Resource integration and firm performance through organizational capabilities for digital transformation

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Abstract

Purpose – Digital transformation is a foundational change in how firms operate and deliver value to customers by using digital technologies to create new business opportunities. The purpose of this study is to offer a conceptual framework by reorganizing the elements of digital transformation, including resources, technology, capabilities and performance, into a workable process and investigating how firms integrate these resources, build new capabilities and transform them into enhanced performance.

Design/methodology/approach – This framework builds three blocks: resource integration, organizational capabilities and outcomes, exploring the impact of resource integration on outcomes through organizational capabilities. For resource integration, this study adopts a resource-based view (RBV) and service-dominant logic (SDL) to integrate organizational resources, including information technology (IT)-based resources, which play a role in moderating the effect of resource integration. Moreover, the author argues that firms' capabilities have two levels: higher-order capabilities and lower-order capabilities, which will convert these resources through the capabilities into organizational performance.

Findings – This framework is built to understand the process of digital transformation and its antecedents for firms' performance in business environments. Drawing on RBV, it provides a more holistic perspective that has been linked to resource integration, organizational capabilities and outcomes at the firm level. In this way, the theoretical basis for diminishing implicitness associated with the current perspective of digital transformation can be strengthened.

Originality/value – This paper offers a coherent discussion of digital transformation and explains the process of digital transformation, thus advancing prior work. The major contribution is connecting the process of digital transformation through which firms integrate resources, i.e. digital technologies and valuable, rare, inimitable and nonsubstitutable (VRIN) and nonVRIN resources as well, to build organizational dynamic capabilities based on RBV and SDL.

Keywords Digital transformation, Digital disruption, Resource integration, Dynamic capabilities, Business model

Paper type Research paper

1. Introduction

Digital transformation is a foundational change in how firms operate and deliver value to customers by using digital technologies to create new business opportunities in response to market disruptions. Digital transformation is often confused with two similar concepts: digitization and digitalization. "Digitization" is the process of transforming analog information into a digital format such that computers can store process and transmit such information; for example, converting handwritten records into computerized records

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(Verhoef *et al.*, 2021). "Digitalization" is the process of applying digital technology and capabilities to change existing business processes. Comparatively, "digital transformation" is a drastic transformation brought about by digital technologies to not only a firm's business but also the entire economy and society (Kim, Choi, & Lew, 2021). According to the conceptual definition from Vial (2019), digital transformation is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies". It leads to major changes in business processes, operational routines, organizational capabilities and even the markets for the business (Singh, Sharma, & Dhir, 2021).

Kraus *et al.* (2022) summarizes the different digital transformation definitions with different focus on technology, organizations, customers, processes, operations, performance and business models. In general, digital transformation covers many elements mainly including technology, business and society (Reis, Amorim, Melão, & Matos, 2018; Van Veldhoven & Vanthienen, 2022) in which firms develop a new digital business model to create value (Vial, 2019; Verhoef *et al.*, 2021; Singh *et al.*, 2021; Wengler, Hildmann, & Vossebein, 2021). "Technology" includes the popular social, mobile, analytics, cloud and the Internet of Things (SMACIT), "business" the internal business processes, connectivity between suppliers and customers, offerings (products and services), organizational structure and business model (Van Veldhoven & Vanthienen, 2022), while "society" includes people, community, institution and value.

Indeed, although there is no established definition of digital transformation, much literature has addressed the links between digital technologies and business model to build dynamic capabilities, e.g. digital sensing, digital seizing and digital transforming capabilities, for digital transformation (Warner & Wäger, 2019; Kraus *et al.*, 2021; Imran, Shahzad, Butt, & Kantola, 2021). It is the process of using digital technologies to modify existing business processes under institutions by integrating resources from suppliers and customers to create value. In this definition of digital transformation, many scholars emphasize the importance of restructuring business processes through digitalization. For example, "business process re-engineering (BPR) " or "enterprise resource planning (ERP) " focuses on the analysis and design of workflows and business processes within an organization, while "service design" stresses redesigning the process of integrating resources in creating service innovation for customers. All these transformations are aimed to restructure the process by using technologies within an organization involved in elements including resources (operant and operand resources), actors (suppliers and customers), institutions and value.

Recent studies have made efforts to build conceptual frameworks by reorganizing the elements of digital transformation with a view to create new business models. Some are focused on business and society (e.g. Van Veldhoven & Vanthienen, 2022; Wengler *et al.*, 2021; Imran *et al.*, 2021), others are organizational change (e.g. Hanelt, Bohnsack, Marz, & Marante, 2021; Verhoef *et al.*, 2021) and still others are dynamic capabilities (e.g. Warner & Wäger, 2019; Magistretti, Pham, & Dell'Era, 2021; Konopik, Jahn, Schuster, Hoßbach, & Pflaum, 2022). In this study however, our main focus is on the business process in the context of digital transformation where digital technologies play a leading role bringing about disruption in the competitive environment and then consequently reconfigure elements of their business model. In doing so, firms can incorporate digital technologies into resource integration to build organizational dynamic capabilities and support the ongoing digital transformation.

More specifically, this study will build links between resource integration, digital technologies, organizational capabilities and firm performance and develop a conceptual framework to explain the digital transformation based on resource-based view (RBV) and service-dominant logic (SDL). In this process, by using digital technologies, firms are expected to improve resource integration, enhance organizational capabilities and finally improve

organizational performance. According to Vial (2019), digital transformation is a process where digital technologies create an impetus for firms to sense disruptions, seize them and to reconfigure elements of their business model. Through the three main mechanisms, e.g. sensing, seizing and transforming, from dynamic capabilities, firms can adapt to changes in their environment and sustain competitive advantage (Teece, 2007). Dynamic capabilities, distinguished from ordinary capabilities, emerged from the RBV in explaining how firms react, adapt and respond to changes in volatile environments and convert resources into improved performance (Teece, Pisano, & Shuen, 1997; Pan, Pan, & Lim, 2015; Vial, 2019).

The main purpose of this study, therefore, is to offer a conceptual framework by reorganizing the elements of digital transformation, including resources, technology, capabilities and performance, into a workable process and investigate how firms integrate these resources, build new capabilities and transform them into enhanced performance. The remainder of this paper is structured as follows. It first reviews the literature related to digital transformation. It then gives the theoretical background about digital technology and disruption, resource integration and dynamic capability linked to RBV in Section 3. In Section 4, it offers a conceptual framework that links organizational capabilities, resources integration and performance outcomes and develops a set of propositions corresponding to the framework. Finally, it presents the discussions and conclusions in Section 5.

2. Digital transformation

In the existing literature, digital transformation does not have a unified definition both in the academic and practitioner communities (Van Veldhoven & Vanthienen, 2022; Gong & Ribiere, 2021). Gong and Ribiere (2021) tries to develop a unified definition of digital transformation that differentiates from the related key terms (e.g. digitalization and digitization) and identifies the core attributes of the digital transformation definition. They explain that considerable confusion and misconception in the extant literature fail to distinguish adequately between the three similar concepts digitization, digitalization and digital transformation. According to Gartner's Information Technology (IT) Glossary, digitization is the process of changing from analog to digital form, digitalization is the use of digital technologies to change a business model, while digital transformation refers to anything from IT modernization to digital optimization, to the invention of digital business models (Gartner, 2022).

Digital transformation is a process consisting of various stages in using advances in digital technologies to build capabilities that create new or modify existing organization's business model within firms, ecosystems, industries, or fields (Warner & Wäger, 2019; Wengler *et al.*, 2021; Kraus *et al.*, 2022; Konopik *et al.*, 2022). The technologies are transforming the society and business that are confronted both internally and externally with novel challenges (Magistretti *et al.*, 2021; Van Veldhoven & Vanthienen, 2022). Digital transformation highlights the modification of processes, products, business models and human behaviors by digital technologies with the aim of designing the organization's activities more efficiently and effectively to achieve better performance and competitive advantage (Singh *et al.*, 2021; Wengler *et al.*, 2021; Li, 2022). In other words, digital transformation goes beyond digital technologies recognized as a holistic socio-technical challenge resulting in drastic consequences for economies, societies, organizations and individuals (Singh, Klarner, & Hess, 2020; Konopik *et al.*, 2022). Van Veldhoven and Vanthienen (2022) propose an interaction-based digital transformation framework which covers three axes: digital technologies, business and society, to better understand the changes in organizations.

Based on the literature review, Vial (2019) develops a conceptual inductive framework to describe digital transformation as a process which comprises eight building blocks: (1) use of

digital technologies, (2) disruptions, (3) strategic responses, (4) change in value creation paths, (5) structural changes, (6) organizational barriers, (7) positive impacts and (8) negative impacts, as depicted in Figure 1. In this conceptual framework, digital technologies (e.g. SMACIT), plays a central role in the creation which brings about the reinforcement of disruptions taking place at the society and industry levels (e.g. consumer behavior and expectations) (A1 in Figure 1). These disruptions trigger strategic responses from organizations (A2) which then devise ways to remain competitive as digital technologies (A3). After that, organizations use digital technologies to implement structural changes (A5) and overcome barriers (A6) from transformation effort and then alter the value creation paths (A4). These changes finally lead to positive impacts (A7) and negative impacts (A8) for organizations, society and individuals.

Different from Vial's framework, Gong and Ribiere (2021) develops a digital transformation conceptual framework in building blocks and explains key elements involved in the process of digital transformation. These key elements include technologies, resources, capabilities and outcomes, linking the blocks of digital transformation. Specifically, firms push digital transformation by wisely using digital technologies and strategically leveraging their resources and capabilities toward business model innovation and then turn specific desired outcomes including economic-driven outcomes (e.g. efficiency, productivity) and capability-driven outcomes (e.g. leadership, competitive advantage), as depicted in Figure 2.

Comparatively, Kraus *et al.* (2022) determine five thematic areas: (1) structural changes and changes in value creation, (2) use of digital technologies, (3) dynamic capabilities, (4)

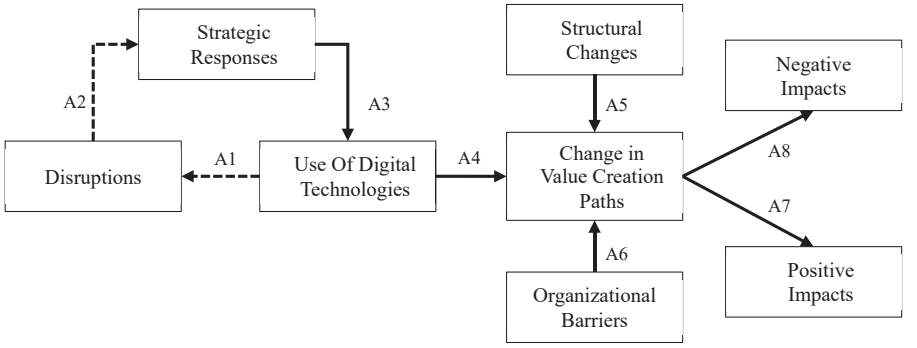


Figure 1.
Building blocks describing digital transformation as a process

Source(s): Vial (2019)

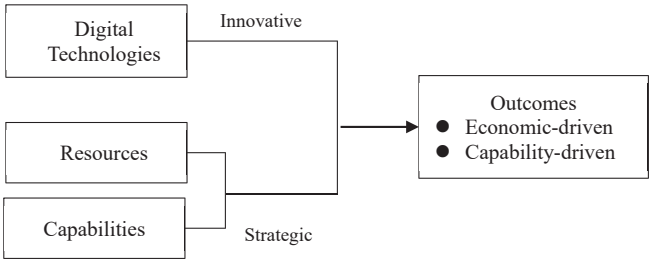


Figure 2.
Building blocks of digital transformation linking the key elements

Source(s): Gong and Ribiere (2021)

strategic response and (5) consumer behavior, following Vial's building blocks. Especially, given the structural changes in industries, Kraus *et al.* (2022) develops a synergistic framework focusing on dynamic capabilities and big data from the RBV. Wengler *et al.* (2021), however, put more emphasis on the market-oriented transformation model following the technology-oriented development stage through which digitization, data integration, process automation system integration and self-learning systems support the evolving processes, whereas Imran *et al.* (2021) put more on the key enablers of digital transformation including leadership, structures and culture for achieving performance outcomes. Obviously, scholars demonstrate different focus from different perspectives on the digital transformation.

3. Theoretical background

3.1 Business models triggered by digital technologies and disruption

One of the main objectives of digital transformation is to utilize digital technologies (e.g. SMACIT) and increase the efficiency of business processes, gain competitive advantage and create new business models from disrupting conventional industry and business logics. In definition, digital disruption is a transformation caused by emerging digital technologies to fundamentally alter historically sustainable logics for a change of customer experiences, business processes and business models that affect value propositions in an ecosystem (Skog, Wimelius, & Sandberg, 2018; Thakur, AlSaleh, & Hale, 2023; Högberg & Willermark, 2022). Thakur *et al.* (2023) proposes that there are two drivers of digital disruption: technology-induced and organization-induced drivers. In other words, digital technology alone cannot improve organizational value much; rather, it is the use in a specific context that empowers the organization to create value, e.g. involving a change in business models.

Vial (2019) argues that digital transformation is a process where digital technologies create disruptions at the society and industry levels and trigger strategic responses from organizations that affect the positive and negative outcomes of this process. Essentially, digital technologies are described as inherent sources of disruption. According to Gartner (2022), digital disruption is an effect that changes the fundamental expectations and behaviors in a culture, market, industry, or process through digital capabilities. With dynamic capabilities, firms sense disruptions, seize them (e.g. through strategic responses) and reconfigure elements of their business model for digital transformation (Teece, 2007; Vial, 2019).

Bradley, Loucks, Macaulay, Noronha, and Wade (2015) stresses that digital disruption arises from digital technologies and business models on a value proposition of incumbent firms. According to Skog *et al.* (2018), digital disruption is a type of digital technology-induced environmental turbulence capable of producing industry-level upheaval. By using disruptive technologies, digital disruption has the potential to overturn existing business models for incumbent firms. However, many established companies are still sticking to their existing business models reluctant to the disruptive changes. Matzler, Friedrich von den Eichen, Anschober, and Kohler (2018) notes that for these companies, they may need to deploy digital technologies for new business models to the advantage of their customers if they would succeed in digital disruption.

Regarding the business model, DaSilva and Trkman (2014) stress that business model is more appropriate to describe it as a managerial "philosophy", rather than as a "approach", through which firms combine the resources and consequent transactions to strengthen their dynamic capabilities rooted in the RBV and in the transaction cost economics. In this digital environment, a business model is faced with the disruptive changes motivated by digital technologies, such as information and communication technologies (ICT) in particular. Digital transformation puts digital technologies at the core of business strategy where firms find ways to refresh or replace an organization's business model, leading to disruptive digital

business models by implementing a new business logic to produce outcome and create value (Warner & Wäger, 2019; Gong & Ribiere, 2021; Verhoef *et al.*, 2021).

3.2 Resource integration from RBV and SDL

According to the modified foundational premise (FP9) from SDL, Vargo and Lusch (2008) and Lusch, Vargo and Tanniru (2010) note that all social and economic actors are resource integrators in networks through the combination of competences, relationships and information. Specifically, Lusch and Vargo (2014) draw on a definition of service ecosystems as "relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange." Accordingly, resource integration can be defined as a continuous process where actors combine and apply resources to produce the outcome for value creation (Kleinaltenkamp *et al.*, 2012; Bruce, Wilson, Macdonald, & Clarke, 2019).

In SDL, resources are categorized as operand and operant resources where operand resources require activities to become valuable (e.g. physical natural resources, raw materials, or physical products), while operant resources are often dynamic and intangible (e.g. knowledge and skills) (Eletxigerra, Barrutia, & Echebarria, 2018). As for the "technology", it can play a dual role of operant and operand resources. Not only can technology be an operant resource because it is constituted by dynamic resources (knowledge and skills), but also serve as an appliance which conveys dynamic resources acting on other resources (Akaka & Vargo, 2014; Lusch & Nambisan, 2015; Eletxigerra *et al.*, 2018).

From the RBV, on the other hand, which addresses the valuable, rare, inimitable and nonsubstitutable (VRIN) resources (Barney, 1991), firms integrate all tangible and intangible assets and capabilities to implement competitive strategies related to performance where IT assets can play a strategic and synergistic role to create IT-enabled resources (Lin & Wu, 2014; Pan *et al.*, 2015). According to Wade and Hulland (2004), RBV have used different terms to describe a firm's resources including skills, competencies, assets and stocks where capabilities can include skills such as technical or managerial ability, or processes. Barney, Wright and Ketchen (2001) stresses that VRIN resources include a firm's management skills, its organizational processes and routines and the information and knowledge, which distinguish them from tangible nonVRIN resources such as funding and office space. Dynamic capability, in particular, addresses the important role in which firms can build, integrate and reconfigure internal and external resources to cope with or adapt to the highly volatile environment (Teece *et al.*, 1997; Lin & Wu, 2014).

Based on RBV, IT is considered valuable organizational resources that can enhance organizational capabilities and dynamic capabilities and eventually lead to firm-level performance outcomes in its operational and management practices (Wernerfelt, 1984; Liang, You, & Liu, 2010; Parida, Oghazi, & Cedergren, 2016). Specifically, IT resources can be integrated with other nonIT resources into a complementary resource and then influence the effectiveness of business processes and performance (Chen, 2012; Liang *et al.*, 2010). Parida *et al.* (2016) notes that ICT capabilities including the use for internal efficiency, use for collaboration and use for communication, can influence the development of higher-order (dynamic) capabilities.

Consistent with the view of RBV, firms can assemble and deploy IT-based resources, including IT infrastructure, human IT skills and IT-enabled intangibles, in combination with other firms' resources (Bharadwaj, 2000; Wade & Hulland, 2004; Nwankpa & Datta, 2017). IT capabilities are a combination of IT-related resources, skills and knowledge exercised through business processes, that transform these resources and processes to new valuable combinations and build new capabilities through learning resources for efficient creation of desired performance (Stoel & Muhanna, 2009; Jantunen, Tarkiainen, Chari, & Oghazi, 2018).

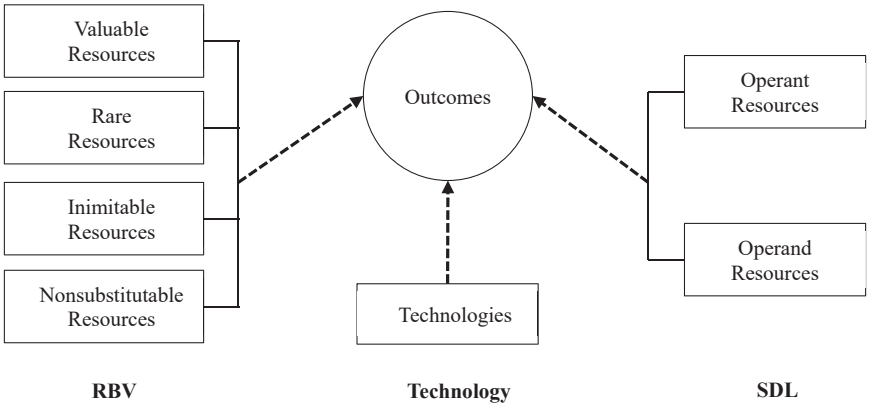
From the SDL perspective, Lusch and Nambisan (2015) and Akaka and Vargo (2014) emphasize the dual role of IT, as an operant resource (skills and knowledge) and as an operand resource (raw materials or physical products), in digital service innovation both for service providers (suppliers) and beneficiaries (customers) in creating value.

Regarding the influence of resource integration on a firm's value creation, therefore, the RBV is parallel to the S-D logic in a sense. As Mele and Della Corte (2013) note, in comparison with SDL, RBV mainly concentrates on the upstream concept with focus on resource interaction within and between firms, while SDL pays attention to the downstream one with focus on resource integration across actors. After the resource interaction or resource integration, firms or actors are expected to produce their desired outcomes: competitive advantage in RBV or value creation in SDL. As for the technology, it plays a dual role in producing an output of and an input for human actions, as an operant resource and as an operand resource for example, in digital transformation (Orlikowsky, 1992; Lusch & Nambisan, 2015). This study illustrates the resource integration from RBV and SDL in Figure 3.

3.3 Organizational capabilities: dynamic and ordinary capabilities

According to Loureiro, Ferreira and Simões (2021), the dynamic capability came from Teece *et al.* (1997) characterizing the set of resources through the RBV of Wernerfelt (1984), subsequently adjusted by Barney (1991). Teece *et al.* (1997) note that dynamic capabilities are the firm's ability to integrate and reconfigure internal and external resources to shape rapidly changing business environments. In other words, firms need dynamic capabilities to sense opportunities and threats, seize these opportunities and the capacity and reconfigure the underlying resources and assets, to remain competitive in the digital age (Teece, 2007, 2014; Vial, 2019; Loureiro *et al.*, 2021; Ellstrom, Holtstrom, Berg, & Josefsson, 2022; Li, 2022). Ellstrom *et al.* (2022) stress that through digital technologies, dynamic capabilities and digital transformation can reshape traditional businesses and require firms to respond to new market opportunities.

Basically, dynamic capabilities are those referred to the higher-order capabilities underpinned by organizational learning and managerial knowledge and skills resulting in more valuable resource bases, which are different from lower-order capabilities resulting in operational-level changes such as changes in managerial practices and technologies used,



Source(s): Barney (1991); Akaka and Vargo (2014)

Figure 3.
Resources from RBV and SDL

including the routine activities and administration on a day-to-day basis (Teece, 2007, 2018; Jantunen *et al.*, 2018; Fainshmidt, Pezeshkan, Frazier, Nair, & Markowski, 2016; Gaviria-Marin, Matute-Vallejo, & Baier-Fuentes, 2021). These routines can be two types: the operational routines (employed in company activities) and dynamic capabilities (those dedicated to altering the operational routines) (Zollo & Winter, 2002; Loureiro *et al.*, 2021). Stated differently, dynamic capabilities, e.g. higher-order capabilities, are a second-order factor, while the ordinary capabilities are a first-order or zero-order factor which reflect change in the firm's operational capabilities including production process (Makkonen, Pohjola, Olkkonen, & Koponen, 2014; Fainshmidt *et al.*, 2016; Jantunen *et al.*, 2018).

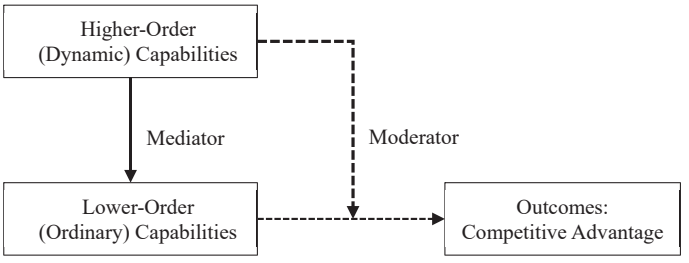
The relationship between the two levels, i.e. higher-order (dynamic) capabilities and lower-order (ordinary) capabilities tend to be complementary, showing the impact of higher-order capabilities on performance mediated by lower-order capabilities (Schilke, 2014; Fainshmidt *et al.*, 2016; Jantunen *et al.*, 2018). Furthermore, dynamic capabilities can also act as a mediating role in transforming resources, including VRIN and nonVRIN, into enhanced performance (Wu, 2007; Lin & Wu, 2014). Schilke (2014) emphasizes the effect of higher-order and lower-order capabilities on performance outcomes and develops two different models whereas in the mediation model higher-order dynamic capabilities lead to an increase in lower-order dynamic capabilities, whereas in the moderation model higher-order dynamic capabilities affect the effectiveness of lower-order dynamic capabilities in increasing performance. These impacting paths are different from the direct effect where both higher- and lower-order capabilities produce performance outcomes.

Figure 4 duplicates the framework of Schilke (2014) which explains the relationship between two levels of organizational capabilities, i.e. higher- and lower-capabilities and produces their outcomes, i.e. competitive advantage. The relationship between two levels of organizational capabilities can be a mediating and/or moderating role.

4. Conceptual framework and propositions

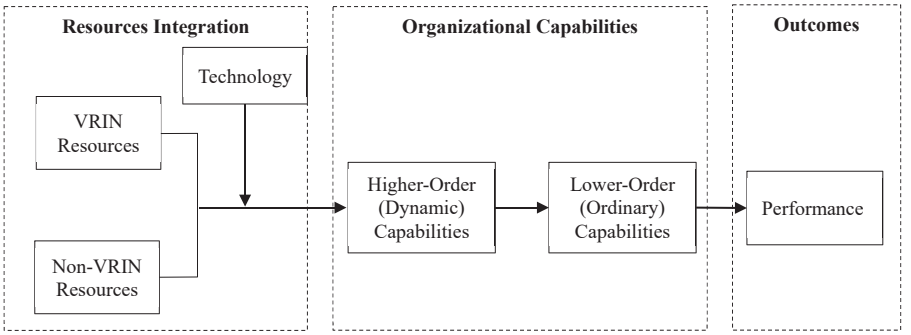
4.1 Theoretical framework and conceptual foundation

Based on the previous research discussed above, we present a conceptual framework depicted in Figure 5. This model aims to understand the process of digital transformation and its antecedents of firms' performance in the business environments. Warner and Wäger (2019) note that the digital transformation has been conceptualized as the use of new digital technologies to create new business models. Vial (2019) states that firms should build their organizational dynamic capabilities to support the ongoing digital transformation where digital technologies can create an impetus for organizations to gain their competitive advantage. Moreover, Gong and Ribiere (2021) also identifies the key elements of digital transformation: technologies, resources, capabilities and outcomes. In this study, therefore,



Source(s): Schilke (2014)

Figure 4.
Higher-order (dynamic) capabilities and lower-order (ordinary) capabilities



Source(s): Author's work

Figure 5.
A conceptual framework

we build a conceptual framework by reorganizing the key elements through the business model based on theories and frameworks from the extant literature including RBV and SDL.

In this framework, we build three blocks: resource integration, organizational capabilities and outcomes, exploring the impact of resource integration on outcomes through organizational capabilities. For resource integration, we argue that firms possess two main types of resources: VRIN resources and nonVRIN resources which will have influences on their dynamic capabilities based on RBV. IT-based resources can play a role in moderating the effect of resource integration in combination with VRIN resources and nonVRIN resources. As for the dynamic capabilities, we argue that firms' capabilities have two levels: higher-order capabilities and lower-order capabilities which will convert these resources through the capabilities into improved organizational performance. Especially, lower-order capabilities play a role in mediating the effect between higher-order capabilities and performance, as shown in Figure 5.

4.2 Propositions

4.2.1 Resource integration and dynamic capabilities in digital transformation. In digital transformation, resource integration is the means by which firms reconfigure various resources and activities within the ecosystem to cocreate value enabled by technology, especially digital or information technology (Lusch & Nambisan, 2015; Sklyar, Kowalkowski, Sörhammar, & Tronvoll, 2019). From RBV, Pan *et al.* (2015) notes that by creating new resources to obtain congruence with the volatile environment, the dynamic capabilities can create new forms of competitive advantage to improve firms' performance. Different from nonVRIN resources, VRIN is central to RBV in providing sustainable competitive advantage where VRIN resources may be able to organize nonVRIN resources (e.g. physical resources and financial capital) in dynamic and fast-changing environments (Lin & Wu, 2014; Van Rijnsoever & Eveleens, 2021; Cuthbertson & Furseth, 2022).

Both VRIN and nonVRIN resources have impacts on firm's dynamic capabilities, just VRIN resources will have a stronger impact than nonVRIN resources as the latter are not rare, inimitable or nonsubstitutable (Wade & Hulland, 2004; Lin & Wu, 2014; Van Rijnsoever & Eveleens, 2021). Specifically, VRIN resources are primary components for firms to achieve their sustained competitive advantage and nonVRIN resources are secondary components to produce positive outcomes; both will enhance their performance outcomes through the mediating effect of organizational capabilities. Drawing upon Lin and Wu (2014), we consequently offer the following two propositions to establish the relationships between organizational capabilities and two different types of resources, i.e. VRIN and nonVRIN resources.

P1. (Strong form). VRIN resources have a positive effect on a firm's higher-order (dynamic) capabilities.

P2. (Weak form). NonVRIN resources have a positive effect on a firm's higher-order (dynamic) capabilities.

4.2.2 Resource integration and dynamic capabilities through digital technology. In SDL, digital technology can play a dual role of operant and operand resources both for its customers and suppliers (firms) in creating value, Recently, digital technology has shifted from operand resources to operant resources as it incorporates more human-like capabilities and increasingly acts without human intervention (Lusch & Nambisan, 2015; Akaka & Vargo, 2014; Sklyar *et al.*, 2019). Past research views information systems (IS) as complementary resources that enhance the value of other organizational resources and capabilities. For example, Bharadwaj, Bharadwaj, and Bendoly (2007) argue that a firm's IS capabilities, integrated with other organizational resources including marketing and manufacturing processes, will be complementary to manufacturing performance.

Digital technology is viewed as complementary resources integrated with VRIN and nonVRIN resources and is often central to the integration process, enhancing organizational capabilities and then improving firm performance (Bharadwaj, 2000; Liang *et al.*, 2010; Chen, 2012). Digital transformation requires a reconfiguration of various resources where digital technology plays a central role in the creation for a change of business processes and business models bringing on reinforcement of disruptions in industries (Skog *et al.*, 2018; Vial, 2019; Thakur *et al.*, 2023). Cuthbertson and Furseth (2022) notes that some of digital resources such as data and algorithms can be VRIN relying on the operant resources that provide the dynamic capabilities to innovate VRIN digital resources.

For this reason, this study views digital technology as a moderator which affects the strength of the relationship between resources and dynamic capabilities. Consequently, we develop the following propositions.

P3a. The association between the VRIN resources and higher-order (dynamic) capabilities is moderated by digital technology.

P3b. The association between the nonVRIN resources and higher-order (dynamic) capabilities is moderated by digital technology.

4.2.3 Relationship between higher-order capabilities and lower-order capabilities. In this study, we argue that there are two levels of organizational capabilities: higher-order capabilities and lower-order capabilities from RBV which are complementary and affect firm performance (Karna, Richter, & Riesenkampff, 2016; Drnevich & Kriauciunas, 2011). Lower-order capabilities are more functional and operational mainly referred to routines that reconfigure the organizational resource base, while higher-order dynamic capabilities are more strategical with core competencies mainly referred to routines that reconfigure lower-order capabilities (Schilk, 2014; Wójcik, 2015; Verreynne, Hine, Coote, & Parker, 2016). Helfat and Winter (2011) note that past studies have distinguished higher-order capabilities from lower-order capabilities where lower-order capabilities enable a firm to make a living in the present, while higher-order capabilities alter how it currently makes its living.

Studies also suggest that higher-level capabilities mediate between resources and performance where resource integration improves firm performance through dynamic capabilities (Wu, 2007; Lin & Wu, 2014; Fainshmidt *et al.*, 2016). Moreover, past research suggests that higher-level capabilities have an impact on lower-level capabilities and in turn on performance outcomes. In a sense, dynamic and ordinary capabilities are complementary at two levels, from higher-level down to lower-level capabilities for improvement (Karna *et al.*, 2016; Jantunen *et al.*, 2018). In other words, the impact of higher-level capabilities on outcomes

may be mediated by lower-level capabilities (Schilke, 2014; Fainshmidt *et al.*, 2016; Jantunen *et al.*, 2018; Zhou, Zhou, Feng, & Jiang, 2019). Consequently, this study develops the following proposition.

P4. Higher-order capabilities have a positive effect on lower-order capabilities.

According to Vial (2019), digital transformation is a process where digital technologies create disruptions from resource integration to organizational capability and lead to the positive and negative outcomes of this process. In SDL, such outcomes of resource integration are referred to the cocreation of value (Vargo & Lusch, 2008; Kleinaltenkamp *et al.*, 2012). From RBV (or the dynamic capability theory, a special case of RBV), such outcomes are referred to the competitive advantages (Barney, Ketchen, & Wright, 2021; Cuthbertson & Furseth, 2022) which lead to superior long-term performance (Barney, 1991; Wu, 2007; Lin & Wu, 2014; Jantunen *et al.*, 2018). Although Wójcik (2015) emphasizes that RBV is criticized for an inability to explain sources of value creation, achieving competitive advantage, or superior performance, this study still adopts the RBV and considers the firm outcomes of digital transformation as improved organizational performance; financial return, operational excellence and marketing performance, for example (Ilmudeen, Bao, Alharbi, & Zubair, 2021).

Schilke (2014) proposes two different models in which firms can utilize the organizational capabilities to improve performance. In the mediation model, higher-order capabilities lead to an increase in lower-order capabilities, while in the moderation model, higher-order capabilities affect the effectiveness of lower-order capabilities in increasing performance. In this study, we argue the mediation effect because many studies have suggested that dynamic capabilities are not directly linked to firm performance (Makkonen *et al.*, 2014; Zhou *et al.*, 2019; Ilmudeen *et al.*, 2021; Kalubanga & Gudergan, 2022). Consequently, this study develops the following propositions.

P5. Lower-order capabilities have a positive effect on firm performance.

5. Discussions and conclusions

5.1 Key findings and discussion

Past research has presented various definitions of digital transformation with different focus on the digital technologies, business processes, organizational capabilities, business models, customer relations, value creation and performance across economies, businesses, societies, technologies and organizations because of lacking a universal and comprehensive understanding (Gong & Ribiere, 2021; Van Veldhoven & Vanthienen, 2022; Kraus *et al.*, 2022; Konopik *et al.*, 2022). In addition, scholars have built different frameworks in explaining the process of digital transformation such as Warner and Wäger (2019), Vial (2019), Gong and Ribiere (2021), Van Veldhoven & Vanthienen (2022), Verhoef *et al.* (2021), Imran *et al.* (2021), Wengler *et al.* (2021), Konopik *et al.* (2022), Kraus *et al.* (2022).

To put these different conceptual frameworks into practice, other authors collect original data to validate the frameworks and provide an overall and comprehensive understanding of these notions, avoiding increased risk of over-interpreting the phenomenon. Most of the empirical studies in digital transformation have adopted qualitative research such as case studies and in-depth interviews (e.g. Warner & Wäger, 2019; Singh *et al.*, 2020; Magistretti *et al.*, 2021). For example, Warner and Wäger (2019) conduct multiple case studies including automotive, banking and Telecoms industries; Singh *et al.* (2020) chooses a multiple-case study design including a retailer, a publishing, a consulting and a financial services company, allowing for cross-case analysis; Magistretti *et al.* (2021) focus on consulting organizations including Design Group Italia and IBM iX. Comparatively, there seems to be relatively limited empirical research undertaken to use quantitative methods (e.g. Li, 2022; Singh *et al.*, 2021).

Verhoef *et al.* (2021) explain that digital transformation is inherently linked to strategic changes in the business model. As stressed by DaSilva and Trkman (2014), "business model" is described as a managerial "philosophy", rather than as a "approach". It is understandable, therefore, that past research adopts a conceptual framework or uses qualitative research more than quantitative methods in the context of digital transformation.

In this study, we develop a conceptual framework by adopting a different perspective in restructuring a process of digital transformation through paths from resources integration, organizational capabilities, to outcomes. Specifically, it reorganizes the elements of digital transformation, including resources, technology, capabilities and performance, into a process where firms integrate these resources, build new capabilities and transform them into enhanced performance. This paper offers a coherent discussion of digital transformation and explains the process of digital transformation, thus advancing prior work. Drawing on RBV, it provides a more holistic perspective that has been linked to resource integration, organizational capabilities and outcomes at the firm level. In this way, we can strengthen the theoretical basis diminishing implicitness associated with the current perspective of digital transformation.

5.2 Theoretical contributions and implications

The primary contribution to this study is connecting the process of digital transformation through which firms integrate resources, i.e. digital technologies and VRIN and nonVRIN resources as well, based on RBV and SDL in order to develop organizational dynamic capabilities. Although some authors (e.g. Baraldi, Gressetvold, & Harrison, 2012; Line & Runyan, 2014; Hollebeek, 2019) have provided comparisons between RBV and SDL in the organizational resource interaction, they have yet built on the digital transformation closely. Different from past research, this study recognizes the importance of digital technologies as a valuable resource which incorporates them into VRIN resources from RBV and SDL and links the process of digital transformation. This has become the major contribution of this study.

Regarding the resource integration in this study, RBV emphasizes the core VRIN attributes and thus reorganizes their nonVRIN resources in providing sustainable competitive advantage for firms (Lin & Wu, 2014; Cuthbertson & Furseth, 2022). As for technology resources, Cuthbertson and Furseth (2022) notes that digital resources can be VRIN resources, some of which are categorized into operant resources (e.g. algorithms), while some others are operand resources (e.g. data). If firms can continually innovate and develop digital resources, their competitive advantages can be created and retained. Compared with RBV, the resources in SDL are mainly those of operant resources, operand resources and technologies where technologies can be viewed as an operant resource composed of dynamic resources bringing about the production of new operant resources and thus create value for actors (Akaka & Vargo, 2014; Lusch & Nambisan, 2015). With this dual role, this study considers technology resources a moderating role through organizational capabilities to produce positive outcomes.

Moreover, this study develops two levels of organizational capabilities, which differentiates higher-order capabilities from lower-order capabilities. Lower-order capabilities are operational routines (Verreynne *et al.*, 2016; Jantunen *et al.*, 2018), while higher-order capabilities are dynamic capabilities such as sensing, seizing and transforming capabilities (Teece *et al.*, 2014, 2018; Vial, 2019), or learning, integration and reconfiguration capabilities (Teece *et al.*, 1997; Lin & Wu, 2014; Farzaneh, Wilden, Afshari, & Mehralian, 2022). Moreover, this study argues that higher-level (dynamic) capabilities on performance may be mediated by lower-level capabilities (Fainshmidt *et al.*, 2016; Jantunen *et al.*, 2018; Zhou *et al.*, 2019). Regarding the outcomes, in RBV, VRIN resources provide sustainable competitive advantage which is related to performance (Newbert, 2007; Wu, 2007; Lin & Wu, 2014), different from those in SDL where operant and operand resources provide value creation (Akaka & Vargo, 2014; Lusch & Nambisan, 2015) as the outcomes from digital transformation.

5.3 Limitations and further research

Whereas in this study we focus on different perspectives from past research, future research still might need to extend the understanding of the evolution of business processes for digital transformation. For example, although this study focuses on digital technologies bringing about disruption, researchers could investigate the more explicit role of resource integration, e.g. moderating, mediating or direct effect, on organizational capabilities and, therefore, need to identify appropriate integration practices. Indeed, considerable research has viewed digital technologies as a role of direct effect (e.g. Liang *et al.*, 2010; Chen, 2012; Parida *et al.*, 2016) for firms to produce outcomes, more evidence is needed for further validation. Digital technologies itself is another issue. In practice, for example, many authors view digital technologies as different types of capabilities ranging from IT capabilities (e.g. Liang *et al.*, 2010), ICT capabilities (Parida *et al.*, 2016), IT-enabled resources (e.g. Chen, 2012), IS capabilities (e.g. Bharadwaj *et al.*, 2007), to digital strategy (Kraus, Vonmetz, Orlandi, Zardini, & Rossignoli, 2023). Future research is needed to further advance the understanding of digital technologies and disruption in the context of digital transformation.

Moreover, researchers could need to investigate the hierarchy of organizational capabilities with different levels. For example, Ambrosini, Bowman, and Collier (2009) propose four levels of organizational capabilities: resource base, incremental dynamic capabilities, renewing dynamic capabilities and regenerative dynamic capabilities, while Verreynne *et al.* (2016) suggest three levels: operating capabilities, lower-order dynamic capabilities and higher-order dynamic capabilities, in explaining firms' abilities and competences. Despite the different levels of organizational capabilities, Schilke (2014) reminds that these levels can be either a mediator or a moderator. More evidence is needed for researchers to conduct empirical studies further to provide in-depth insight into the different dimensions. This way, this perspective will help to identify more meaningful theoretical and practical implications of digital transformation.

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