al., 2015).

The concept of digital transformation is becoming increasingly prevalent in contemporary academic and practitioner discourse. Concurrently, the global spread of the New Crown Pneumonia epidemic has precipitated significant challenges for business operations, prompting many established companies to navigate uncharted entrepreneurial terrain (Browder et al., 2023). This has further accelerated the digital transformation process. Digital transformation has precipitated a shift towards flexible organizational design, embedded in digital commerce ecosystems, enabling continuous adaptation to environmental changes (Hanelt et al., 2021). Furthermore, digital transformation is increasingly regarded as a key means of gaining a competitive advantage. The digital transformation of enterprises is a lengthy and challenging process that necessitates sustained investment and commitment from enterprises. Currently, numerous traditional organizations have adopted the digital transformation model, utilizing digital technology to alter how they coordinate value activities with customers, to enhance business performance.

In academic research on digital transformation, scholars have highlighted the accelerated growth of research in this area (Hanelt et al., 2021; Zalmanson et al., 2013). As digital transformation progresses, global policymakers have begun to implement relevant policies to facilitate the secure and seamless design and utilization of digital technologies by enterprises (Agarwal et al., 2022). This represents a rare and extraordinary opportunity for academic research to advance and develop new theoretical knowledge and formulate influential policies (Agarwal et al., 2010). Conversely, the existing research on digital transformation is not without shortcomings. One such shortcoming is that the plethora of digital transformation literature lacks a consensus on what exactly digital transformation is (Warner and Wäger, 2019) and what it entails (Wessel et al., 2020). Furthermore, the changes brought about by digital technologies and the unresolved moral and ethical issues that arise from them. A second shortcoming is the lack of a systematic review of the digital transformation literature published in UTD24 and FT50, which has been conducted by a few scholars.

In light of the aforementioned analysis, this paper considers 54 documents published in UTD24 and FT50 as the subject of its investigation. It offers a comprehensive re-

view of the digital transformation process, refines the fundamental research framework of digital transformation, and identifies potential ways for future research.

2. Research design

This paper employs a review of the system (Tranfield et al., 2003) as its methodology, comprising three steps: (1) record data, (2)analyze data, and (3)establish the research framework (Hanelt et al). In the paper, we refer to Hanelt et al. (2021) and utilize the Web of Science database as a data source, given that it encompasses a vast repository of over 1,300 high-impact, peer-reviewed theses within the dynamic and interconnected fields of economics and management. These journals cover a different range of topics, from creativity research in macroeconomic theory and international business, to innovative studies in organizational action, strategic management, and entrepreneurship. This constitutes one of the most comprehensive sources of literature data. To guarantee the quality of the literature review, the target journals for this paper were selected as UTD24 and FT50. The UTD24 and FT50 journals are the most highly regarded journals used to assess the international business school rankings by the University of Texas at Dallas, USA, and the Financial Times, UK, respectively. In this paper, the Web of Science database was used for an advanced literature search. The journals were set to UTD24 and FT50, and the topic was set to digital transformation. A total of 400 documents were obtained. The titles, abstracts, and keywords of these 400 documents were read, and conference papers and editorials were excluded. Documents not related to digital transformation were also excluded, leaving 346 documents. The final literature included in the database is 54.

3.Research findings

To supply a more accurate representation of the trajectory of digital transformation research, this paper presents a visual representation of the trend of literature publication, as illustrated in Figure 1.

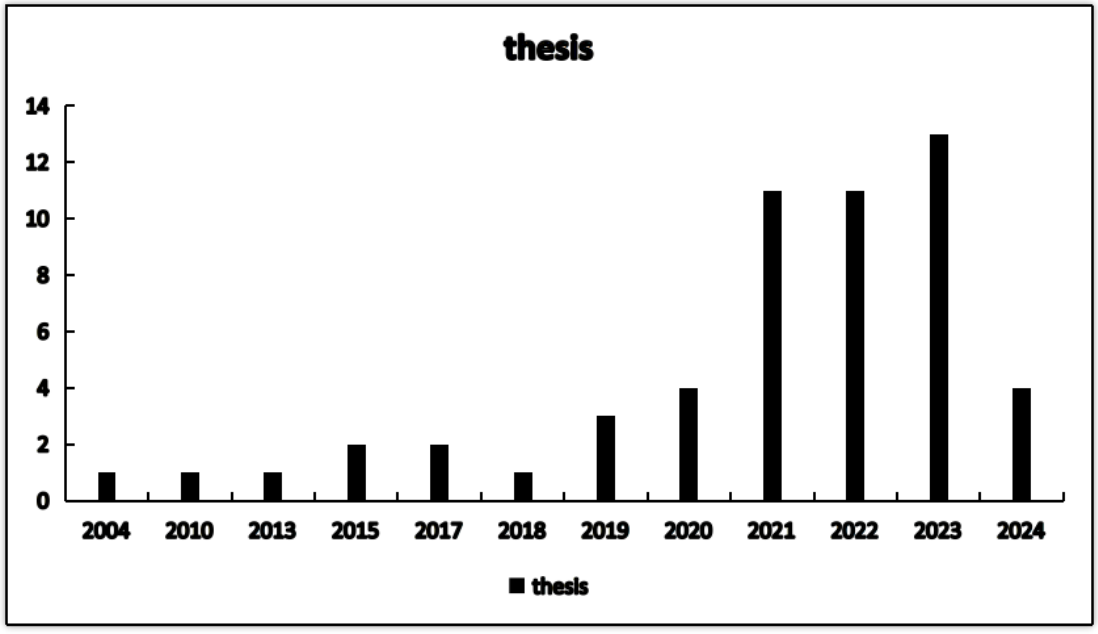

Figure 1. Articles on digital transformation published over time

Figure 1 shows a clear upward trend in publications on digital transformation with a number in UTD24 and FT50 journals from 2004 to 2023. The largest increase in the number of publications occurred in 2021, with the highest number of publications (14) occurring in 2023. These findings suggest that digital transformation is a growing field of research and that it is emerging as a significant trend in the field of literature.

3.1 Antecedents

This paper posits that factors such as resources, organizational structure, and the external environment act as both triggers and shapers of digital transformation.

At the resource level, existing research has explored the influences of digital technologies and digital resources, as well as digital innovation, on digital transformation. The new and powerful digital technologies, platforms, and basic facilities has changed innovation and entrepreneurship significantly. Beyond creating new chances for reformers and entrepreneurs, these digital advancements have also had a profound impact on value creation and value capture.(Nambisan et al., 2019). The digitalization, digitalization, and digitalization of not only work and communication, but also social and technological basic facilities that

enable connectivity, have made the behavior of people, collectives, and technological equipment increasingly visible and visible (Leonardi et al., 2020). The relevance of data is being reintroduced into the analysis of organizations, with data showing complicacy and multidimensionality as cultural, cognitive, and technological artifacts that are deeply involved in digital transformation.

At the level of organization, existing research has probed the necessity for digital technologies and the character of the Chief Digital Officer, middle managers, the technology orientation of CEOs, and family businesses in driving them. In the context of rapid advances in digital technologies, the digital era has brought about basic changes in business and management in universal. Reuter and Floyd (2024) posit that strategic leaders are pivotal, and the digital ecosystems they envisage are of paramount importance. The proliferation of automation technology is intensifying the debate about the influence of digital automation on the strategic importance of middle managers (Doorn et al., 2023). The advent of digital automation has brought about significant complexities and contingencies in the strategic engagement of mid-managers in contemporary organizations (Doorn et al., 2023). Furthermore, the phenomenon of digital transformation has given rise to novel leadership roles, with companies increasingly designating the chief digital officer as a pivotal figure in their digital transformation endeavors (Firk et al.,2021). First-level dynamic capabilities, which result from changing, expanding, or adapting existing resources, processes, and values, of the company are positively correlated with the ability to build digital platforms. These capabilities influence the performance of responses to digital disruptions (Karimi et al., 2015). Filatotchev et al. (2023) In circumstances where radical technological change has happened, the CEO's digital technology direction exceeds that of the company's industry peers, thereby increasing investors' perceptions of firm value. The influence of the CEO's digital technology positioning on firm value is further increased by digital expertise and knowledge diversity.

In terms of the environmental dimension, existing studies have checked the impact of customer demand (Scott and Orlikowski, 2022), government policy (Bodrožić et al., 2022), and the environment outside (Kwan et al., 2023; Copestake et al., 2024) on digital transformation. In the context of increasingly diversified and personalized customer demands and more competitive markets, companies must enhance their competitiveness through digital transformation. The advent of digital transformation has had a deep influence on how companies conduct their operations, engendering strategic shifts and facilitating the generation of novel forms of value creation both within and between organizations (Scott and Orlikowski, 2022). Digital transformation represents a new phase of the ICT revolution, one that promises broader deployment, and the trajectory of this deployment is depend upon the collective choices made within the organizational and public policy field (Bodrožić et al., 2022). Governments have introduced policies to support the digital transformation of businesses. The United States, for example, is investing significant resources into digitizing its healthcare system, and global policymakers are exploring the potential of digital technologies to enhance the safety, affordability, and accessibility of healthcare systems (Agarwal et al., 2010). The research by Copestake et al. (2024) suggests that the ongoing global pandemic is likely to result in prolonged output losses. However, influenza pandemics also prompt the rapid adoption of digital technologies by firms. For instance, the digital technological capabilities of banks were severely tested during the New Crown Pneumonia pandemic, resulting in an unexpected and unprecedented shift in banking services from face-to-face to digital (Kwan et al. 2023).

3.2 Mechanisms

This paper identifies two mechanisms through which digital transformation generates economic impacts: the integration mechanism and the innovation mechanism. The innovation mechanism encompasses the application of new resources, processes, and capabilities within the organizational context, whereas integration pertains to the integration of new resources, processes, and capabilities with existing ones (Hanelt et al., 2021).

In their 2023 research, Angelopoulos et al. argue that the rise of digital technologies in various aspects of operations management has led to a transformation in decision-making processes, creating new operational dynamics and business opportunities. The widespread impact of digital technologies on decision-making across all areas of operations management is a fundamental principle of the digital transformation framework. Jan et al. (2019) contend that the digital transformation of intra- and inter-organizational processes offers significant avenues for research in the domain of operations and supply chain management. Kellogg (2022) posits that avoiding the loss of autonomy and strengthening the work of less powerful actors in the process of introducing and integrating digital technologies represents a significant collective action challenge. Problems frequently emerge during the introduction and integration of digital technologies, which can result in less powerful actors losing autonomy and strengthening their work capacity. In a longitudinal case study of two incumbent firms, Russell et al. (2023) demonstrate that digital transformation contributes to the reduction of shareholder risk and the mitigation of the neo-crest epidemic by

strengthening firm capacity.

In terms of innovation mechanisms, Nambisan et al. (2017) identify that digital innovation challenges fundamental assumptions about the boundaries of innovation, innovation agents, and the relationship between innovation processes and results. This disrupts existing theories of innovation management. Agarwal et al. (2022) identify the digital transformation of traditional healthcare as a process that creates a digitized healthcare system, which enables or facilitates new forms of care. Furthermore, this transformation has the potential to trigger shifts in healthcare delivery systems and the integration of numerous healthcare resources. Copestake et al. (2024) conclude that digitization not only supports growth and innovation in the long term, but can also help prevent and mitigate the damaging effects of the recession in the mid-term.

3.3 Consequences

This paper identifies two categories of consequences resulting from digital transformation: positive and negative. About the former, digital transformation has been found to enhance organizational resilience (Copestake et al., 2024; Russell et al., Furthermore, digital transformation (2023) alters organizational boundaries (Prügl and Spitzley, 2021), establishes the centrality of organizational structure (Alaimo and Kallinikos, 2022), facilitates innovations in supply chain management (Zuo-Jun, 2021), and enhances business performance (Homburg et al., 2021). The increasing necessity for firms to collaborate with subjects outside their boundaries, for example through alliances with start-ups (Prügl and Spitzley, 2021), is a further consequence of digital transformation. Based on a longitudinal case study of two established firms, Russell et al. (2023) found that digital transformation is beneficial for enhancing firm resilience. Baygi et al. (2021) The continuous digital innovation that is transforming every aspect of contemporary society has the effect of making our work and lives more fluid and dynamic. Furthermore, it enables the possibility of creating, perceiving, and realizing change promptly. Alaimo and Kallinikos (2022) posit that the adoption of digital technologies by organizations results in a reduction in reliance on domain knowledge data and a corresponding adjustment in the level of involvement of internal and external actors within the organization. This, they argue, increases the centrality of organizational structure. Zuo-Jun (2021) identifies the advent of digitalization as a catalyst for innovations in supply chain management practices. As technology continues to evolve, supply chain management theory and practice will likely continue to evolve in imaginative ways. In their study, Homburg et al. (2021) found that digital business capabilities contribute to organizational performance, but that this relationship is moderated by technological turbulence, organizational structure, and firm type. Alaimo et al. (2021) argued that as digital transformation evolves, digital technology reinforces the traditional functions of data as a management and control tool, but also reconfigures and extends its role. In terms of negative impacts, digital transformation gives rise to some ethical issues, employment-related concerns (Balsmeier and Woerterb, 2023; Cirillo et al., 2021), paradoxical problems (Menz et al., 2021; Shin-Yuan et al., 2023) and risk-related challenges (Agarwal et al., 2010; Kathuria et al., 2023). Balsmeier and Woerterb (2023) posit that Investment in digital technology is clearly correlated with the employment of high-skilled workers while negatively correlated with the employment of low-skilled workers, resulting in a net positive effect on employment. Cirillo et al. (2021) advance the argument that the impact of digitization on employment is influenced by the extent to which tasks within each occupation are routine. For example, occupations that are positioned at the more labor-intensive phases of the production process may be susceptible to replacement due to the implementation of digital technologies aimed at substituting human labor. Menz et al, (2021) observe that, in the background of the rapid development of digital technologies, while the digital era has brought about significant changes to business and management practices in general, digital transformation has increased the ambiguities and paradoxes surrounding the strategic direction of future development. Agarwal et al. (2010) found that information technology is improving the safety, affordability, and usability of the healthcare system. However, significant challenges remain in improving the quality of care and decreasing the cost of care. Kathuria et al. (2023) argued that for family businesses, investment in digital technologies poses a dilemma because it is risky but must be pursued in the long term. As observed by Shin-Yuan et al. (2023), the advent of digital transformation can engender task conflict, which in turn has the potential to impact the functionality of essential business processes and the operational cash flow of an enterprise. However, the very nature of task conflict can also facilitate the innovative design of updated systems that integrate data, platforms, and software across operational functions. Table 1 presents a multi-dimensional framework of digital transformation.

Table 1. A multi-dimensional framework of digital transformation

Antecedents	Mechanism	Result
Resource level: digital technology, digital resources, and digital innovation; organization level: establishment of chief data officer position, participation of middle managers, the technical orientation of CEO, family business needs, and promotion of digital technology; environment level: customer needs, government policies, and external environment innovation mechanism: application of new resources, course, and capabilities to the organization.	Innovation mechanism: involving the application of new resources, and capabilities to the organization; Integration mechanism: it means to integrate new resources, processes, and capabilities with existing resources, processes, and capabilities.	Positive impact: improve enterprise resilience, change organizational boundaries, promote the centralization of organizational structure, supply chain management innovation, and improve enterprise performance; Negative effects: moral issues, employment issues, paradoxes issues, risks, and challenges.

4.Conclusions and Discussion

4.1 Research Conclusion

In the context of the digital age, digital transformation has become a necessity for the future development of companies. Digital transformation drives strategic change within and between companies and enables new forms of value creation (Scott and Orlikowski, 2022). The field of digital transformation research has improved over the past two decades, resulting in a substantial body of literature. Over the past two decades, a substantial corpus of literature has emerged on this topic. Our search yielded 400 documents, sourced from the UTD24 and FT50 journal lists. After a rigorous process of culling and review, we arrived at four key conclusions.

Firstly, publication trends. This paper finds that the number of publications on digital transformations' number in UTD24 and FT50 journals has increased annually from 2004 to 2023, with the most significant growth occurring in 2021 and reaching its highest point in 2023 with 14 publications. Overall, the literature on digital transformation is expanding, and digital transformation is emerging as a dominant trend in future development.

Secondly, this paper presents a summary of the antecedents of digital transformation, organized according to three levels: resource, organizational, and environmental. At the resource level, digital transformation is characterized by the presence of digital technology, digital resources, and digital innovation. At the organizational level, the creation of the Chief Data Officer position (Firk et al., 2021) and the involvement of middle managers (Angelopoulos et al.) are identified as key antecedents. Additionally, the technological orientation of the CEO (Filatotchev et al., 2023) and the necessity and influential role of digital technology in contexts such as family businesses (Kathuria et al., 2023) are also pertinent considerations. Finally, the environmental dimension encompasses customer needs (Scott and Orlikowski, 2022), government policies (Bodrožić et al., 2022), and the external environment (Kwan et al., 2023; Copestake et al., 2024).

Thirdly, the mechanism of the impact of digital transformation. This paper identifies two principal mechanisms of digital transformation: integration and innovation. The innovation mechanism encompasses the deployment of novel resources, processes, and functions that are new to the organization. In comparison, the integration mechanism is pivotal in combining these new with existing elements within the organization (Hanelt et al., 2021).

Fourthly, this paper presents a summary of the impact consequences of digital transformation, categorizing these as either positive or negative. Amongst the positive impacts, digital transformation has been observed to enhance firm resilience (Copestake et al., 2024; Russell et al., 2024). Furthermore, digital transformation (2023) alters organizational boundaries (Prügl and Spitzley, 2021), reinforces the significance of organizational structure (Alaimo and Kallinikos, 2022), innovates supply chain management (Zuo-Jun, 2021), and enhances business performance (Homburg et al., 2021). Conversely, digital transformation (2023) gives rise to ethical concerns and employment-related issues (Balsmeier and Woerterb, 2023; Cirillo et al., In addition, digital transformation has been found to give rise to several other issues, including ethical concerns (Menz et al., 2021; Shin-Yuan et al., 2023), paradoxical problems (Menz et al., 2021; Shin-Yuan et al., 2023), and risk challenges (Agarwal et al., 2010; Kathuria et al., 2023).

4.2 Research contributions

This paper takes 54 high-quality digital transformation articles published in UTD24 and FT50 as research samples to outline the overview of digital transformation research and provide research ideas to promote digital transformation research. The paper proposes a research framework of digital transformation from the logical chain of "antecedents-mechanisms-consequences". Furthermore, the paper puts forward future research ideas of digital transformation from the antecedents, consequences, research methods, and types of enterprises, which is conducive to further promoting digital transformation research.

4.3 Future Research Perspectives

Firstly, it is necessary to consider the antecedent aspects of digital transformation. Stark et al. (2023) posit that the expectation of Industry 4.0 is to mobilize industry to identify improvement opportunities and bridge the gap between potential and reality. However, there is a paucity of both exemplars and comprehension of how to actualize the advantages of digital transformation in manufacturing in comparison to more mature improvement opportunities, such as lean manufacturing. The existing research has primarily investigated the driving influence of digital transformation at the resource level, with a paucity of research at the organizational level. A few studies have focused on the role of chief digital officers and middle managers in driving digital transformation. Future research could focus on the impact of other types of expert leaders on digital transformation. For instance, Menz (2021) posits that future research should focus on the negative impact that chief digital officers can have on digital transformation.

Secondly, the consequences of digital transformation warrant further investigation. On the one hand, future research could focus on the effect of digital transformation on firms' competitive strengths, company size, scope and boundaries, and internal structure. On the other hand, it is important to recognize that digital transformation is not a smooth ride and that it may trigger some negative impacts and fail to achieve the desired goals. Digital transformation may give rise to several ethical and moral issues, including those about privacy, discrimination, workers' rights, and regulation (Zalmanson et al., 2013). Research may focus on the ethical and moral issues that arise from digital transformation. Furthermore, the global war for talent is likely to intensify further with digitalization, which requires an increasing number of skills and competencies from employees (Balsmeier and Woerter, 2023). Future research may focus on the paradoxical problem of digital transformation (Ribeiro et al., 2023), namely that despite the investment of digital resources, the expected results are not achieved. For example, Ribeiro et al. (2023) argue that future research needs to better understand the relationship between digitization and employee performance.

Thirdly, the methodology employed in existing research on digital transformation is predominantly descriptive and quantitative. However, future research could benefit from exploring the phenomenon of digital transformation in greater depth by the use of experimental methods and qualitative comparative analysis.

Fourthly, the aspect of firm types is worthy of further investigation. Existing studies have primarily focused on common firm types as samples, yet there are significant discrepancies in the digital transformation of different types of firms. To derive conclusions that are actionable and beneficial for practice, digital transformation has compelled all types of firms to proactively adopt digital technologies to gain and maintain competitiveness (Wielgos et al., 2021). Future research could concentrate on the digital transformation of different types of firms, such as family firms (Kathuria et al., 2023), and healthcare firms (Steinhauser et al., 2020) versus small and medium-sized companies(SMEs), has been the subject of much research. For example, Kathuria et al. (2023) argue that for family firms, investments in digital technologies pose a dilemma because they are risky.

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