An Introduction to Digital Transformation

Patrick Mikalef (ID) **and Elena Parmiggiani** (ID)

Abstract Digital transformation has been one of the most studied phenomena in information systems (IS) and organizational science literature. With novel digital technologies emerging at a growing pace, it is important to understand what we have learned in over three decades of research and what we still need to understand in order to harness the full potential of such digital tools. In this chapter, we present a brief overview of digital transformation and develop a conceptual framework which we use as a basis of discussing the extant literature. The conceptual framework is also used as a means of positioning the empirical chapters presented in the rest of this edited volume. Finally, we discuss the role of context in digital transformation and identify some differences that span industry, domain, size class, and country of operation.

1 Introduction

Digitization, digitalization, and digital transformation are terms that often appear in the top of priorities for contemporary managers. While often used synonymously, these notions have very different meanings and entail a radically different approach. Digitization describes the process of moving from analog to digital, while digitalization is defined as "the way many domains of social life are restructured around digital communication and media infrastructures" [1]. Finally, digital transformation has been defined as "a process that aims to improve an entity by triggering significant

P. Mikalef
Department of Computer Science, Norwegian University of Science and Technology, Trondheim, Norway

Department of Technology Management, SINTEF Digital, Trondheim, Norway
e-mail: patrick.mikalef@sintef.no

E. Parmiggiani (✉)
Department of Computer Science, Norwegian University of Science and Technology, Trondheim, Norway
e-mail: parmiggi@ntnu.no

changes to its properties through combinations of information, computing, communication, and connectivity technologies" [2]. Although largely acknowledged that these three terms often follow a sequential order of maturity, most contemporary organizations are now in the process of digitally transforming their operations. Doing so, however, presents a number of caveats, and technology is often only a part of the complex puzzle that must be solved to remain competitive in the digital world.

While there has been a significant amount of research conducted over the past decade in the domain of digital transformation, there is still a lot to learn about this shift. This is largely because digital transformation is subject to a vast array of contingencies and takes place in a fluid and constantly changing environment which requires a holistic understanding of the entire ecosystem in which it unfolds. Among the vast empirical research conducted examining the phenomenon of digital transformation, researchers have examined changes in organizational strategies [3], process [4], structures and decision-making organizing [5], culture [6], as well as industry shifts [7]. Nevertheless, digital transformation is not a phenomenon that prompts effects at these different levels, without at the same time being influenced by them simultaneously. Therefore, there is a complex interplay between the forces that affect digital transformation and its effect on them.

For this article, we ground our understanding of digital transformation on the abovementioned definition of Vial (2019). This definition regards digital transformation as a process that encompasses significant changes through the introduction of information and communications technologies (ICTs). Extending the work of Vial (2019), we develop a conceptual model which incorporates theoretical insight from the literature on digital business strategy [8], organizational change management [9], and IT capabilities [10]. The conceptual model serves as a basis for positioning the cases presented in the remainder of the book, as well as for developing a comprehensive understanding of digital transformation as studied in the extant literature. We want to highlight here that the conceptual model presented in this article serves the purpose of creating a comprehensive understanding of what the concept entails, without having emerged from a systematic process of reviewing all relevant literature. Rather, it builds on prominent research streams that have appeared over the years, as well as on the authors' own perspectives.

The next section introduces the conceptual model of digital transformation and presents some key themes that have occupied academic and practical interest over the past decades. In sequence, we briefly touch upon the implications that research has had on practice and conclude with a brief description of the subsequent chapters and the different domains they cover.

2 A Conceptual Model for Digital Transformation

Building on the extant literature on digital transformation, and grounded on the synthesis of recent prominent literature reviews [2, 9], we develop a consolidated perspective of digital transformation as depicted in Fig. 1. The conceptual model makes the distinction between digitalization, which only involves the improvement of organizational activities by leveraging digital technologies, and digital transformation which entails a deeper, core change of the entire business model of an organization with ripple effects on entire industries. Thus, digital transformation requires a broader view of antecedents that spark or condition changes within organizations, as well the outcomes that such changes have on the broader context of operating. By applying this understanding in our conceptual model of digital transformation, we define four key points of interest which are described in more detailed in the sub-sections below. These are by no means exhaustive, and there are obviously complex causal and feedback associations between the key elements that jointly comprise digital transformation. For the sake of simplicity and to provide a concise and understandable overview of digital transformation, this article presents some of the key findings within the four main areas: antecedents, leveraging digital technologies, value generation, and performance.

2.1 Antecedents

Antecedents of digital transformation include elements that trigger and shape digital transformation [11]. Such antecedents either have a direct relationship in shaping the actions organizations must undertake to transform their business strategies and operations or act as moderating conditions which influence the way digital transformation is enacted.

Emerging digital technologies are obviously one of the key drivers of prompting changes and disruptions in how organizations operate. Over the past decade, the pace at which such new digital technologies are maturing and reaching production has accelerated, with technologies such as augmented/virtual reality, 3D printing, IoT, cloud computing, blockchain, drones, digital twins, and machine learning, to name a few, creating massive disruptions in entire industries [12]. A prominent example has been the proliferation of cloud computing services which has enabled organizations to deploy digital solutions throughout their value chains, which were previously unable to do so due to the high cost of setting up and maintaining scalable local infrastructure.

Nevertheless, emerging digital technologies alone are insufficient to produce digital transformation effects, as they are heavily dependent on the organizational context in which they are introduced. The history of an organization and the structures, culture, skills, and leadership commitment play an important role not only toward what types of digital technologies will be embraced but also at what
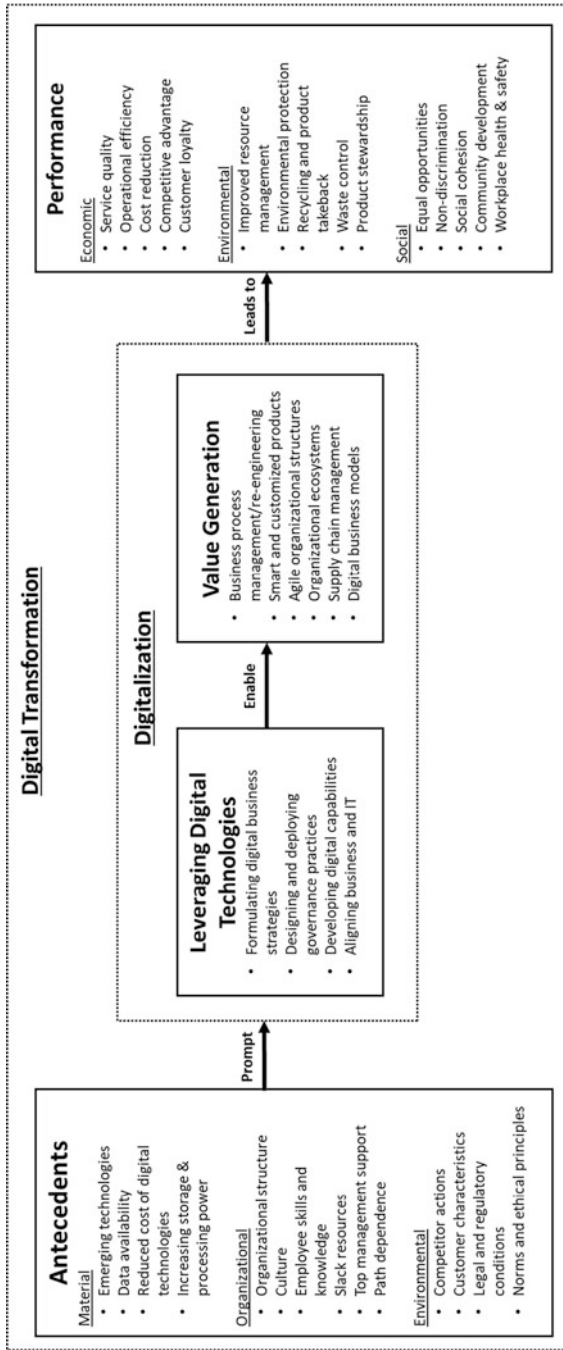
Fig. 1 Conceptual framework of digital transformation

speed and to what breadth within organizational activities [13]. As with any organizational change, rigidity, path dependence, and resistance to change can significantly impact efforts toward digitally transforming operations. These effects can manifest themselves at different levels within an organization and at different stages of deploying digital technologies [14]. Hence, there are numerous tensions that manifest during the process of digital transformation which can either enable or impede diffusion [14, 15].

Similarly, there are forces from the external environment that can prompt or restrict the digital transformation process of organizations. For example, changes in customer behavior or their expectations can necessitate strategic responses from organizations in order to address the new requirements [16]. On the other hand, such prompts may be a result of competitive actions which then spark a snowball effect in entire industries. Some examples of this are the use of touchscreens on mobile devices or the use of digital distribution channels for audio and video content which sparked a major disruption through streaming services [17]. Yet, changes in how digital transformation is deployed can also be a result in new laws and regulation or even based on acceptable social norms and ethical practices.

2.2 Leveraging Digital Technologies

The process of leveraging digital technologies consists of different levels of planning and deploying novel solutions. Studies within the digital transformation literature have shown that the process of doing so includes elements such as developing strategies of how such transformations will take place, therefore linking digital transformation to the overall strategy of organizations [3]. In addition, there is a requirement to convert strategies into deployable practices with concrete rules, process, structures, and a timeline of activities in order to be able to orchestrate and manage all relevant resources [18].

In this stream of research, there have been studies that have examined digital transformation from a number of different standpoints, such as identifying how digital transformation strategies should be designed and implemented [3], to understanding resource structuring and capability building to leverage different types of novel digital technologies [19]. Nevertheless, there has been significant heterogeneity in findings around how to digitally transform based on the varying emerging technologies that are prevalent at different points in time. The focus has thus shifted from integrated large-scale information systems, such as enterprise resource planning (ERP) and customer relationship management (CRM) systems, to distributed, decentralized, and cross-organizational technologies that facilitate real-time information exchange and knowledge management. During the past 5 years, the focus has shifted on leveraging data analytics technologies that utilize big data, as well as on sophisticated forms of analytics which fall under the umbrella term AI [20, 21]. Such technologies create novel forms of transformations for organizations that can

generate more accurate insight into complex processes, as well as automate many previously manual tasks.

2.3 Value Generation

The forms and scale of value generation from digital transformation have shifted as different emerging technologies mature. While previously digital technologies were used to enhance prior tasks and processes, they are now creating opportunities for organizations that were previously impossible to conceive. For example, the introduction of AI in the pharmaceutical domain in conjunction with the advancing knowledge on genomes has given rise to the novel approach of pharmacogenomics. Furthermore, the scale, speed, and accuracy that can be achieved by leveraging various digital technologies vastly outperform manual ways of executing different tasks. An example of this is the use of recommender systems to provide personalized recommendations to millions of consumers, such as those implemented by Amazon [22]. Nevertheless, the use of digital technologies and leveraging them in the organizational sphere do not only concern marketing and end products. Many digital technologies are now commonly used in organizations in order to improve collaboration and communication and enhance knowledge capturing and sharing, as well as in improving information linkages with external parties such as supplies and other business partners [23].

Value generation by leveraging different digital technologies has been studied extensively from different streams of research. These include the IT capabilities stream of research which seeks to understand how digital technologies along with complementary resources can be converted into hard-to-replicate organizational capabilities that can confer value [24]. In an attempt to understand what digital technologies enable organizations to do, another prominent stream has adopted an affordance perspective, which seeks to examine the way in which novel technological tools can afford individuals and organizations to perform certain actions [25]. Studies that adopt the affordance perspective seek to understand not only what digital technologies can enable organizations to do with the different types of functions offered but also how the process of leveraging unfolds [26]. From a strategy point of view, several studies have examined digital transformation through the lens of how it can support or drive business strategies [27]. The main argument in such studies is that digital transformation should be seen through the lens of the strategic direction organizations want to pursue. Thus, any use of digital technologies must be driven by the strategic orientation of the organization at hand [28].

2.4 Performance

One of the central areas of inquiry within the IS domain has been to gauge the degree to which digital transformation results in tangible performance outcomes for organizations. Most studies have emphasized on economic-related measures of performance such as financial performance or the degree to which digital transformation results in a competitive advantage for firms [17]. This trend has been driven by the fact that investments in novel and often costly digital technologies must justify a financial return [29]. In addition, such economic measures of performance are the predominant way of assessing the impact of digital technologies within the IS domain, which follow studies that are grounded in disciplines such as economics, organizational science, and strategic management. Furthermore, other types of performance metrics such as environmental and social have until recently not been considered as primary to organizational operations. Nevertheless, with the focus on responsible and sustainable business models that promote inclusiveness and social cohesion, studies on digital transformation have begun to examine the effects that such transitions have on these types of outcomes [30]. Several articles have also begun to examine how novel digital technologies can support specific strategies that fall under such paradigms and what the performance effects are using new types of metrics [31, 32]. Yet, while there are an increasing number of studies that take a broader view of performance measures to determine the impact of digital transformation, there are still several research streams that have yet to be integrated or adopted in the IS domain. We discuss these and other opportunities for research and practice in the concluding sections.

3 Context-Driven Digital Transformations

Much of what we briefly described in the previous section highlights the contextual nature of digital transformations. From the drivers that either enable or inhibit organizations to commence their journey of digitally transforming operations, to the contingency elements that underpin the activities of leveraging such digital technologies, to the types of effects that are realized, much of what has been found in the literature on digital transformation underscores the important role of context [33]. Nevertheless, context and contingency elements can come in many "shapes and sizes" and oftentimes involve more than one important element that has an important bearing on the entire process.

For instance, there is a large divide in the literature regarding digital transformation in the private and public sector. These studies have documented that there are significant forces that influence not only the types and outcomes of digital transformation but also the speed of adoption, pace of deployment, and forms of work within the different types of organizations [34, 35]. Similarly, large differences have been identified when comparing among firms that belong to different industries

[36, 37]. The organizational processes that are digitally transformed in various industries are largely dependent on how important they are for the organization at hand. For example, robotic process automation has been central for many firms in the manufacturing or assembly industries since it vastly improves efficiency and cost reduction. On the other hand, being able to maintain good customer relationships, improving profit margins from customers, and identifying untapped market segments have been at the core of retail companies. Therefore, it is interesting to try to draw a mental image of how novel technologies might reshape different industries in a number of varying ways.

Finally, an important contextual dimension when examining digital transformation has to do with the country or region in which such transformation takes place. Several studies have documented that cultural, socioeconomic, and political elements can have a profound effect on what organizations do with new digital technologies, as well the ways in which they leverage them. Country-specific studies have elucidated such practices and shed some light on how organizations engage in the process of digital transformation. As a country with many unique characteristics in terms of socioeconomic and political history, Norway presents an interesting context to study digital transformation. In the next chapter, we present a historical overview of digital transformation in Norway and identify some of these important contextual elements.

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