Dynamic capabilities for digital transformation

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Abstract

Purpose – The purpose of this paper is to identify sensing, seizing and reconfiguring routines of dynamic capabilities that enable digital transformation in firms.

Design/methodology/approach – A qualitative approach is used. Representatives from a firm going through digital transformations are interviewed, and focus groups have been carried out with a consultancy firm experienced in giving advice to firms going through digital transformation.

Findings – Six routines identified as relevant specifically for digital transformation are identified. These are cross-industrial digital sensing, inside-out digital infrastructure sensing, digital strategy development, determination of enterprise boundaries, decomposition of digital transformation into specified projects and creation of a unified digital infrastructure.

Practical implications – The authors provide direction for managers on how to approach digital transformation. In relation to previous research, the authors provide more specific guidance regarding how to reconfigure the organization in digital transformation.

Originality/value – The paper uses a novel context for digital transformation and complements the very few studies available using dynamic capabilities to understand digital transformation.

Keywords Digital transformation, Dynamic capabilities, Routines, Digitalization, Qualitative research, Innovation, Technology

Paper type Research paper

1. Introduction

Corporate transformation is required to meet changes in the business environment over time (Tushman *et al.*, 1986; Weick and Quinn, 1999) and may entail radical changes to both firm strategy and capabilities (Pearce and Robbins, 2008). The development of digital technologies over the past decades has been a major force reshaping business models in various industries (Bharadwaj *et al.*, 2013; Liu *et al.*, 2011), and countless firms express a need for digital transformation. Today, the opportunities for digital transformation are greater than ever, and there are more digital solutions on the market than ever before (McLaughlin, 2017; Parviainen *et al.*, 2017). Warner and Wäger (2019) highlight the need for more research on how firms digitally transform since this is a field with only limited empirical and conceptual studies.

1.1 Digital transformation

We follow Verhoef *et al.* (2021, p. 889), who define digital transformation as "a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm". Liu *et al.* (2011) similarly emphasize that digital transformation is facilitated by digital technologies and carried out in order to attain

competitive advantage. Further, digital transformation changes the business model of the company through changing for example value creation processes, organizational tasks and how the business is made (Verhoef *et al.*, 2021).

Many firms fail to see the potential of digital transformation, and many of those who do see the potential still struggle to make enough organizational changes in habits and ways of working to be able to capture the maximum benefits of the digital efforts (Parviainen *et al.*, 2017). A common reason why digital transformation efforts fail is that the leaders do not create the right sense of urgency for managers to direct their focus or let them know how to act (Fitzgerald *et al.*, 2014). In addition, there are risks regarding the wider adoption of digital technologies such as data security issues, lack of interoperability with existing systems and lack of control (Schwertner, 2017). If these risks are avoided, and digital technology is implemented in a way that supports the overall strategic and operational objectives of the firm, then digital transformation can have a significant and positive impact on the firm's performance (McLaughlin, 2017). Thus, it is important to formulate and implement a digital transformation strategy (Liu *et al.*, 2011; Matt *et al.*, 2015; Warner and Wäger, 2019). The need for firms to better align digital technology to their overall strategy is requiring firms to rethink how they view and implement technology in a way that builds a capability for the firm on a holistic level. Integrating digital technology in internal processes or customer offerings should not be a goal in itself. Digital transformation is a means to improve the business model and create better customer experiences (McLaughlin, 2017; Rogers, 2016).

Since digital transformation aims to appropriate more value to a firm (Verhoef *et al.*, 2021) and create competitive advantage (Liu *et al.*, 2011), it is an important aspect of strategic development for incumbent firms (Warner and Wäger, 2019). Strategic change of corporate development may be labeled differently: converging or frame-breaking (Tushman *et al.*, 1986), evolutionary (Lovas and Ghoshal, 2000), planned, regulated, conflictive or competitive (Van de Ven and Sun, 2011) and episodic or continuous (Weick and Quinn, 1999), with the overarching meaning that change can be either incremental or radical. Digital technologies add yet another dimension to strategic change, implying that digital transformation of corporations deviates from the above-mentioned paths of change since the rate of change in digital technologies is swift (Warner and Wäger, 2019). In a context with digital transformation strategies, the time perspective, or speed, is of importance in several ways: the speed of launches of products and services increases, the technology gives access to enormous amounts of data which affects the need for faster decision-making, the technology has increased the possibilities to optimize and coordinate supply chains and finally, the technology has also emphasized the possibility of creating capabilities to design, manage and adapt to the network structure more quickly (Bharadwaj *et al.*, 2013). Thus, digital technologies have an impact on the strategic development of firms, and there is a need for a digital transformation of firms to create competitive advantages, which requires thought-through strategic processes (Aspara *et al.*, 2013).

1.2 Dynamic capabilities in digital transformation
To create an organization that can manage digital transformation, this study relies on the assumption that firms need to develop dynamic capabilities specifically for digital transformation. When digital disruption threatens to render the current skills and resources held within a firm obsolete, they need to shift their focus to the capability to change. The phenomenon of dynamic capabilities was first expressed by Teece *et al.* (1997), aiming to explain how firms achieve and sustain competitive advantage. Dynamic capabilities focus on the actions taken by firms to change their resources to continuously adapt to, and build, competitive advantage in a changing environment (Teece *et al.*, 1997). (Helfat *et al.*, 2007, p. 4) describe this dynamic capability as "... the capacity of an

organization to purposefully create, extend, and modify its resource base". As digital transformation implies changes to for example value creation processes and organizational tasks, with the aim to attain competitive advantage, it can be argued that dynamic capabilities are necessary to successfully implement these changes. While ad hoc problem-solving may be sufficient in some cases, the dynamic capability to systematically adapt to changes may be preferred when environmental changes threaten the value of a firm's capability to compete in today's market (Winter, 2003). In the strategic management literature, adaptation to changes in technology has often been studied through a dynamic capabilities lens (Eisenhardt and Martin, 2000; Teece, 2007; Warner and Wäger, 2019). Dynamic capabilities provide a consistent approach for studying digital transformation, considering the powerful impact digital technologies continuously have and will have on business performance (Warner and Wäger, 2019).

Thus, to engage in digital transformation successfully, firms need a set of capabilities that facilitate changes to their business models and their organization. Teece (2007) suggests that sensing, seizing and reconfiguring capabilities together create dynamic capability. While Teece (2007) uses microfoundations to further elaborate on the content of the sensing, seizing and reconfiguring capabilities, Hilliard and Goldstein (2019) use routines to capture and measure the construct of dynamic capabilities. Following Hilliard and Goldstein (2019), this paper sees dynamic capabilities as a set of routines that are necessary to follow in the management of continuous change. In the context of this paper, continuous change is represented by digital transformation. Therefore, the purpose of this paper *is to identify sensing, seizing and reconfiguring routines of dynamic capabilities that enable digital transformation.* Several studies have tried to identify relevant dynamic capabilities in other settings, but only a handful target digitalization or digital transformation specifically. Karimi and Walter (2015) provide conclusions at an abstract level, and therefore, it is hard for business leaders to know what needs to be in place in the organization in order to ensure a successful digital transformation. Yeow *et al.* (2018) focus on specific actions related to general microfoundations. Warner and Wäger (2019) describe microfoundations as being relevant for digital transformation and digital strategies. We adhere to Warner and Wäger's (2019) call for further research on how firms build dynamic capabilities for digital transformation and provide a complementary exploratory analysis of dynamic capabilities in this setting. While Warner and Wäger (2019) dissect larger firms, this paper adds the perspective of a medium-sized firm and their digital transformation.

2. Dynamic capabilities enabling a digital transformation
Dynamic capabilities emerged from the resource-based view emphasizing firm-specific capabilities and assets to explain how competitive advantage is attained and acquired over time (Eisenhardt and Martin, 2000; Helfat *et al.*, 2007; Teece *et al.*, 1997; Yeow *et al.*, 2018). In a dynamic and changing market, a resource advantage might become a disadvantage when the market conditions change (Ambrosini *et al.*, 2009). Thus, a continuous development of a firm's resources is required to obtain long-term competitive advantages and be able to remain competitive over time in a dynamic market (Ambrosini *et al.*, 2009; Helfat *et al.*, 2007; Teece *et al.*, 1997). Eisenhardt and Martin (2000) add that firms in relatively stable markets also need dynamic capabilities to acquire, develop, integrate and reconfigure resources as a response to market changes. The dynamic capabilities framework addresses the development, deployment and protection of resource and competency combinations that is required to adapt to changes in the business environment (Teece *et al.*, 1997). Eisenhardt and Martin (2000, p. 1,107) describe dynamic capabilities as routines to alter the resource base of a firm, and as ". . . the drivers behind the creation, evolution and recombination of other resources into new sources of competitive advantage".

Hess *et al.* (2016, p. 123) emphasize the need for companies "... to make digital transformation a strategic priority ..." and the risk of being left behind if not continuously evaluating their options regarding technology utilization. The two concepts of dynamic capabilities and digital transformation coincide as digital technologies can fundamentally reshape traditional businesses and require firms to respond to new market opportunities. Still, the way dynamic capabilities for digital transformation are built, "... is a paramount strategic question that is yet to be fully understood" (Warner and Wäger, 2019, p. 333).

Teece (2007) divided dynamic capabilities into three comprehensive groups: sensing opportunities and threats, seizing these opportunities and the capacity to stay competitive through a reconfiguration of the underlying resources and assets. This classification of dynamic capabilities is widely used in the literature (Fischer *et al.*, 2010; Kindström *et al.*, 2013; Warner and Wäger, 2019; Yeow *et al.*, 2018) and will also provide the structure for this paper to explore the routines necessary for digital transformation.

2.1 Sensing capabilities for digital transformation

Sensing and shaping new opportunities involves activities such as scanning, creating, learning and interpreting (Teece, 2007), and entails "... identification, development, co-development and assessment of technological opportunities in relationship to customer needs" (Teece, 2014, p. 332). To carry out meaningful sensing and shaping, there is a need for embedded organizational routines related to the specific underlying activities (Teece, 2007). Firms need an awareness of their entire ecosystem, not only in terms of their immediate surroundings and direct competitors but also regarding threats from new entrants and other competing activities (Teece, 2007). For mature firms, there are significant challenges in building sensing capabilities to be able to predict, take advantage of and implement the latest technology (Matt *et al.*, 2015). Digital sensing capabilities need to be built by firms in order to better understand unanticipated developments in a changing business landscape and to take actions to manage change (Jacobi and Brenner, 2018; Warner and Wäger, 2019).

2.2 Seizing capabilities for digital transformation

Seizing capabilities relates to sensing capabilities as sensed opportunities or possibilities need to be addressed either through new products, processes, services or a combination of these alternatives (Teece, 2007). A seizing capacity allows a firm to capture the value of potential business opportunities and to decide what specific changes are needed throughout the organization to seize the value of the new opportunities (Yeow *et al.*, 2018). Firms frequently sense opportunities but then fail to seize the value for many reasons, such as lack of commitment, aversion to risk or for financial reasons (Teece, 2007). To overcome such failings, firms must improve rules and routines, strengthen their leadership and improve strategies to understand, capture and evaluate potential business opportunities (Teece, 2007). When introducing new technologies into incumbent firms, there is a potential for a gap in capabilities (Karimi and Walter, 2015). Therefore, a seizing capability is important to be able to capture value from new opportunities.

2.3 Reconfiguring capabilities for digital transformation

Reconfiguring means a continuous renewal and transformation of organizational routines (Yeow *et al.*, 2018). Reconfiguring capabilities to transform organizational structures and assets as the firm grows and the environment changes are a key to sustained profitable growth (Teece, 2007). Reconfiguration capabilities play important roles when it comes to transforming existing resources to align with new strategies, building new resources and supplementing current gaps in the resource base of a firm (Yeow *et al.*, 2018). However,

changing routines is both risky and costly (Teece, 2007). In more stable situations, firms therefore tend to fine-tune their asset base and build on existing resources (Kindström *et al.*, 2013). When market conditions change more rapidly, more substantial reconfiguration is required (Helfat *et al.*, 2007). Due to the relative novelty of digitalization, many firms might not have all the essential internal resources, for example digital expertise, to be successful in digital transformation (Yeow *et al.*, 2018). Therefore, developing a reconfiguring capability is essential for these firms to be able to access and build new resources (Yeow *et al.*, 2018).

3. Material and methods
Helfat *et al.* (2007) claim that empirical studies are required in order to truly understand dynamic capabilities and to be able to develop a model that captures the specific market dynamics. Because of the elusiveness of dynamic capabilities (Pavlou and El Sawy, 2011), this study relies on an interpretative case study approach. This is an acknowledged method for building theory (Eisenhardt and Graebner, 2007) and follows the tradition of several other studies specifying dynamic capabilities in various settings (e.g. Fischer *et al.*, 2010; Kindström *et al.*, 2013; Mousavi *et al.*, 2019; Yeow *et al.*, 2018).

3.1 Case selection
The study is based on two firms – *EnergyFirm*, which is going through a digital transformation, and *AdvisorFirm*, a consultancy firm giving advice to firms under digital transformation. The energy industry, of which *EnergyFirm* is part, is currently facing challenges of digital disruption (Berger, 2015). *AdvisorFirm*, the consultancy firm, has long experience in advising other firms on digital transformation. Inclusion of experienced consultants in data collection on digital transformation has previously been done by e.g. Warner and Wäger (2019). This will provide insights into different types of firms within a variety of industries and enable conclusions to be drawn that are also applicable to other firms, irrespective of industry and digital maturity level. It seems that the actions and prerequisites required to perform a digital transformation are similar for all types of industries and digital maturity levels, and differences mainly appear in the flow of activities and the speed of transformation (Schwertner, 2017).

3.2 Data collection
Data were collected in three steps: a focus group at *AdvisorFirm*, interviews at *EnergyFirm* and a post-analysis focus group at *AdvisorFirm*.

In, the first focus group with *AdvisorFirm,* the consultants were encouraged to describe various examples of capabilities required for digital transformation. Seven consultants of varying seniority attended the focus group, see Table 1. This provided the possibility for each participant to share their views and simultaneously provide a wide range of responses (Guest *et al.*, 2017).

The data collection at *EnergyFirm* used semi-structured interviews (Gibbert *et al.*, 2008) to explore the routines required for digital transformation. An interview guide was developed with questions related to sensing, seizing and reconfiguring capabilities. The interviews focused on how changes related to digitalization and digital transformation were accomplished in *EnergyFirm*. Nine interviews were held with respondents from different hierarchical levels and business units (as recommended by Eisenhardt and Graebner, 2007) with experiences from different digital transformation initiatives, see Table 1. In addition, secondary sources of firm information were used.

Firm	Role	Respondents	
EnergyFirm	Going through digital transformation	One corporate manager Five BU managers Three department-level managers	
AdvisorFirm	Consultancy, advising firms going through digital transformation	*Focus group 1* One CEO One head of consultants Five management consultants	
		Focus group 2 One CEO Three management consultants	

The second focus group at *AdvisorFirm* was carried out after initial analysis of the previous data collection. The tentative results in terms of suggested routines required for digital transformation were discussed. This focus group included four participants.

3.3 Data analysis
From the first focus group with *AdvisorFirm,* and the interviews at *EnergyFirm*, descriptions of specific routines, roles or activities and their importance for digital transformation were extracted. The analysis consisted of iterations between theory and empirical results (Dubois and Gadde, 2002). Inspired by Tuli *et al.* (2007), three criteria were used to select which routines to include: (1) is the routine applicable beyond a specific context, firm or industry, (2) do multiple participants mention or agree with the importance of the routine and (3) does the routine go beyond the obvious to provide a relevant conclusion? This process resulted in six routines related to the dynamic capabilities of sensing, seizing and reconfiguring that are required for digital transformation. The second focus group with *AdvisorFirm* provided further insights regarding these routines. No routines were completely removed or added based on the findings from this focus group, but some of the routines were reformulated and further specified.

4. Dynamic capability routines for digital transformation
As dynamic capability routines or microfoundations for digital transformation are a relatively unexplored area, the empirical findings in this section are related to previous research discussing dynamic capabilities in other contexts. This provides a description of the key important routines that enable a successful digital transformation.

4.1 Cross-industrial digital sensing
EnergyFirm pointed out that digital innovation does not have to be revolutionizing, but can just as well be copying something that has been done elsewhere or applying something old in a new way. This reduces the pressure or expectations when employees are asked to be innovative, which in turn may inspire and encourage people to think and practice ideas and solutions in unproven ways.

The essence of the sensing dynamic capability is the identification of new opportunities for the firm (Teece, 2007). Mousavi *et al.* (2019) describe a sensing microfoundation as routines to anticipate market trends and scan information and developments outside the firm in order to make informed decisions about recognized opportunities. Kindström *et al.* (2013) also claim

that in order to have service innovation, it is important to scan and explore sources outside the service system. Networking is an important capability in this endeavor (Alford and Duan, 2018) that is also highlighted by *AdvisorFirm*. Similarly, it can be assumed to be important for innovation related to digital transformation to seek new opportunities and solutions outside the industry where a firm operates. *AdvisorFirm* describes how dialogue with clients rarely leads to novel ideas that can solve problems for that particular client. Instead, inspiration often comes from other digitalization initiatives in completely different industries, which can be modified to suit the client at hand. Hargadon and Sutton (1997) label this technology brokering, to emphasize the recombination of existing ideas in novel innovations. This use of inventive analogies is a powerful cognitive mechanism (Kalogerakis *et al.*, 2010). When facing problems, firms benefit from having routines for acquiring, storing and retrieving external technological knowledge (Hargadon and Sutton, 1997). It is therefore important to have entrepreneurial resources within the firm which enable creativity, foresight, intuition and alertness to new opportunities (Mousavi *et al.*, 2019). Teece (2007) emphasizes that firms need to search for opportunities not only at the core of their business ecosystem but also in the periphery. However, firms' have limited capabilities to search for and process knowledge available beyond their traditional industry boundaries (Enkel and Heil, 2014), which emphasizes the need for deliberate inter-firm learning efforts (Phelps, 2010). To conclude, firms need routines to identify new digital opportunities also outside their networks of partner firms, to achieve digital transformation.

4.2 Inside-out digital infrastructure sensing

An essential part of a digitalization journey is to improve the way internal digital infrastructure is used. *AdvisorFirm* argues that if we digitally innovate our business model, there is a demand for a well-functioning digital infrastructure, to avoid high maintenance costs associated with outdated digital infrastructure. *EnergyFirm* lacks an overview of what digital and technical systems exist within the firm. This is perceived as an obstacle to digital transformation, as it is difficult for managers to evaluate the need for new systems.

McLaughlin (2017) identifies technical infrastructure management as a dynamic capability firms need to ensure that their technology is adding value. Part of this includes knowing what systems exist in the firm today, understanding how they can be better used, seeing future demands and functions needed, and understanding how the corporate digital infrastructure would be managed ideally (Yeow *et al.*, 2018). McLaughlin (2017) also discusses the need to understand when systems are outdated or misunderstood, and when development and improvement are needed. In general, IT investments need to be selected based on their contribution to business value (Melville *et al.*, 2004). The development of digital infrastructure has to take the demands of the firm as its point of departure rather than what is technically feasible. *AdvisorFirm* described how they developed a new digital front-end for a client, but then it turned out the client lacked the digital infrastructure to automatically support the front-end with relevant and updated information. In this case, the sensing capability is therefore internal to begin with. Firms need routines to evaluate the demand for digital infrastructure and then search for new solutions.

4.3 Digital strategy development

At *EnergyFirm*, people throughout the organization know that the firm is facing a digital transformation. However, a concern regards the fact that the direction is too broad, and that they are doing everything that could be included within the broad boundaries of the digital vision without a clear focus or prioritization. These problems experienced at *EnergyFirm* highlight the importance of a well communicated digital strategy, directed by clear business objectives. To achieve a successful digital transformation, it has to be clear to all employees

what the goal of the digital transformation is (Kane *et al.*, 2015; Schwertner, 2017). McLaughlin (2017) claims that without a clear digital strategy, there will be disagreements within the organization regarding what capabilities need to be developed in order to support aligned digital enablement. Clear business objectives should guide the business model design (Casadesus-Masanell and Ricart, 2010) and a good fit between strategies, structures and processes is required (Miles and Snow, 1984). Parviainen *et al.* (2017) claim that lack of an overall digital strategy is one of the most typical obstacles for digitalization.

However, commitment to a strategy and certain business objectives has far-reaching consequences as earlier choices constrain later ones (Ghemawat, 1991). For firms facing digital transformation, the environmental conditions can change rapidly. According to *AdvisorFirm*, both the strategy and goals of a firm facing digital transformation therefore need to be flexible and adaptive with regard to new opportunities. Firms undergoing business development should, according to Fischer *et al.* (2010), have the capacity to quickly prepare a strategic response to competitors' activities as well as customers' changing demands. Ideas generated from cross-industrial digital sensing also need to be wisely incorporated in the business. Research is inconclusive whether R&D alliances in themselves increase innovation performance, suggesting that firms need a capability to also assimilate and exploit these cross-industrial opportunities (Lin *et al.*, 2012).

A dilemma occurs for managers where they have to balance commitment and flexibility. Ghemawat (1991) argues for the inclusion of the time dimension in strategy making and the search for success. Ambidexterity research (see O'Reilly and Tushman, 2013, for a review) substantialize this by describing how firms can go between periods of exploration, where flexibility is emphasized, and periods of exploitation, where resources are committed to strategy realization. Once an investment is made (during an exploitation phase), it also opens up new options for expansion and latent growth opportunities (Ng, 2007) that can be incorporated in the next exploration phase. Within the periods of exploitation, Brown and Eisenhardt (1997) also describe how successful innovative firms create semistructures, where some priorities or responsibilities are fixed, while others are not. To take both commitment and flexibility needs into account, strategies should provide clear behavioral guidelines as boundaries and let ideas and structures emerge within these boundaries (Fischer *et al.*, 2010). In a changing environment and with flexible business objectives, firms undergoing digital transformation therefore need to semi-continuously adapt their digital strategy. In digital transformation, the business model will be increasingly digitalized. To embrace this shift, the digital strategy also needs to develop.

4.4 Determine enterprise boundaries

In a digital transformation, firms need to determine what to do internally and what to outsource. But when competence is lacking, outsourcing is not always the answer. If a competence is an essential part of an envisioned digital business model, the consultants at *AdvisorFirm* generally suggest that the competence should be developed internally. This is in line with Teece (2019), suggesting that reduced transaction cost can be reached through internalization of core competences. For *EnergyFirm,* the knowledge of how to develop a digital business model would be considered a core competence. When asset specificity and uncertainty is high, there is an increased risk of transactional difficulties and opportunistic behavior from the sourcing partner (McIvor, 2009; Williamson, 2008). It is likely that outsourcing of tasks critical to the digital strategy of a firm would be associated with both high uncertainty and high asset specificity. The consultants at *AdvisorFirm* also mentioned that outsourcing can be used in the initial stages of a transformation before the necessity of a specific competence is determined. This implies that the company's internal need of developing competence must fit the need over time and can also differ over the time.

The different departments at *EnergyFirm* had different routines for keeping track of existing competencies, and there were no organization-wide routines for evaluating which types of competencies existed and which would be necessary for the near future. Yeow *et al.* (2018) discuss the importance of knowing what knowledge already exists within the organization throughout all departments and functions. To make sure tasks are not outsourced when the competence for doing them is available elsewhere in the organization, an understanding of how current competences can be used in other parts of the organization is required.

Teece (2007) describes the selection of enterprise boundaries as a microfoundation for the seizing capability. Digital transformation has a disruptive impact on value chain networks and business ecosystems. Therefore, a key requirement for a digital strategy is the ability to structure, manage and design integrating networks that provide complementary capabilities to those of the firm itself (Bharadwaj *et al.*, 2013; Karimi and Walter, 2015). To conclude, firms going through digital transformation need routines to determine what to do in-house and what to outsource, based on an understanding of current competence in the organization and the necessity of the competence for the digital strategy.

4.5 Decompose digital transformation into specified projects

According to *EnergyFirm*, having a digital portfolio with separate projects would ease prioritization and avoid bottlenecks arising. The *AdvisorFirm* consultants talk about the necessity to separate the more long-term digital transformation endeavors from the daily work, to make sure sufficient resources are spent on long-term improvements. A project structure is one way of achieving this separation. Teece (2007) also argues for decomposition and pushing decision rights down in the organization as it achieves greater managerial accountability. Furthermore, McLaughlin (2017) mentions program and project management as part of his dynamic technology capability model.

Prioritizing which digital opportunities to turn into projects and evaluating ongoing projects requires routines to examine how the different initiatives fit the digital strategy and could contribute to an increasingly digital business model. According to *AdvisorFirm*, prioritizing and evaluating digital activities in alignment with the digital strategy can create additional personal commitment among employees involved in the project. Developing a portfolio and clarifying which project has the highest priority would help to develop an overview that respondents feel is lacking at *EnergyFirm*. A clear process of allocating resources to projects is also lacking at *EnergyFirm*. Few projects are shut down once they have started, resulting in ineffective resource usage. Karimi and Walter (2015) suggest the implementation of staged allocation of resources based on continuous evaluation of projects. Following ambidexterity thinking (O'Reilly and Tushman, 2013), smaller projects could be limited in time to one exploitation phase. For longer project, resource allocation could be reevaluated during exploration phases, when the digital strategy is readjusted. Brown and Eisenhardt (1997) suggest using semistructures during exploitation phases, where some features such as project priorities and time intervals between projects can remain fixed. The *AdvisorFirm* consultants argued that cross-functional integration can make competencies temporarily available in projects when they are needed and mentioned several projects related to digital transformation, where cross-functional teams had been found critical in order to develop processes. As suggested by Teece (2007), different project managers need to be able to see the overall benefit of all the projects and understand when a team member may be better used or more critical on another project.

To conclude, a project-based structure is suggested in digital transformation, where allocation of resources and team members is reevaluated during exploration phases, based on the project's alignment to the modified digital strategy.

4.6 Create unified digital infrastructure
At *EnergyFirm*, spatial inflexibility and limited digital communication tools were described as barriers to digital transformation. The use of better digital infrastructure may be a way to reconfigure the organizational design digitally without physically moving people, by allowing and facilitating more communication, collaboration and innovation between departments and organizational levels. The consultants at *AdvisorFirm* emphasized the need for common ground on what systems constitute the firm's infrastructure, in line with what is argued for in previous research (Bharadwaj *et al.*, 2013; McLaughlin, 2017; Schwertner, 2017). *EnergyFirm* has an ongoing project regarding the creation of corporate-wide information storage, which is intended to enable all employees to find relevant information when needed, by collecting all information in the same place. This will, among other benefits, help *EnergyFirm's* field staff to access systems, maps and instructions on their mobile devices. Firms should secure organization-wide availability and performance of the digital technology, according to McLaughlin (2017). When systems exist in separate departments, value can be captured by reusing the same systems in other departments (Fischer *et al.*, 2010). This is referred to as leveraging (Yeow *et al.*, 2018), which may include using the same system in a new part of the organization or using an existing system in a new way. Making sure a firm's assets are complementary is particularly relevant when innovation is characterized as cumulative (Teece, 2007), such as for digital infrastructure. Digital transformation requires interconnection of things, people and data in the organization. A widely accessible and unified digital infrastructure will most likely facilitate mutual understanding and collaboration across business units and departments. The functionalities of the digital infrastructure enable communication and provide the foundation on which the digital transformation is realized.

5. Conclusions and implications
This paper has identified six routines required for digital transformation. They are summarized in Table 2.

5.1 Research contribution
Successfully carrying out digital transformation places demands on firms in terms of continuous flexibility and adaptability. This paper complements Warner and Wäger's (2019) effort to describe the capabilities needed for digital transformation.

Regarding sensing, our routines mainly correspond to the capabilities of *digital scouting* and to some extent to *digital scenario planning*, as suggested by Warner and Wäger (2019). *Digital mindset crafting* was not raised as an important capability in itself by the respondents in our study but would likely follow as a consequence of having the other routines in place.

Regarding seizing, our findings can be related to all three capability themes identified by Warner and Wäger (2019). A semi-continuous adaptation of the digital strategy requires both *strategic agility* and *rapid prototyping*. Determination of enterprise boundaries relates to the activity of balancing internal and external options that Warner and Wäger describe as a part of *balancing digital portfolios*.

Regarding reconfiguring, our suggested routines provide a complement to Warner and Wäger's (2019) findings. While the routines we describe relate to *redesigning internal structures,* we also provide a more specific description of how to manage digital transformation. We suggest that digital transformation should be achieved through separate digitalization projects. Once developed, new digital systems and solutions need to be integrated with the existing digital infrastructure and made easily accessible for the entire organization. This mitigates the risks of interoperability with existing systems and lack of

	Routines
Sense	(1) *Cross-industrial digital sensing*: Identify new digital opportunities, also outside network of partner firms
	(2) *Inside-out digital infrastructure sensing*: Routines to evaluate the demand for digital infrastructure and search for new solutions
Seize	(3) *Digital strategy development:* Semi-continuous adaptation of increasingly digitalized strategy, aligned with (changing) environment and (flexible) overall business objectives
	(4) *Determine enterprise boundaries:* Routines to determine what to do in-house and what to outsource, based on an understanding of current competence in the firm and the necessity of the competence for the digital strategy
Reconfigure	(5) *Decompose digital transformation into specified projects*: Prioritize digitalization projects based on alignment to digital strategy and reevaluate resource and team member allocation during exploration phases
	(6) *Create unified digital infrastructure*: Integrate digital solutions into unified digital infrastructure and make it accessible to entire organization

Table 2.
Routines for digital
transformation

control (Schwertner, 2017). Digitalization efforts may target an urgent problem; but to become a useful solution, they need to overcome the internal resistance to change, through the involvement of employees from all organizational levels and through integration with the systems familiar to the organization. This is required to change habits and ways of working (Parviainen *et al.*, 2017) and create a sense of urgency related to the digital transformation among managers (Fitzgerald *et al.*, 2014).

5.2 Managerial implications
Many firms are starting to realize the potential of digital transformation, but there are many challenges to tackle in order to achieve the maximum benefits of a digital transformation. This paper has examined sensing, seizing and reconfiguring routines useful for firms' digital transformations. Below follows a discussion on two common challenges of digital transformation, and how the presented framework can be a means to manage these challenges.

5.2.1 Failing to capture potential in digital transformation. The findings by Parviainen *et al.* (2017) showed that many firms fail to see the potential of digital transformation or struggle to make enough organizational changes in habits and ways of working to be able to capture the maximum benefits of the digital efforts. An at least semi-continuous adaptation of the digital strategy increases the potential in digital transformation. Digitalization has no value in itself and substantializing how the digitalization efforts enable the overall objectives of the firm is therefore important (McLaughlin, 2017). Further, if the firm creates a project prioritization system so that the digital projects can be prioritized depending on how well they align to the digital strategy, it will ensure the projects are beneficial. An important part of capturing the potential in digitalization is to really utilize the implemented digital tools, systems and other project results and make sure to take full advantage of the potential benefits. By creating a unified digital infrastructure, digital tools and systems can be better utilized, resulting in a more flexible way of working with better communication platforms.

5.2.2 Difficulties regarding human factors. Schwertner (2017) identifies human factors and the workforce itself as a main difficulty when it comes to digital transformation. Like any major organizational change, there is a risk of inertia, and employees showing resistance to change. This is one of the reasons to promote the encouragement of individual contributions to change as it will increase support for the digital transformation. The aim shall be to create an environment where ideas are seriously taken into consideration, so employees feel their

ideas are being appreciated. Collaboration across business units and department boundaries enhances the possibility to learn from each other and gain a wider understanding of the entire value chain, as well as exploiting and developing competencies. In order to achieve this, the development of a unified digital infrastructure will facilitate communication and information spreading, as well as creating the opportunity to find and ask for help.

5.2.3 Risks related to IT and data security. Data security issues are, according to Schwertner (2017), often perceived to be the main obstacle for digital transformation. An important aspect of creating a corporate digital infrastructure is to ensure that the systems integrated into the digital infrastructure meet the requirements and demands placed upon them and these demands should include IT and data security aspects. For example, the handling of customer data places great demands on the firm regarding securing personal information. Therefore, it is important that these demands are continuously developed, and that the fulfillment of these requirements is regularly evaluated.

5.3 Future research and limitations
The developed framework aims to be generalizable for all firms facing digital transformation, irrespective of their industry, size or digital maturity. The dynamic capability routines are consequently formulated to make them relevant for any firm. However, the final framework has not been tested on firms from different industries or with varying digital maturity. While this study provides a complement to Warner and Wäger's (2019) findings, further studies are welcomed to complement and contextualize our frameworks.

Another important aspect that all firms ought to manage when going through digital transformation is the matter of IT and data security. This aspect requires further investigation as it is one of the major risks that have been identified for firms facing and going through a digital transformation.

The question of whether some of the routines can generally be proven to be more important than others, or whether there is a certain order that some routines should be prioritized has not been the primary concern in this paper. We believe that this varies between firms with different preconditions, for example their digital maturity level, or their current routines and strategies. A suggested process for how to install the routines necessary for digital transformation would, however, be managerially relevant.

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