

## Open for business: Towards an interactive view on dynamic capabilities

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### ABSTRACT

Theories of business relationships and networks suggest that a firm's relationships with other organizations matter for its performance and survival (Håkansson & Snehota, 1995). Inspired by business relationship and network perspectives, we expand Teece's (2007) dynamic capabilities model and develop an interactive dynamic capabilities framework with three pairs of capabilities: sensing and being sensed, seizing and being seized, and reconfiguring and being reconfigured. Conducting process data analysis of two cases, we shed light on how firms can change and enhance their business performance through the three pairs of interactive dynamic capabilities. The framework adds to the theory of dynamic capabilities by conceptualizing how they can operate across firm boundaries, in inter-organizational relationships, networks or ecosystems populated by many organizations involved actively, and interactively, in sensing, seizing and reconfiguring themselves and each other.

### 1. Introduction

The dynamic capabilities view (DCV) has received considerable attention in strategic management research. Extending from the resource-based view (RBV) which focuses on sustainable competitive advantage in stable environments; the DCV focuses on the issues of competitive survival and strategic renewal in fast-paced environments. From initially focusing on a firm's internal resources and activities, the DCV increasingly emphasizes the importance of the environmental context in which firms operate (Schilke, 2014; Teece, 2007) which “is not that of an industry, but that of the business ‘ecosystem’ – the community of organizations, institutions and individuals that impact the enterprise and the enterprise's customers and suppliers” (Teece, 2007, p.1320). With increased attention to the external environment and the ecosystems which firms occupy or operate in, research has emphasized not only the different types of organizations and institutions in the ecosystem but also the external business relationships and networks that firms have formed (L. Alinaghian & Razmdoost, 2018; Blyler & Coff, 2003). As an extension of the RBV, the DCV sees engagement in business relationships, strategic partnerships and networks as a path or a means to achieve competitive advantages for a firm (L. Alinaghian & Razmdoost, 2018; Foss, 1999; Mitrega & Pfajfar, 2015; Schepis, Ellis, &

Purchase, 2018) or for all firms in a strategic network (Dyer, 1996).

Business relationships, strategic partnerships and networks have been investigated from various perspectives, such as collaborative advantage (Kanter, 1994), strategic alliances (Hamel, 1991), collaborative advantage and the relational view (Dyer & Singh, 1998), industrial marketing and purchasing (McGrath, Medlin, & O'Toole, 2019; O'Toole & McGrath, 2018; Snehota & Hakansson, 1995), relationship marketing (Möller & Halinen, 1999; Sheth & Parvatiyar, 2000), logistics and supply chain management (Harland & Knight, 2001; Kim, Cavusgil, & Cavusgil, 2013), and sustainable supply chain management (Seuring, 2011). In all these perspectives, the discussion on dynamic capabilities centers on the role of the external relationships and networks and how firms can benefit from utilizing external resources via inter-firm collaboration. The dynamic capabilities which allow for this are referred to as relationship-enabled responsiveness (Kim et al., 2013); network-oriented dynamic capabilities (L. Alinaghian & Razmdoost, 2018); capabilities for managing strategic nets (Möller and Svahn, 2003), or network capability (McGrath et al., 2019; Walter, Auer, & Ritter, 2006).

However, most of the literature on dynamic capabilities that takes an ecosystem or network view focuses on the firm's capability to search, shape, seize and reconfigure its ecosystem (Teece, 2007) and scrutinize

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how firms can actively exploit and explore external resources and business relationships in support of their own purposes. Scarcely any attention has been paid to addressing how a firm can take into account and benefit from the dynamic capabilities of the other organizations in the networks or ecosystems in which the firm is embedded, and their active attempts at exploring and exploiting the firm's resources in pursuit of their purposes.

As noted by [Randhawa, Wilden, and Akaka \(2022, p. 185\)](#), “the study of dynamic capabilities [...] has focused on the role of shapers [...] however, a wider perspective is needed to extend beyond the study of keystone shapers and explore the roles of non-focal actors and their dynamic capabilities [...] supporters can take on roles of shapers and vice versa”. Other researchers have also discussed the desire to control decision-making, and not being controlled by others, as factors that inhibit the development of a firm's network capability ([McGrath & O'Toole, 2013](#)) and called for more interactive views on network capability development ([Gadde, Huemer, & Håkansson, 2003](#); [McGrath, O'Toole, Marino, & Sutton-Brady, 2018](#)). As a contribution to filling this research gap, we explore the research question of how a firm's dynamic capabilities allow it to sense, seize and transform the organization while accommodating the sensing, seizing and reconfiguring efforts of other firms and organizations in its surrounding networks. The aim is to enrich our understanding of interactive dynamic capabilities, both conceptually and empirically.

Thereby, our endeavors provide a follow up to the discussion on strengthening the alignment between theories on dynamic capabilities and on industrial marketing and supply chain management, which was the key topic in the special issue “Capabilities in business relationships and networks” in *Industrial Marketing Management* (2018) as well as to the calls for further research on capabilities in business relationships and interorganizational settings, both conceptually and empirically, made in the extensive reviews by [Forkmann, Henneberg, and Mitrega \(2018\)](#) and [Schilke, Hu, & Helfat \(2018\)](#).

In order to achieve our aims, we first review previous literature on dynamic capabilities and network capabilities and build an interactive dynamic capabilities framework to capture how firms can develop competitive advantages through interaction with other firms and organizations in their surrounding networks. Taking into account the two-sided, reciprocal nature of interaction and the paradoxical nature of business networks ([Håkansson & Ford, 2002](#)), we expand Teece's dynamic capabilities framework to include three pairs of capacities: *sensing and being sensed*, *seizing and being seized*, and *reconfiguring and being reconfigured*. Second, we conduct process data analyses and present two in-depth case studies of how the three pairs of capacities come into play in cooperative processes of strategic change in networks. In particular, we use the framework to shed light on how firms can enhance their business performance and achieve sustainability targets through interaction-oriented dynamic capabilities. Finally, we discuss the findings, and derive implications for research and for managers.

## 2. Theoretical framework

### 2.1. The nature of dynamic capabilities

The dynamic capabilities perspective is an extension of the RBV of the firm ([Barney, 1991](#); [Helfat & Peteraf, 2003](#)), which emphasizes capabilities that can effect change in firms' existing resources, ecosystems, and external environment ([Helfat & Winter, 2011](#)). A widely adopted definition of dynamic capabilities is that they are constituted from organizational routines, processes, and competences that aim to integrate, build, and reconfigure internal and external competences to address rapidly changing environments ([Teece, Pisano, & Shuen, 1997](#)). Based on a systematic review of the DCV literature, [Barreto \(2010\)](#) suggests that dynamic capabilities can be defined as “a firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions,

and to change its resource base.” The DCV is change-oriented: it emphasizes the firm's ability to actively adapt to changes in the environment, and markets therein, through innovation or corporate entrepreneurship.

Following [Teece \(2007\)](#), dynamic capabilities can be disaggregated into three clusters of activities: “the capacity to sense and shape opportunities and threats (sensing), to seize opportunities (seizing), and to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets (reconfiguring)” ([Teece, 2007](#), p. 1319). These orchestration capabilities are the foundation for a firm's strategic innovation and long-term performance.

*Sensing* describes firms' capability to identify opportunities. It concerns firms' continuous actions to scan and search for opportunities that are constantly opening up, both within and outside the firm's boundaries, in the firm's ecosystems ([Teece, 2007](#)). Typical activities are developing internal R&D and technology, identifying customer needs and target market segments, tapping innovations made by suppliers and complementors, etc. ([Teece, 2007](#)). Exploring and exploiting opportunities are vital parts of maintaining competitive advantage, which requires firms to exercise good judgment in their choice of a search strategy ([Casson & Wadeson, 2007](#)). The constant searching and shaping of opportunities via core business partners, such as suppliers, competitors, and business partners, can be seen as the main source for identifying opportunities in business ecosystems. However, firms should also search “the periphery of their business ecosystem. Search must embrace potential collaborators – customers, suppliers, complementors – that are active in innovation activity” ([Teece, 2007](#), p.1320). Some broad opportunities in long-distance seeking activities, such as attending trade fairs and business conferences, provide the benefit of temporary geographic proximity to scan new opportunities and gain up-to-date information and technology ([Bathelt & Schuldt, 2008](#); [Torre, 2008](#)). Sensing in a nearby network or at a long distance involves active interaction with the firm's ecosystem and external environment, which can complement the firm's internal searching and exploration to identify and shape more opportunities.

*Seizing* activities happen after firms have sensed (and possibly shaped) opportunities and involve recognizing the value and potential of the opportunities. Typical seizing activities are “delineating the customer solution and the business model, selecting enterprise boundaries to manage complements and control platforms, selecting decision-making protocols, building loyalty and commitment” ([Teece, 2007](#), p. 1334). Designing business models that create and capture value in the value chain is a key aspect of dynamic capabilities ([Teece, 2018](#)). Meanwhile, the business model must be compatible with the business models of its business partners, emphasizing high cospecialization and complementarity, such as in the software industry. Moreover, to seize opportunities successfully, a firm needs corresponding “defense” mechanisms to avoid potential threats and deception behaviors and to anticipate the behavior of competitors ([Teece, 2007, 2018](#)).

*Reconfiguring* is the last capability, a continuous process of aligning and realigning resources and organizational structures as the enterprise grows, and as markets and technologies change, when opportunities are sensed and seized ([Teece, 2007](#)). Reconfiguring involves activities such as decentralizing and achieving near decomposability, learning, knowledge management, and corporate governance ([Teece, 2007](#)). Frequently reconfiguring the business model and re-exploiting the present set of opportunities are essential for competitive resilience and series of temporary advantages. Although a firm's current business model and partnerships may suffice for exploitation of adjacent business opportunities, they may not be sufficient to capture novel and emerging opportunities for future innovation.

### 2.2. Dynamic capabilities in network perspectives

Literature on network-related dynamic capabilities has contributed

to our understanding of how firms' dynamic capabilities are embedded in networks. Such dynamic capabilities enable firms to recognize, utilize, and develop their business partnerships and are referred to as "network capabilities," "network competence," or "network-oriented dynamic capabilities" by various scholars (L. Alinaghian & Razmdoost, 2018; Mitrega, Forkmann, Ramos, & Henneberg, 2012; Schepis et al., 2018; Walter et al., 2006).

One stream of research focuses on the role of the network in developing the dynamic capabilities of a firm, and attends to how the gaining of knowledge and skills through business networks can accelerate the firm's information-gathering and learning efforts and help assess the degree of "causal ambiguity" associated with other firms' skills and capabilities (Barney, 1991; Lei, Hitt, & Bettis, 1996; Reed & DeFillippi, 1990). Following this line of research, Mason and Leek (2008) highlight the role of the network structure, inter-firm routines, and knowledge forms in building a knowledge transfer supply network and stress that a firm's ability to co-create and transfer knowledge within the network can be central for building and continuously developing dynamic business models. Similarly, Allred, Fawcett, Wallin, and Magnan (2011) show how a strong collaboration capability facilitated by shared goals, resources, risks and awards can function as a dynamic capability itself, which is a source of competitive advantage. In a similar vein, Zhang and Wu (2017) find that a firm's power in its business network influences the effect of the firm's internal resources on its ability to sense and seize opportunities, which are vital dynamic capabilities.

Other scholars more specifically attend to relationships as assets and emphasize the joint contribution of a firm and its strategic partners. For example, Clifford Defee and Fugate (2010) propos that continuously renewed collaborative capabilities between partners can facilitate the joint development of new capabilities in an evolving environment. Leila Alinaghian, Kim, and Srai (2020) detail how a firm's social, cognitive, and physical aspects of relational embeddedness play roles in inducing three types of buyer-supplier dyads, namely, unilateral, quasi-unilateral, and bilateral, which underpin the three dynamic capabilities – sensing, seizing, and reconfiguring.

Scholars adopting a business relationships and networks perspective focus on *interaction* in business relationships (Håkansson, 1982) as well as in the networks which arise from connections between relationships (Håkansson & Snehota, 1995). Relationships and network are seen as essential learning spaces, where firms find out how they can combine their resources, adjust their activities, and align their strategies and expectations, to utilize resources more efficiently as well as bring about innovation (Håkansson & Waluszewski, 2007; Havensvid, de Boer, & Holmen, 2022). Thereby, business relationships and networks enable not only economic exchanges but also learning, teaching, and innovating as part of these exchanges, meaning that the business relationships and networks are key resources for firms in processes of strategic innovation and renewal. Since business relationships are connected to each other, a change happening in one relationship can affect what happens in others (Håkansson & Ford, 2002).

In line with this perspective, Ritter, Wilkinson, and Johnston (2002) developed the concept of network competence for managing in networks and Walter et al. (2006) attended to the role of network capabilities for entrepreneurial action. Furthermore, Möller and Svahn (2003) proposed dynamic capabilities for managing strategic nets which are purposefully delineated subsets of wider networks. In addition, the evolution of network capability has been extensively discussed, in particular in relation to entrepreneurial firms (McGrath et al., 2018; McGrath et al., 2019; McGrath & O'Toole, 2013, 2014; O'Toole & McGrath, 2018). All these studies are based on the idea of cross-fertilization of RBV/DCV concepts and theory on business relationships and networks, in line with a long-standing tradition for example resources and heterogeneity (Håkansson & Snehota, 1995), strategy (Baraldi, Brennan, Harrison, Tunisini & Zolkiewski, 2007) and ecosystems (Aarikka-Stenroos and Ritala (2017).

All the above-mentioned studies capture important aspects of

network-oriented dynamic capabilities, different dimensions of capabilities, different enablers and inhibitors, and many report positive effects on firms' value creation from possessing such capabilities. Furthermore, all of them stress the importance of interaction, in exercising network capabilities as well as in building network capabilities, and several stress the paradoxes intrinsic to the nature of business networks (Håkansson & Ford, 2002): more specifically that networks offer both opportunities and limitations (first network paradox); that the interaction a firm engages in should allow both for influencing and being influenced (second network paradox), and that a firm can attempt to control a network but should also accept the limits of that control, since a too self-centered perspective overlooks the different perspectives and dynamics in the network, and risks turning the network in a closed hierarchy with limits to innovation (third network paradox).

An explicitly interactive and paradoxical perspective, however, entails that all parties take active roles in networks and, therefore, that a focal firm is continuously involved in or exposed to the sensing, shaping, seizing, and reconfiguring efforts of the counterparts they engage with. Therefore, inspired by the ideas of two-way interaction and the network paradoxes, in the next section, we propose an interactive dynamic capabilities framework which extends Teece's (2007) dynamic capabilities framework.

### 2.3. Towards an interactive dynamic capabilities framework

In Teece's (2007) dynamic capabilities framework, firms are those that sense and shape opportunities and threats, seize opportunities, and enhance and reconfigure intangible and tangible assets in order to create value, innovation, and competitive advantages. In contrast, the business relationship and network perspective considers the firm as part of a network of active, interdependent actors, which relate their activities and resources across organizational boundaries.

Extending Teece's dynamic capabilities model by combining it with the interactive network perspective, we propose three pairs of capacities: *sensing and being sensed*, *seizing and being seized*, and *reconfiguring and being reconfigured*. Hence, the interactive dynamic capabilities framework contains three extra capacities from the interactive perspective, namely, being sensed, being seized, and being reconfigured.

Being sensed: Building on the definition by Teece (2007) of "sensing" capacities, we define "being sensed" capacities as the firm's systems, processes and individuals with capacities that enable outside actors to sense and shape opportunities which may be interactively pursued. Hence, "being sensed" relates to sensing not being a unidirectional process performed by one firm or organization but a two-way process in which the process of being reviewed by others includes the firm exposing for example, its strategies and goals, vision and ambitions, and change and transition paths, technology road maps, etc. to others. It may include participating in joint R&D, exploring conditions and coalitions for market entry, presenting new technologies and business ideas, organizing events, seminars, fairs and conferences or participating in such events organized by other parties, such as supplier days, innovation days, market dialogues, innovation hackathons, innovation challenge events, hosting customer visits, and establishing market communication strategies to be exposed to potential partners. Participating in regional business or cluster activities, attending national or international events in locations that seem of interest, engaging with students through guest lectures, company presentations, master projects, as well as firm sponsored adjunct professorships at universities are other examples. Allowing both for in-person sensing, as well as for digital sensing, it may also involve establishing a digital presence in different social media, and informative homepages which allow for others to sense the company. Some of the "being sensed" will be directed at counterparts with whom the firm already is in contact, for example dedicating time at annual supplier reviews for informing about promising future developments which are being considered, while other are directed towards counterparts with whom the firm has not (yet) established relationships. By

catering for how the firm can “be sensed” by counterparts, the firm increases the chances that opportunities actually come knocking at its door.

**Being seized:** Building on the definition by Teece (2007) of “seizing” capacities, we define “being seized” capacities as the firm’s structures, procedures and individuals with capacities that enable the firm to engage in efforts by outside actors to seize opportunities interactively with the firm. Hence, “being seized” relates to the firm’s strategy formation processes in relation to other firms’ strategies and actions in which the firm is expected to play a part. It involves abilities to respond to strategies and choices made by others regarding new product and service concepts, and new business models, and the ability to make valuable and timely suggestions and contributions to concept, design and development processes championed by other parties. For example, building business models with partners, being involved in partners’ design and development projects, selecting among projects suggested by different counterparts with different business outlook and time horizons, or designing platforms to be compatible with partners’ products.

“Being seized” involves considerations of positive and negative effects for the firm as well as emphatic consideration of effects for other involved parties, since neither of the other parties will continue their seizing efforts unless these have a clear value potential for them, or in other ways contributes to developing value in its relationships. Thus, the firm’s decision-making processes depend substantially on previous, current, and potential future interactions with involved and related firms, and therefore, on understanding the strategies and decision-making processes of those firms. Insight into the envisioned future development paths of existing suppliers and customers is necessary to assess where and how to inspire as well as assist others. As such, personality traits of the involved employees matter for allocating them to processes of “being seized” as well as their understanding of the limits to which the firm can commit to particular “being seized” processes and enroll others therein.

**Being reconfigured:** Building on the definition by Teece (2007) of “reconfiguring” capacities, we define “being reconfigured” capacities as the firm’s structures, processes and capacities of individuals which enable continuous alignment and realignment of the specific tangible and intangible assets involved in reconfiguration efforts by outside actors. Hence, “being reconfigured” relates to ability of the firm to make adaptations in relation to strategies and demands by other firms, through constructive inputs and reactions in interaction processes with other firms who try to bring about change to pursue opportunities, neutralize threats, or ensure compliance with regulations. It involves making choices and taking action based on deep understanding of the limits to what can be reconfigured, and what cannot or should not be reconfigured, in the firm, given risks involved when changing systems characterized by causal ambiguity. Furthermore, since changes in tangible and intangible resources not only take place within the boundaries of the firm but relate to resources that are controlled by others and therefore depend on the engagement of several firms, “being reconfigured” also involves consideration of the type and extent of adaptations which the firm has to bring about in its wider network and the extent of visioning, mobilizing and enrollment efforts required for doing so. Typical activities in “being reconfigured” comprise absorbing knowledge, as well as transferring knowledge, to involved counterparts; being open to supplier development efforts of customers as well as the ability to cascade such efforts to suppliers of the firm; motivating, engaging and enabling employees to change in line with the chosen opportunities and implement the required adaptations possibly spurred by the involvement of representatives from the counterparts championing the transformation; reconfiguring, initiating and terminating business relationships; while maintaining or enhancing the firm’s reputation, value creation, and position.

### 3. Methodology

After reviewing the literature on dynamic capabilities and industrial network theory, we adopted a qualitative approach and conducted multiple case studies to extend the existing theory and generate new theoretical insights (Birkinshaw, Brannen, & Tung, 2011; Eisenhardt, 1989; Eisenhardt & Graebner, 2007). Specifically, we aim to refine our understanding of the key constructs of the interactive perspective of firms’ dynamic capabilities and to discover relationships between these constructs. The exploratory nature of the research questions suggests that a qualitative research approach is appropriate. The key issue in this study is to understand the dynamic capabilities in a connected world and the role of business partners, which could help build consensus and establish a research framework in the future. Whilst acknowledging that constructivism and critical realism can be said to both converge and diverge in different dimensions when studying business networks, see for example Peters, Pressey, Vanharanta, and Johnston (2013), our ontological position is closer to critical realism (Easton, 2010) assuming that a real world exists, independently of the observer; that social reality is constructed from both natural and social elements; and that the task of the researcher is to identify, explore and seek to understand the causal mechanisms of entities that cause events to happen in the context of particular conditions. For example, innovation and change (events) are produced by firms (events) who make use of their interactive dynamic capabilities (causal mechanisms), in the context of (particular conditions) e.g. sustainability goals, regional constraints, competitive pressures, and other firms and their business relationships (other entities).

We chose the case study method because (1) our focus is to answer how, what, and why; (2) the companies’ behavior cannot be manipulated; and (3) contextual conditions are relevant to the phenomenon under study (Yin, 2003). Case studies explore real-life stories over time through detailed, in-depth data collection involving multiple source of information (Lewis, 2015). In this study, we conducted a purposive sampling procedure to select the organizations and participants. Given our objective to explore the interactive dynamic capabilities through which firms can bring about strategic change through collaboration in relationships and networks, we chose a multiple-case study. Multiple cases typically provide a stronger base for theory building, are more accurate, and are more generalizable, because this research design enables comparisons, and the propositions are more grounded in varied empirical evidence (Eisenhardt & Graebner, 2007; Yin, 2003). We chose two cases that were in different stages and types of collaboration with similar characteristics: both cases concern a firm that had been involved in close collaboration with another firm or organization for at least one year.

We examined two cases (Table 1) in Norway in two different industries: aquaculture and manufacturing. Both industries have faced great challenges and increasing pressure on private and public actors regarding social and environmental responsibility. Case A is about the process when a firm engages in network collaboration with two firms to develop sustainable solutions. All three actors are private firms, and they have formed a long-term collaborative relationship. Case B focuses on a firm’s joint effort with a local public organization. The collaboration between the firms is a good example of how a firm can create shared value by developing profitable business strategies that deliver social

**Table 1**  
An overview of the two cases.

Case study	Industry	Focalfirm/ organization	Partner firm/ organization	Type of relationship
Case A	Aquaculture	Firm A (private)	Firm B (private), Firm C (private)	Long-term contractual partnership
Case B	Manufacture	Firm D (private)	Org A (public)	Long-term contractual partnership

benefits while making economic profit.

The case study method we employed was based on systematic combining (Dubois & Gadde, 2002) which implies going back and forth between framework, data sources, and analysis. For developing the case, and the framework, data collection aimed at understanding the involved parties, their interaction and the dynamic capabilities that come to the fore in particular strategic change processes. To capture the importance of the interaction in dynamic capabilities and understand the passive influence of the partner firm, information was collected from both sides of the partnership. We collected data from both sides of the two partnerships from different sources from May 2014 to May 2018. The data were gathered from a total of 24 interviews and numerous observations during company visits, project meetings, and industry seminars (Table 2).

For analyzing the case data, we applied a visual mapping strategy (Langley, 1999). This method allows the presentation of large quantities of information in relatively little space, and it is an useful tool for developing and verifying theoretical ideas (Langley, 1999). We present the natural development process of each case in the Results section.

## 4. Results

### 4.1. Case A

Evidence collected for Case A is mapped in Fig. 2. In the following sections, a detailed discussion of the interaction process of Firm A, Firm B, and Firm C is provided.

#### 4.1.1. The case companies

Firm A is a small family-owned business. The firm aims to be a world-leading expert in production technology concerning injection molding. The owners of Firm A are convinced that continually engaging in learning processes in relation to other knowledgeable firms and other types of organizations is key for maintaining the firm’s innovative edge. At Firm A, collaboration, innovation, and sustainability are closely intertwined aspects of the firm’s core business.

Firm B was established in the 1980s, and today, it is a publicly listed company. The company supplies a range of products from single components to complete solutions and installations for sea-based cage farming and land-based aquaculture. Firm B’s major customer base is the global salmon farming industry.

Firm C is a company focusing on waste management, container rental, shipping and salting, and snow removal. The firm specializes in recycling plastics from the discarded fish farming cages.

#### 4.1.2. Outlining the cases in light of the theoretical model

In this section, we describe the case A. Fig. 2 provides a visual map of the events in the case, related to phases and background conditions.

**Table 2**  
Data collection.

Case study	Data type	Number	Roles and positions
Case A	Open-ended interviews	9	CEO, CFO, project managers, R&D managers, technical sales managers, purchasing managers, and engineers from Firm A and Firm B
	Semi-structured interviews	5	CEO, CFO, project managers, R&D managers, business developer, and engineers from Firm A, Firm B and Firm C
Case B	Open-ended interviews	5	CEO, R&D manager, sales and marketing director, and COO from Firm D, manager of Org A
	Semi-structured interviews	5	CEO, R&D manager, Sales and marketing director from Firm D, supply chain manager from the wholesaler

Fig. 3 highlights the phases and interactive dynamic capabilities of Firm A.

**4.1.2.1. Sensing and being sensed.** Firm A realized that the government has increasing pressure on producers’ environmental responsibility in the aquaculture industry, and the firm was constantly sensing new opportunities and looking for new customers in the aquaculture sector. Firm A’s sensing activity involves not only problem searching and solving for current customers but also understanding potential and latent market demand. Firm A was continuously engaging heavily in in-house R&D activities and participating in R&D projects involving business, government and non-government actors, and research institutions. At the same time, Firm B was also actively searching for suppliers, as the firm had been engaged in unsatisfying business relationships with several suppliers overseas. This search brought the opportunity for initiating the collaboration with Firm A, whose employees and Firm B’s employees met at an aquaculture convention in Norway. These two firms immediately found a common interest in the idea that Firm A could supply stable and high-quality product components that Firm B is searching for. After this meeting, Firm B hired Firm A to design and produce the components for the casings. Firm A later presented the possibility of taking over the development and production of several other cage components. Eventually, Firm B decided that Firm A would become their main supplier of molded plastic components, and the firms signed an eight-year production contract. This contract specified that they would keep open dialogue and have close collaboration as partners.

The being sensed activities for Firm A involves being exposed to potential customers, such as being introduced to Firm B at the aquaculture convention and presenting their ideas to Firm B. At a conference in 2016, Firm A was again introduced to a firm, called Firm C, which specialized in collecting plastics from fish farming cages, which led to further dialogue between the two firms on how to benefit from each other’s needs and goals. Firm A saw potential in using secondary material collected from discarded fish cages from Firm B’s customers, and Firm C was looking for long-term customers to secure a steady in-flow of waste material. By sensing and being sensed, an opportunity for the two firms to potentially form a closed loop concerning waste material from the fish cages surfaced.

In the Firm A case, it is clear that the initiative Firm A took dovetailed well with the active participation and sensing activities by other actors—in this case, Firm C, which viewed Firm A as a good collaboration partner for developing their technology and services. Thus, Firm A and Firm C were actively open towards each other in a mutual process of sensing and being sensed.

**4.1.2.2. Seizing and being seized.** Once a new opportunity is sensed and being sensed, it is important for all involved parties to invest in the development and commercialization process. In the collaboration between Firm A and Firm B, they have continuously initiated new R&D projects in which they developed new types of brackets. One project that required close cooperation and extensive development of molds and production equipment is the development of the largest product that Firm A has ever produced: a bracket model associated with a cage sold by Firm B with specific reinforcements to accommodate the needs of large-scale fish farming in rough seas. The outcome was a unique production procedure that produces among the largest integral injection molded products in Europe. For each new product that is to be developed (e.g., a new bracket model), there is close cooperation between the R&D facilities at Firm B and the responsible project engineer at Firm A. The collaboration between Firm B and Firm A shows the capacity to seize opportunities and being seized with a business partner.

The relationship between Firm A and Firm C also involved the seizing and being seized process. They moved forward in seizing the opportunity for the potential reusing of the discarded plastic materials from fish farming cages. The two firms initiated tests at Firm C facilities for

cleaning the plastic waste material so that it can be used in Firm A's production process without interruptions. They achieved satisfactory results in 2017 with an envisioned cost savings as high as 30%. They can achieve major cost-saving by using the secondary material from Firm A. In this case, the decision to move forward with the idea for reuse the secondary material is highly dependent on Firm C being an active counterpart and "seizing" the opportunity to make Firm A into a collaboration partner.

**4.1.2.3. Reconfiguring and being reconfigured.** In the collaboration between Firm A and Firm B, new R&D projects have continuously been initiated in which the firms have developed new types of brackets. One development is the unique production procedure for the new bracket model.

The long-term vision of Firm A and Firm B is to achieve a more sustainable supply network in relation to cage production by creating a closed loop. Instead of burning the old cages, the aim is to use so-called secondary material in terms of collecting the cages and reusing the material to produce new ones. Using secondary material would not only decrease the environmental effect but also lower material costs for Firm A and Firm B. However, this process requires new production technology. To move in this direction, Firm A is currently the project owner of a four-year research project begun in 2016 with a budget of 30 million NOK (about 3 million Euro). The project goal is to develop production methods for molding extra-large products. Firm A has been concerned with the question how to connect this project, and Firm B, in an initiative for creating a closed loop of the plastic material used for the fish cages produced for Firm B.

Firm A's initiative to form a closed loop of waste material also shows several tendencies towards transformation. The first is that the dialogue and cooperation continue by involving testing and adaptation of technology and material solutions, within Firm A and Firm C. The second is that Firm A and Firm C have applied to the Norwegian Research Council for funding to continue their collaboration. The third is a research project initiated in 2016 in parallel to the ideas for the closed loop that also involves Firm B. In this project, the main goal is to produce larger key components of fish farming cages. One major cost-saving parameter could be the use of secondary material, and thus, the two projects are closely related. If the two R&D projects are successful, Firm C, Firm A, and Firm B could mutually develop a supply and recycle process (closed loop) in which secondary material is used to produce larger brackets.

In this case, the initiative for forming a closed loop clearly required Firm A and Firm C to engage their intangible (knowledge/competence/routines) and tangible (materials, production technology) assets and resources in a process of how they would fit together effectively. As an example, it meant developing Firm C's existing cleaning technology in terms of making the secondary material smooth enough for Firm A's existing production process.

## 4.2. Case B

### 4.2.1. The case organizations

Firm D is a Norwegian company founded in 1960s that develops and supplies brass couplings and related products for the water and gas distribution industries. The firm focuses on quality and technical solutions. Firm D's main products are couplings (fittings) for pipes of various sizes. Previously, Firm D's dominant product was brass couplings. However, during the 1990s, the market trends for coupling products were driven from metals to plastic materials, because the plastic product is cheaper and does not have the potential to corrode, as brass couplings do. Moreover, many end-users were skeptical about having metals in the ground due to drinking water conditions. Therefore, Firm D started R&D on a composite product which has several advantages: it is lighter, is corrosion resistant, does not expand, and is free of lead. In 2003, Firm D started producing couplings in composite. The first composite product

was delivered to the market in 2009, making Firm D the first to offer this product in the industry. The production process for composite is easier and consumes less energy than that for brass.

Org A is one of the local offices of the Norwegian Labor and Welfare Administration and administers part of the national budget through unemployment benefits, work assessment allowances, sickness benefits, pensions, child benefit payments, and cash-for-care benefits. One of the agency's main goals is to get more people employed and provide services tailored to users' needs and circumstances.

### 4.2.2. Application of the theoretical model

In this section, we describe the case B. The visual map (Fig. 4) of case B describes the key events in the case and the interactive dynamic capabilities of Firm D is discussed in Fig. 5.

**4.2.2.1. Sensing and being sensed.** Firm D's process for developing the new product started with active sensing activities. Firm D realized that composite couplings might be preferred by future consumers, as they are cheaper, do not have potential corrosion issues, and do not have the potential lead health issue. Firm D started R&D on the composite product. After the firm introduced the product in the market, it was very popular because of its outstanding features, but the increased demands on the production system led to an assembly capacity shortage at Firm D. Therefore, the firm looked for possibilities to increase their assembly capacity. One solution considered was to create an automated process. However, this was not feasible, because Firm D gets many small orders and diverse product dimensions, and automatization is not flexible enough to adjust to different orders. Therefore, manual assembly fits Firm D much better.

Firm D then started sensing and being sensed activities. The CEO of the Firm D contacted several Labor and Welfare Administration centers to look for a partner and contacted the manager of Org A in the spring of 2013. Org A was interested in collaborating as there was a wave of immigrants, and the organization faced challenges with integrating the immigrants in the community. An important way of solving this problem was to help the immigrants get engaged in the job market. Therefore, the Org A manager presented the idea of establishing a job training center, so the immigrants could get job training opportunities. Firm D was immediately interested. Firm D and Org A signed a five-year cooperation agreement in August 2013. The agreement included available positions, integration, job training, and language training. This agreement is rewritten every year, in an annual meeting, based on previous results and experiences to adjust future plans and new ideas. By sensing and being sensed, Firm D and Org A explored an opportunity that benefited both parties: Firm D could solve its assembly capacity shortage, and Org A could help more people get valuable job training.

In the Firm D case, identifying the potential market needs and starting the R&D project on composite product were Firm D's active sensing activities. To manage its assembly capacity, Firm D needed a local partner with a low-cost, flexible available workforce, and Org A had the resources. On the other hand, Org A was also actively searching for a way to help immigrants integrate, and Firm D had the capacity and willingness to collaborate. Therefore, Firm D and Org A were actively sensing, being sensed and through their collaboration process enabled each other to achieve their goals.

**4.2.2.2. Seizing and being seized.** The collaboration with Org A also involved the process of seizing and being seized. Establishing a job training center was attractive to both parties, and since the cooperation agreement was signed in 2013, all composite parts produced by Firm D have been assembled at the job training center. From 2013 to 2014, 287 individuals participated in the center's activities through Org A, and 31% had a foreign background. At the center, they experienced Norwegian work life and prepared themselves for the future job market by getting important job training. The participants are sometimes assigned

to other firms in the local industrial park that have an acute need for temporary labor. Through this initiative, the municipality has fewer unemployed residents, and it creates important value for society at large. For Firm D, the job training and recruitment center is beneficial as manual assembly is more flexible and efficient compared to automatization. Firm D still pays the same cost as for an automated line but views the initiative as an important part of taking social responsibility. In 2015, Firm D and Org A agreed to increase the number of participants at the center and to further develop the organizations' cooperation. In addition, in 2016 firms within the industry park started recruiting employees from the job training and recruitment center, which confirmed that the cooperation provided huge opportunities for immigrants and others in the job market. In 2017, Firm D increased the number of participants because of the rise in production volume, and the firm aims to expand the center.

In this case, the collaboration between Firm D and Org A has been a win-win situation for both parties, and it provided training opportunities to participants. This win-win situation could not have been created without the involvement of both parties. Firm D needs Org A to be a reliable partner in the long-term as manual assembly is not easy to realize in a low-populated country like Norway. Org A may also face difficulties finding another partner since the cooperation is possible only because Firm D is the sole supplier in this niche market in Norway. Otherwise, the cooperation would have violated the laws regulating competition. Therefore, the win-win collaboration is a result of the mutual process of seizing and being seized.

**4.2.2.3. Reconfiguring and being reconfigured.** The job training and recruitment center has been successful for Firm D and Org A. The center has expanded steadily since the beginning as Firm D's production volume increased, and today, all composite parts Firm D produces are assembled at the center. In this case, Firm D has successfully reconfigured its product portfolio and included composite couplings as its key competitive products. It is also evident that the collaboration with Org A plays a very important role in securing Firm D's assembly capacity. Both parties have engaged actively to establish and operate the job training center to make sure that Firm D gets the assembly it needs, Org A can fulfill its duty to help people get employed, and the participants can get job training and prepare for the job market. Today, Firm D is still considered an important cooperation partner for the municipality, as the firm assists with getting immigrants employed.

The operational model established between Firm D and Org A interested Firm D's contacts in XX Country, where a high unemployment rate and illiteracy are huge social issues. XX Country currently has big water supply issues due to outdated and obsolete mechanization, indicating that the potential market is huge for Firm D. Moreover, the composite product is also more appealing to developing countries than brass products, as brass couplings are prone to theft because the metal is valuable. Thus, Firm D plans to create a cooperation project similar to the job training and recruitment center in XX country, where the participants mount parts and assemble and learn to read and write. Creating a local assembly center in the country could provide more job opportunities for the local community, and thus, Firm D distinguishes itself from its competitors by showing their high responsibility to the local community and creating shared value for society.

## 5. Discussion and conclusions

### 5.1. Case discussion

The following subsections divide the discussion of the results into three main areas of interest of this study of interactive dynamic capabilities; dynamic capabilities in interaction, the reach of the firm's interactive dynamic capabilities, and the perceived value of interactive dynamic capabilities.

#### 5.1.1. Dynamic capabilities in interaction

Although the dynamic capabilities framework emphasizes the relationship between a firm and its ecosystems and network, the framework focuses on the three capacities that are within the firm. On the other hand, theories on networks recognize that a firm's resources are more valuable when they can be combined and utilized with other firms. A firm's business relationships and network can be a source of information, resources, and opportunities, but they can also restrict the firm's capability to manage changes and challenges (McGrath & O'Toole, 2013). Therefore, in addition to focusing on building sensing, seizing, and reconfiguring capabilities, our study suggests that a firm should also analyze its dynamic capabilities from the perspective of other firms and organizations, in its surrounding networks (or ecosystems).

A firm is being sensed, seized, and reconfigured by other firms and organizations in its network. Specifically, when building business relationships is part of a firm's strategy, the firm turns to being influenced by those relationships (Håkansson & Ford, 2002). This kind of interdependence between firms means that the firm's development process is interactive and responsive, rather than independent (Håkansson & Ford, 2002). For example, a firm can be influenced by the interaction between its supplier and the supplier's other customers; if the supplier decides to allocate more resources to other customers, then this firm may face a potential supply shortage. In our cases, the firms were sensed, seized, and reconfigured through interactions in their business relationships in different ways. In the first case, the relationship between Firm A and Firm C involved the sensing, seizing, and reconfiguring processes in both directions. Both firms sensed the potential to organize a closed loop for reused material together, and they relied on each other to be active partners. In the end, Firm A became dependent on the interactions that Firm C had with other customers and technology suppliers. In the second case, the win-win situation accomplished by Firm D and Org A might not have existed if either party had left the relationship, as it was difficult for both organizations to find substitutes. The two case studies show that dynamic capabilities of the firms come into play through interaction in business relationships, and networks, and involves active as well as more reactive elements.

In sum, a firm's business relationships and network are sources of knowledge and resources, but also restrict its ability to change (Håkansson & Ford, 2002; Håkansson, Ford, Gadde, Snehota, & Waluszewski, 2009). In other words, the interdependency among network partners can strengthen the interactive dynamic capabilities, but this interdependency will also increase the cost to replace any of the partners because of the structural and social bonds that develop between partners over time (Kalubanga & Gudergan, 2022; Schmitz, Schweiger, & Daft, 2016). Therefore, the ability to leverage external networks to adapt to a rapidly changing environment and get the most value from the networks is an important manifestation of dynamic capabilities (Teece, 2007; Teece et al., 1997).

#### 5.1.2. The reach of the firm's interactive dynamic capabilities

Firms need to make decisions on the range and strength of their interactive dynamic capabilities. Sensing new opportunities is related to the firm's efforts in scanning, learning, and interpretive activities, both "local" and "distant" (Teece, 2007). In-house R&D activity can be seen as a typical local search, while searching opportunities at the periphery of the business ecosystem with collaborators, such as customers, suppliers, and complementors, are distant sensing activities (Teece, 2007). Seeking opportunities and potential collaborators helps firms to be innovative and valuable in the market. In the first case, we find that Firm A made continuous efforts to seek new opportunities, such as investing in R&D, initiating business relationships at conferences, collaborating with research institutes, and so on. By engaging in these activities and opening up for exposure, Firm A was also being sensed, in this case by Firm B who was actively looking for new suppliers and represented a new market for Firm A. We found similar attempts in the second case: Firm D realized the opportunity that composite coupling may be

preferred by future consumers and became the first to develop couplings in composite. Subsequently, engaging in sensing in the public sphere by contacting multiple Labor and Welfare Administration centers, Firm D was in turn sensed by Org A for a potential collaboration.

Empirical evidence shows that a tightly integrated production network characterized by proximity and strong collaboration can outperform a loosely integrated production network characterized by low inter-firm specialization (Dyer, 1996). Gaining knowledge and skills through business relationships can accelerate the firm's information-gathering and learning efforts and help assess the degree of "causal ambiguity" associated with other firms' skills and capabilities (Ragatz, Handfield, & Scannell, 1997). Therefore, the business network built with large investments of time, money, and human resources from each partner is a unique competitive advantage for the partners. For instance, in the first case, we found that before Firm A was introduced to Firm B, Firm A was struggling to identify a sustainable foundation for its business through long-term business relationships in particular markets. It was the relationship with Firm B that in turn created opportunities for seizing and being seized both by Firm B and subsequently Firm C. The relationship between Firm A and Firm B acted as a learning space for the two partners, which led to a long-term relationship and new business opportunities. Ultimately, for Firm A, it led to the process of reconfiguring and being reconfigured in interaction with Firm C in organizing a closed loop for reused material.

A business network characterized by high exclusiveness and specificity may limit the opportunity for firms that seek change (Håkansson & Ford, 2002). Usually, making a change is very costly, and a business network can make it costlier because a change in a network involves other firms to comply with. For Firm D, the plan to collaborate with the local labor market to secure the assembly capacity would not have been realized without Org A. Thus, in accordance with an interactive perspective, tangible and intangible assets stretch across organizational boundaries and as such require mutual engagement of several actors in order to change. Due to the interdependence among firms, the mobilization of other actors is key for transformation to take place (Håkansson & Ford, 2002). However, following from the paradoxes intrinsic to the nature of business networks, firms need to find a balance between influencing and being influenced, and between attempting to control and being out of control (Håkansson & Ford, 2002). Achieving, or striving towards, such a balance constitutes a firm's interactive dynamic capabilities.

In sum, a firm's business relationships and network can shape the firm's sensing behavior: a relatively large and loose network can provide more opportunities and resources, but it may also distract the firm from real opportunities, which requires the firm to be resourceful and selective. A relatively short-range dense network with high exclusiveness and specificity may limit the opportunities for firms that are seeking change, which requires the firm to broaden its business horizon and initiate new business relationships (Holmen & Pedersen, 2003). The stronger and closer the relationship, the more resources and attention a firm will allocate to it, which will both create development opportunities within the relationship and restrict the firm's freedom to build other relationships (Håkansson et al., 2009).

### 5.1.3. Perceived value of interactive dynamic capabilities

Taking a network perspective, a firm's chances of sensing opportunities, and the value of the opportunities, are highly correlated with the firm's business relationships, meaning that having dynamic and innovative business relationships can be valuable sources for the relationship.

Håkansson et al. (2009) suggest that networks with strong central control by a single firm tend to be relatively less innovative and less likely to embrace external opportunities and changes. Firms in this type of network, then, have less chance for exposure to highly innovative opportunities, either as the central firm or as a firm on the periphery. Compared to network ties with strong connection and control, the weak

ties of infrequent and distant relationships are likely to be more advantageous when firms search for new opportunities (Granovetter, 1977; O'Toole & McGrath, 2018). In the first case, we found that neither Firm A nor Firm C was willing to be tied up in the relationship. Firm A plans to be a self-reliant supplier that can handle secondary materials without Firm C's involvement, while Firm C is also not dependent solely on Firm A as a customer. The firms' collaboration is based on current mutual interests, and they expect to have a flexible relationship that is open to other opportunities. In the second case, Firm D plans to implement the successful operation model with Org A in another country. Although Org A is the only manual assembly partner Firm D has in Norway, the operation model is highly replicable. If successfully established in the new country, the collaboration with the local government can bring great value to society. However, this does not mean a firm should be involved in as many business relationships as possible. According to Holmen and Pedersen (2003, p. 417), a firm "(a) is directly involved with a small number of their counterparts' other counterparts on some issues—especially if they have direct (or indirect) relationships to these, (b) has some knowledge of and can indirectly influence a relatively small number of their direct counterparts' other relationships, and (c) has no knowledge about a large part of their direct counterparts' other relationships."

Summing up, the two cases showed how a firm's business relationships influence its dynamic capabilities, such as the firm's chance to sense opportunities, the value of the opportunities, and how well the firm can seize the opportunities and achieve the reconfiguration process to gain long-term profit. Furthermore, the presence of all three pairs of interactive dynamic capabilities (sensing – being sensed; seizing – being seized; reconfiguring-being reconfigured) in the two cases implies that firms need to possess dynamic capabilities that not only focuses on their ability to influence and control others, but also of being influenced by, and accepting a certain loss of control in interaction with, specific counterparts.

### 5.2. Theoretical implications

The dynamic capabilities view suggests that a firm's superior performance and survival originate from the firm's ability to sense and shape opportunities in its business ecosystem and to seize the opportunities, and to integrate, protect and reconfigure the firm's resources to changes in the ecosystem. The internal emphasis is consistent with the resource-based view of the firm. However, while the framework by Teece (2007) stresses the importance of the firm acting on its ecosystem, it does not explicitly discuss the importance of the firm being open to the ecosystem acting on the firm. Furthermore, Teece (2007) limits "shaping" of the ecosystem to the firm's "sensing" capabilities, and not to its "seizing" and "reconfiguring". Hence, there is a need for conceptualizing the dynamic capabilities that enable a firm to be "open for business" to active others.

Inspired by perspectives focusing on interaction, adaptation and change in business relationships and networks, we have suggested an interactive dynamic capabilities framework, underpinned by empirical findings from two cases. This framework proposes that the performance and survival of the firm is highly related to its capabilities of not only sensing but also being sensed by others, by not only seizing but also being seized by others, and finally, by not only reconfiguring, but also being reconfigured by others. While these corresponding capabilities of the ones presented by Teece (2007) do not equal a "surrendering" of the firm to the will and power of others, in accordance with the network paradoxes (Håkansson & Ford, 2002) they do imply that firms are not in complete control. Rather, as business actors, firms are part of a network of active, interdependent actors that need to interact in order to survive and thrive. Successful firms have learnt how to wield such interdependency and use "openness" to achieve superior performance by pursuing joint benefits with specific others. As such, while corresponding, these capabilities are distinctly different than the ones presented by Teece



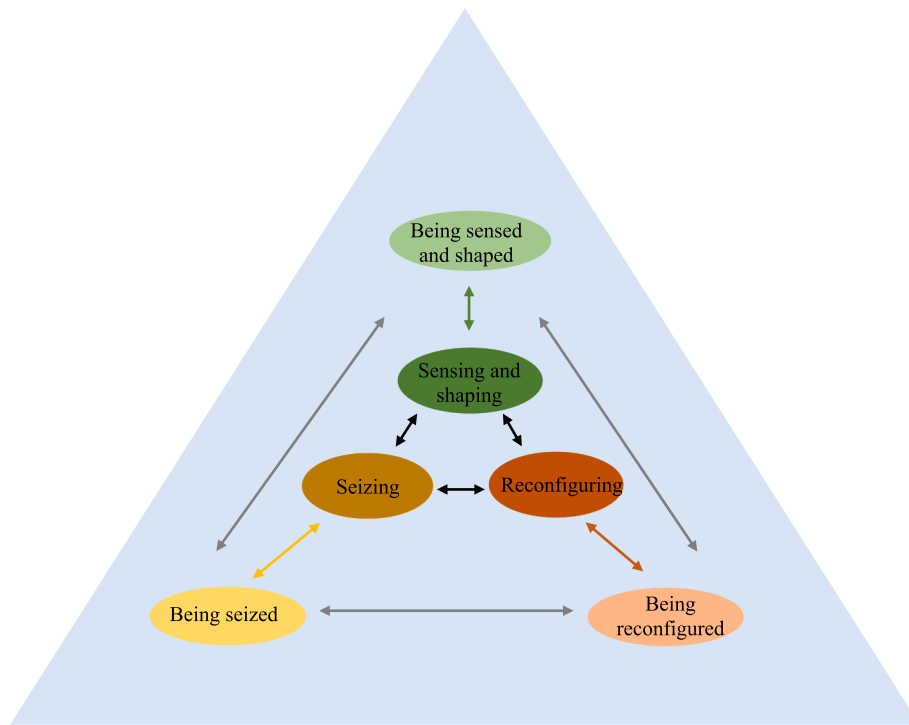


Fig. 1. The interactive dynamic capabilities frameworks.

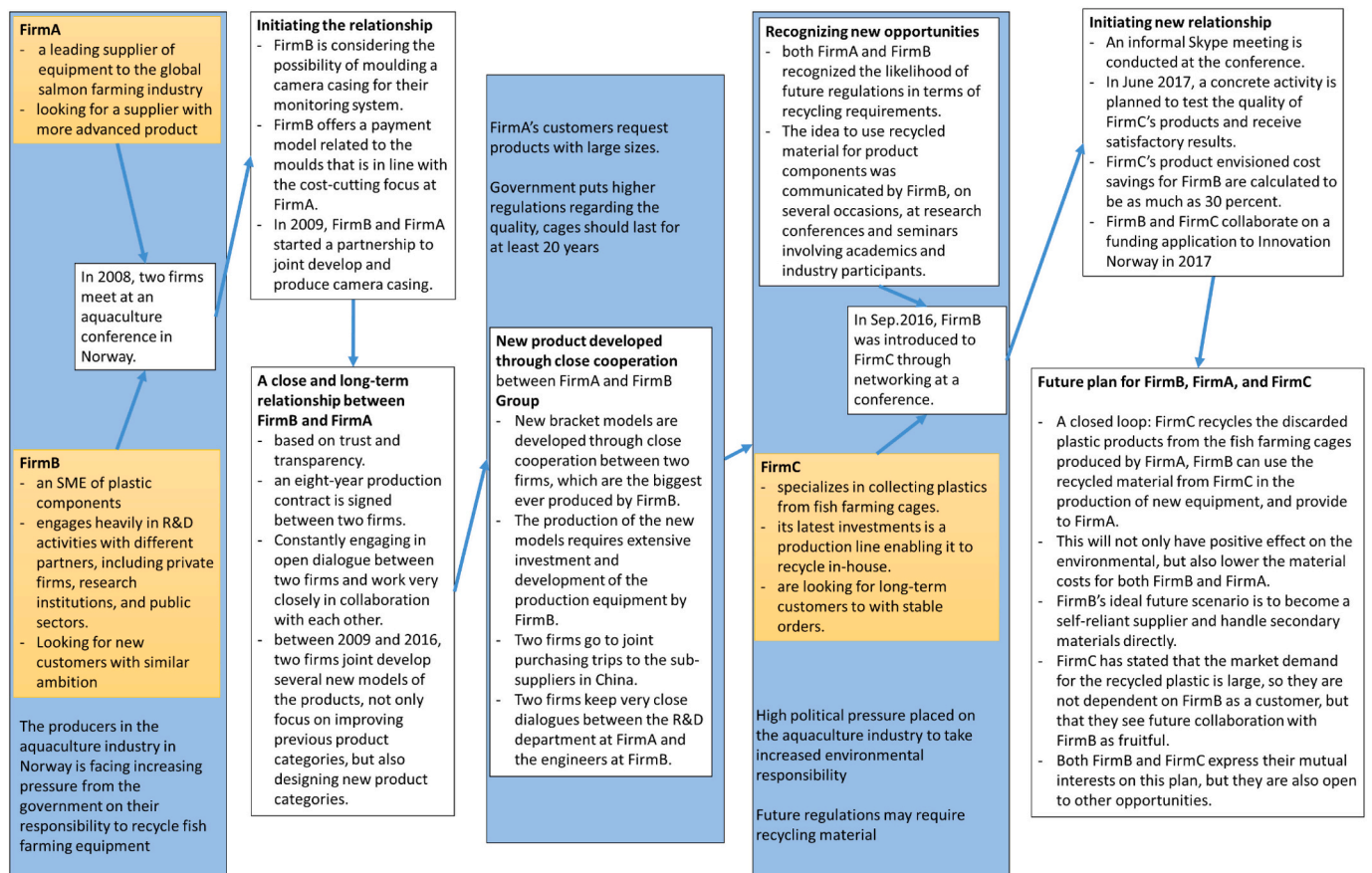


Fig. 2. Visual map of Case A.

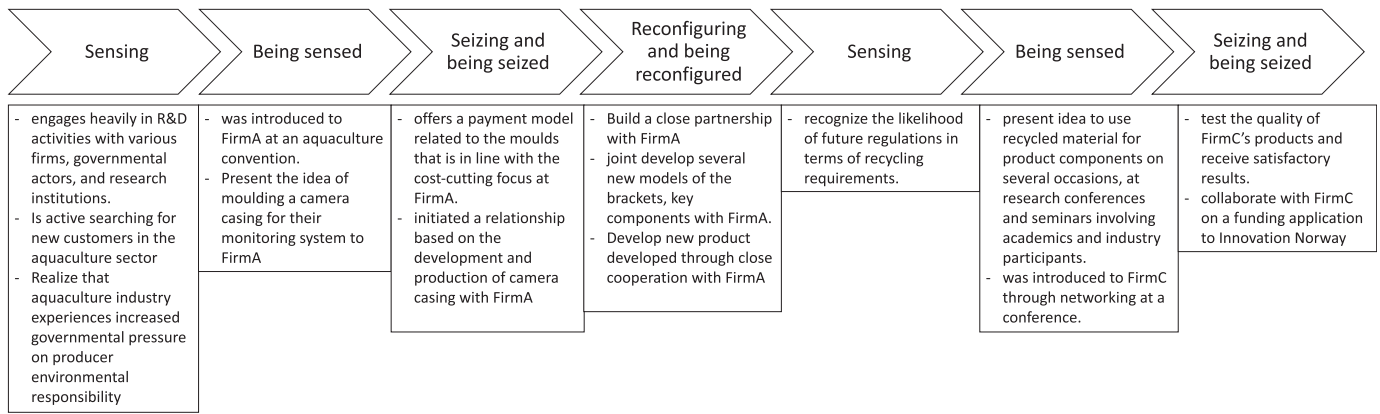


Fig. 3. Interactive dynamic capabilities of Firm B.

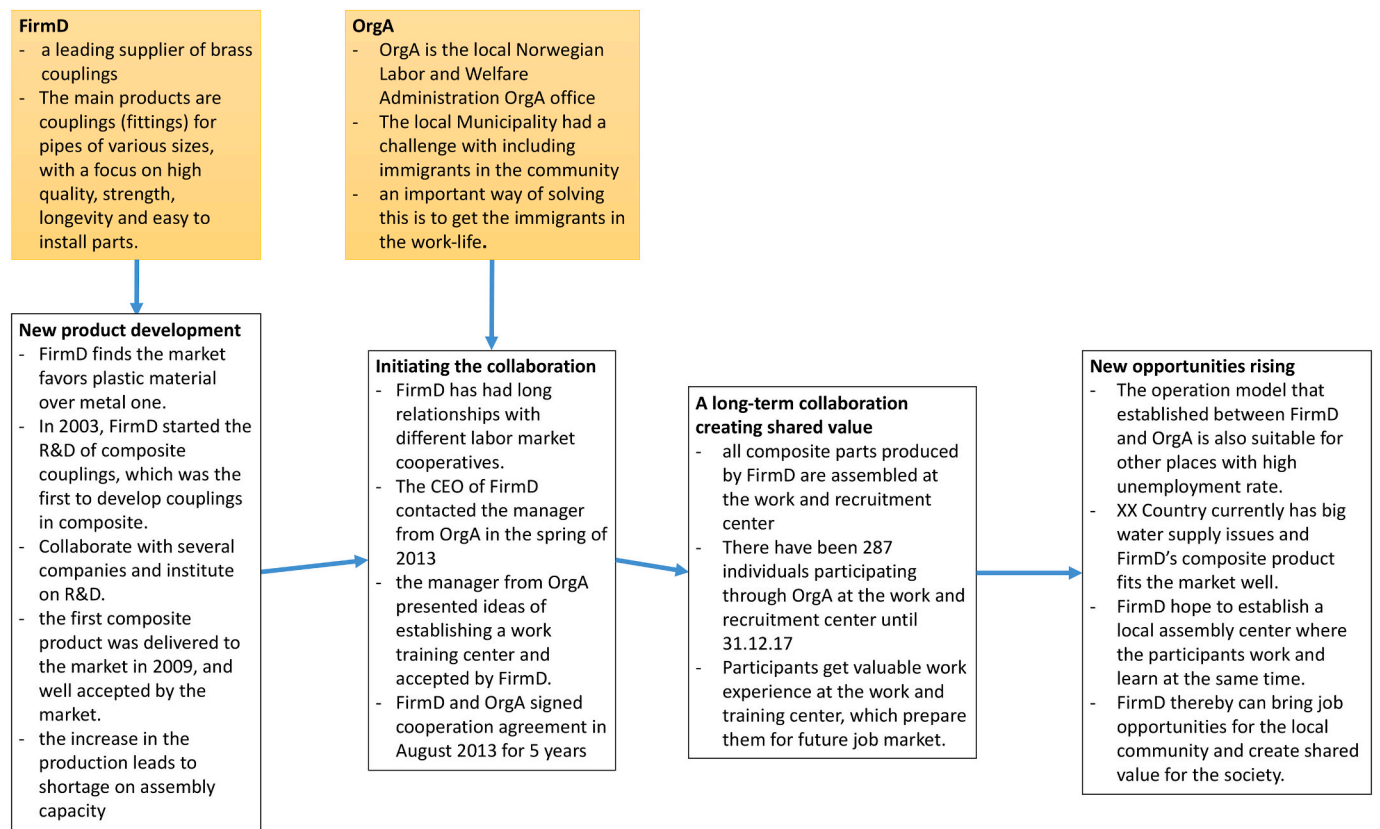


Fig. 4. Visual map of Case B.

(2007) and therefore represent an extension of his original framework through a wider perspective on dynamic capabilities as such, as called for by e.g., Randhawa et al. (2022) and McGrath et al. (2018). Based on the analysis of the cases, we suggest the following clarifications of the framework (outlined in Fig. 1), related to the firm level, the dyadic relationship level, and the network level.

5.2.1. Firm level

Each respective pair of the firm's interactive dynamic capabilities. Each pair of the dynamic capabilities comprises elements that involves partly different capacities, abilities and activities. A firm that is good at "sensing" is not necessarily good at "being sensed", and in contexts of rapid or disruptive change, where core competencies may become core rigidities (Leonard-Barton, 1992), it may be the ability to excel at both,

and the ability to choose which to apply in different circumstances (Winter, 2000), and relational contexts, which best ensures resilience and survival. Applying a similar logic to "seizing" and "being seized", and "reconfiguring" and "being reconfigured", we argue that the interactive pursuit of novel opportunities with new collaboration partners, or novel opportunities in relationships to existing counterparts which pursue strategic innovation and change, may require the firm to master both sides of the pairs.

The firm's total set of three pairs of interactive dynamic capabilities. Each pair of interactive dynamic capabilities is independent, meaning that firms that are very good at "being sensed" may not necessarily be good at "being seized" and "being reconfigured", which also is a consequence of the different microfoundations on which the capabilities rely (Teece, 2007). For example, a firm can be very active in marketing

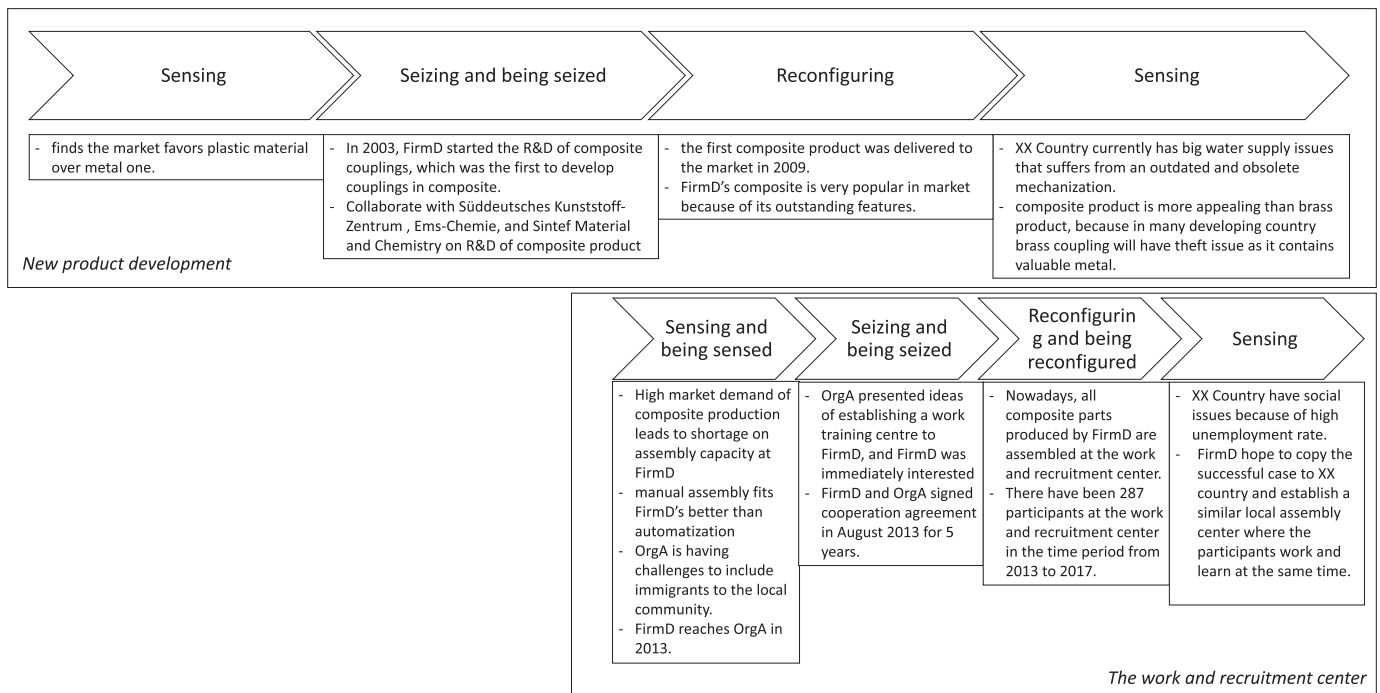


Fig. 5. Interactive dynamic capabilities of Firm D.

communication activities and pose many different innovation challenges to potential partners, and derive a set of opportunities with a huge potential, but the results may be meagre if the firms do not have a useful combination of capabilities to “seize” and “be seized”, and “reconfiguring” and “be reconfigured”. Furthermore, the interplay and interdependence between the different interactive dynamic capabilities (Roberts and Grover, 2012; Leeman, Kanbach and Stubner, 2021) shows the importance of considering the firm’s total set of interactive dynamic capabilities.

5.2.2. Dyadic level

*The mix of the three respective pairs of interactive dynamic capabilities of each party in a dyadic relationship.* Related to the second contention, we propose that the interactive dynamic capabilities operate in the context of an interorganizational relationship and requires a fit between the focal firm’s and the involved counterpart’s interactive dynamic capabilities. The importance of collaborative interest, mutual trust, willingness to share information and knowledge, joint learning and certain level of flexibility contributed from both sides of the dyad have been pointed out as essential for the establishment and maintenance of the interactive dynamic capabilities (Lai, Pai, Yang, & Lin, 2009; Medlin, Aurifeille, & Quester, 2005). A fit is necessary, as it may be challenging if both parties are much better at “reconfiguring” than in “being reconfigured”. On the other hand, if one party possesses the capability to “transform” and the counterpart is good at “being reconfigured” it may suffice for some collaborative change processes, for a particular period, but in the long run with periods of radical change, each involved party mastering only one side of the pair of each interactive dynamic capabilities may prove counterproductive for both parties.

*The mix of the total set of all three respective pairs of interactive dynamic capabilities of each party in a relationship.* It may not be necessary for both counterparts to have a high level of capability in all three pairs of interactive dynamic capabilities, to create value in a relationship. For example, two parties may possess the interactive dynamic capabilities of “sensing” and “being sensed”. However, if their joint capabilities at seizing and reconfiguring are waning in the particular dyad, one or both parties may further pursue the sensed opportunities with other parties. Such behavior, however, must be acceptable given the mutual

expectations in the relationship (Kim et al., 2013) and the business models and forms of value creation pursued by the involved parties, to not risk permanent damage to or termination of the relationship.

*The substance of each of the interactive dynamic capabilities is a function of the substance of the relationship and the context of the relationship it operates within.* A firm may allow different counterparts to sense it differently, for example it may open its facilities to visits by one counterpart due to its relationship with that counterpart but close the gates for another counterpart who would like to sense opportunities related to the firm. Similarly, the firm’s acceptance of being reconfigured, may be a consequence of the trust in the relationship as to the counterpart realizing and rewarding the commitment and adaptations made by the firm as well as the consequences for the network of making such adaptations. The logic also applies to the sensing, seizing and reconfiguring capabilities, for example that the ability of a firm to influence its suppliers to made adaptations is a function of the substance of their relationships, and the importance of the firm as a customer (Dyer, 1996; Kim et al., 2013).

5.2.3. Network level

*The mix of each respective pair, and the mix of the total set of all three respective pairs, of interactive dynamic capabilities, among the parties in the network, matter for the change which the involved parties can bring about in the network and its resilience.* Finally, the logic underlying the three implications at the dyadic level can be transferred to the network level, in the sense that when more than two organizations are collaboratively involved in strategic change efforts, the result may depend on the respective, connected pairs of interactive dynamic capabilities of each involved organization, as well as connected total set of interactive dynamic capabilities of each involved organization in the network, and the substance and connections of their relationships.

Summarizing, how companies develop and exercise their dynamic capabilities is strongly related to the actors and relationships in the surrounding context, whether conceptualized as an ecosystem or a network. By considering the intrinsic paradoxical nature of networks and the interactive nature of adaptation and control, we add to the concept of dynamic capabilities in ecosystems characterized by a multitude of active and interactive actors which aim to control and

accept to be controlled, and make others adapt to own, as well as adapting to others, strategic change initiatives.

### 5.3. Managerial implications

Over the last decades, there has been growing realization among managers that business networks and relationships are key assets for firms, to thrive in the long run. Firms should not only consider how their dynamic capabilities allow them to sense and seize opportunities in the ecosystem, and transform their organizational system and supply chain, but also how they accommodate the sensing, seizing and transformation efforts of active parties outside the organization, and how their own dynamic capabilities function when being sensed, seized and reconfigured by active others. If firms scrutinize their dynamic capabilities of being sensed, seized and reconfigured, they may discover opportunities of capability improvement, and consider how to mature their dynamic capabilities of being sensed, being seized, and/or being reconfigured towards a higher and more robust performance level. Exercising and developing the three pairs of capabilities also relies on culture (McGrath & O'Toole, 2014) and on employees on having appropriate skills and personality traits. Developing individuals who excel at both sides of a capability pair, and building teams that together master both sides, is an important task for managers.

This, however, is challenging for managers as their resources are scarce and they therefore need to focus on the most important matters at hand. Teece (2007) suggest that firms must search both at the core and the periphery of their ecosystems. Extending this suggestion to interactive dynamic capabilities implies that attention must be divided between efforts at sensing/being sensed, seizing/being seized, and reconfiguring/being reconfigured in their established relationships such efforts with potential new partners, relationships and networks.

When balancing the different activities to build strong interactive dynamic capabilities, the firm also need to make decisions on the reach of the interactive dynamic capabilities: to engage in relatively large and loose networks with opportunities and resources, or to be more selective and keep a relatively short-range dense network with high exclusiveness and specificity.

Another important implication from our research is that the interdependency among network partners can strengthen their interactive dynamic capabilities, but also make it more difficult to replace a partner, which also limits the value of the interactive dynamic capabilities. A firm needs to be aware of this trade-off and be prepared for a rapidly changing environment. Therefore, firms need to consider a wider network horizon when making decisions and have a sufficient overview of the network and its dynamics. As Holmen and Pedersen (2003) suggested, mapping out the network horizon to investigate the firm's counterparts and, via them, the wider network can be an effective way to understand a "whole" network context.

### 5.4. Limitations and further research

Our aim with this study is to contribute to developing a network-oriented, interactive view of the dynamic capabilities framework. However, there are some limitations that call for further research. First, we suggest that more case studies should be done in line with the interactive dynamic capability framework. The present study covered only two case studies in Norway, and hence, the generalization of this study should be undertaken with caution. Therefore, in line with the realist philosophy, the contribution is to theory – developing concepts that capture underlying causal mechanisms whose logic can come into play, and therefore can be transferable, to firms in comparable settings, at other points in times. Future case studies that capture dynamic capabilities in interaction, in different settings, and with different types of organizations, especially larger firms, in different types of relationships and networks, with successful or less successful outcomes, can improve the external validity of the findings, and further develop the proposed

theoretical framework. When designing and conducting these case studies, the theoretical model developed by Di Stefano, Peteraf, and Verona (2014), which combines different views on the definition of dynamic capabilities, may provide a solid basis for achieving and maintaining conceptual rigor in these efforts. In line with the arguments made by Peters et al. (2013), future case work in this area could also benefit from alternating between constructivist and critical realist approaches in the pursuit of ever more refined insight into how research in and about business networks is shaped by these related yet distinct ontological stances.

Second, in the vein of Wacker (1998)'s discussion of qualitative and quantitative methodologies complementing each other, the theoretical framework generated from the case study may provide a fruitful basis for large scale quantitative research, involving the identification of measurement scales for each construct of interactive dynamic capabilities, testing the inhibitors and enablers, and the role of these constructs on firm's performance, which can be another step to advancing the knowledge in this area. The recommendations provided by Laaksonen and Peltoniemi (2018) for operationalizing dynamic capabilities in quantitative studies based on four different data types including managers' evaluations, financial data, company actions and managers'/employees' experience, may prove a useful starting point for this purpose.

Third, additional analyses of the interaction among the proposed three pairs of interactive dynamic capabilities seems to be a plausible method to gain further understanding of the proposed theoretical model. We also suggest future research on how managers can balance their efforts and trade-off on each capability-pair, so as to achieve better performance, which will require longitudinal and in-depth qualitative research. In summary, we encourage further research on how firms exercise and develop interactive dynamic capabilities which enable them to be open to business driven by other parties.

### Data availability

The authors do not have permission to share data.

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### References

- Aarikka-Stenroos, L., & Ritala, P. (2017). Network management in the era of ecosystems: Systematic review and management framework. *Industrial Marketing Management*, 67, 23–36.
- Alinaghian, L., Kim, Y., & Srari, J. (2020). A relational embeddedness perspective on dynamic capabilities: A grounded investigation of buyer-supplier routines. *Industrial Marketing Management*, 85, 110–125.
- Alinaghian, L., & Razmdoost, K. (2018). How do network resources affect firms' network-oriented dynamic capabilities? *Industrial Marketing Management*, 71, 79–94. <https://doi.org/10.1016/j.indmarman.2017.12.006>
- Allred, C. R., Fawcett, S. E., Wallin, C., & Magnan, G. M. (2011). A dynamic collaboration capability as a source of competitive advantage. *Decision Sciences*, 42(1), 129–161.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Barreto, I. (2010). Dynamic capabilities: A review of past research and an agenda for the future. *Journal of Management*, 36(1), 256–280.
- Bathelt, H., & Schuldt, N. (2008). Between luminaires and meat grinders: International trade fairs as temporary clusters. *Regional Studies*, 42(6), 853–868.
- Birkinshaw, J., Brannen, M. Y., & Tung, R. L. (2011). *From a distance and generalizable to up close and grounded: Reclaiming a place for qualitative methods in international business research*. Springer.
- Blyler, M., & Coff, R. W. (2003). Dynamic capabilities, social capital, and rent appropriation: Ties that split pies. *Strategic Management Journal*, 24(7), 677–686. <https://doi.org/10.1002/smj.327>
- Casson, M., & Wadeson, N. (2007). The discovery of opportunities: Extending the economic theory of the entrepreneur. *Small Business Economics*, 28(4), 285–300.

- Clifford Defee, C., & Fugate, B. S. (2010). Changing perspective of capabilities in the dynamic supply chain era. *The International Journal of Logistics Management*, 21(2), 180–206.
- Di Stefano, G., Peteraf, M., & Verona, G. (2014). The organizational drivetrain: A road to integration of dynamic capabilities research. *Academy of Management Perspectives*, 28(4), 307–327.
- Dubois, A., & Gadde, L. E. (2002). Systematic combining: an abductive approach to case research. *Journal of business research*, 55(7), 553–560.
- Dyer, J. H. (1996). Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management Journal*, 17(1), 271–291.
- Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23(4), 660–679.
- Easton, G. (2010). Critical realism in case study research. *Industrial marketing management*, 39(1), 118–128.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532–550.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25–32.
- Forkmann, S., Henneberg, S. C., & Mitrega, M. (2018). Capabilities in business relationships and networks: Research recommendations and directions. *Industrial Marketing Management*, 74, 4–26.
- Foss, N. J. (1999). Networks, capabilities, and competitive advantage. *Scandinavian Journal of Management*, 15(1), 1–15.
- Gadde, L.-E., Huemer, L., & Håkansson, H. (2003). Strategizing in industrial networks. *Industrial Marketing Management*, 32(5), 357–364.
- Granovetter, M. S. (1977). The strength of weak ties. In *Social networks* (pp. 347–367). Elsevier.
- Håkansson, H. (1982). *International marketing and purchasing of industrial goods: An interaction approach* (Vol. 389).
- Håkansson, H., & Ford, D. (2002). How should companies interact in business networks? *Journal of Business Research*, 55(2), 133–139.
- Håkansson, H., Ford, D., Gadde, L.-E., Snehota, I., & Waluszewski, A. (2009). *Business in networks*. John Wiley & Sons.
- Håkansson, H., & Snehota, I. (1995). *Developing relationships in business networks*. London: Routledge.
- Håkansson, H., & Waluszewski, A. (2007). *Knowledge and innovation in business and industry: The importance of using others*. Routledge.
- Hamel, G. (1991). Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal*, 12(S1), 83–103.
- Harland, C. M., & Knight, L. A. (2001). Supply network strategy: Role and competence requirements. *International Journal of Operations & Production Management*, 21(4), 476–489.
- Havenvid, M. I., de Boer, L., & Holmen, E. (2022). *The role of interaction in achieving increased sustainability in supply networks*.
- Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, 24(10), 997–1010.
- Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic Management Journal*, 32(11), 1243–1250.
- Holmen, E., & Pedersen, A.-C. (2003). Strategizing through analyzing and influencing the network horizon. *Industrial Marketing Management*, 32(5), 409–418.
- Kalubanga, M., & Gudergan, S. (2022). The impact of dynamic capabilities in disrupted supply chains—The role of turbulence and dependence. *Industrial Marketing Management*, 103, 154–169.
- Kanter, R. M. (1994). Collaborative advantage. *Harvard Business Review*, 72(4), 96–108.
- Kim, D., Cavusgil, S. T., & Cavusgil, E. (2013). Does IT alignment between supply chain partners enhance customer value creation? An empirical investigation. *Industrial Marketing Management*, 42(6), 880–889.
- Laaksonen, O., & Peltoniemi, M. (2018). The essence of dynamic capabilities and their measurement. *International Journal of Management Reviews*, 20(2), 184–205.
- Lai, C.-S., Pai, D.-C., Yang, C.-F., & Lin, H.-J. (2009). The effects of market orientation on relationship learning and relationship performance in industrial marketing: The dyadic perspectives. *Industrial Marketing Management*, 38(2), 166–172.
- Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24(4), 691–710.
- Lei, D., Hitt, M. A., & Bettis, R. (1996). Dynamic core competences through meta-learning and strategic context. *Journal of Management*, 22(4), 549–569.
- Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice*, 16(4), 473–475.
- Mason, K. J., & Leek, S. (2008). Learning to build a supply network: An exploration of dynamic business models. *Journal of Management Studies*, 45(4), 774–799. <https://doi.org/10.1111/j.1467-6486.2008.00769.x>
- McGrath, H., Medlin, C. J., & O'Toole, T. (2019). A process-based model of network capability development by a start-up firm. *Industrial Marketing Management*, 80, 214–227.
- McGrath, H., & O'Toole, T. (2013). Enablers and inhibitors of the development of network capability in entrepreneurial firms: A study of the Irish micro-brewing network. *Industrial Marketing Management*, 42(7), 1141–1153.
- McGrath, H., & O'Toole, T. (2014). A cross-cultural comparison of the network capability development of entrepreneurial firms. *Industrial Marketing Management*, 43(6), 897–910.
- McGrath, H., O'Toole, T., Marino, L., & Sutton-Brady, C. (2018). A relational lifecycle model of the emergence of network capability in new ventures. *International Small Business Journal*, 36(5), 521–545.
- Medlin, C. J., Aurifeille, J.-M., & Quester, P. G. (2005). A collaborative interest model of relational coordination and empirical results. *Journal of Business Research*, 58(2), 214–222.
- Mitrega, M., Forkmann, S., Ramos, C., & Henneberg, S. C. (2012). Networking capability in business relationships - concept and scale development. *Industrial Marketing Management*, 41(5), 739–751. <https://doi.org/10.1016/j.indmarman.2012.06.002>
- Mitrega, M., & Pfajfar, G. (2015). Business relationship process management as company dynamic capability improving relationship portfolio. *Industrial Marketing Management*, 46, 193–203. <https://doi.org/10.1016/j.indmarman.2015.02.029>
- Möller, K. J., & Halinen, A. (1999). Business relationships and networks: Managerial challenge of network era. *Industrial Marketing Management*, 28(5), 413–427.
- O'Toole, T., & McGrath, H. (2018). Strategic patterns in the development of network capability in new ventures. *Industrial Marketing Management*, 70, 128–140. <https://doi.org/10.1016/j.indmarman.2017.07.003>
- Peters, L. D., Pressey, A. D., Vanharanta, M., & Johnston, W. J. (2013). Constructivism and critical realism as alternative approaches to the study of business networks: Convergences and divergences in theory and in research practice. *Industrial Marketing Management*, 42(3), 336–346.
- Ragatz, G. L., Handfield, R. B., & Scannell, T. V. (1997). Success factors for integrating suppliers into new product development. *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association*, 14(3), 190–202.
- Randhawa, K., Wilden, R., & Akaka, M. A. (2022). Innovation intermediaries as collaborators in shaping service ecosystems: The importance of dynamic capabilities. *Industrial Marketing Management*, 103, 183–197.
- Reed, R., & DeFillippi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review*, 15(1), 88–102.
- Ritter, T., Wilkinson, I. F., & Johnston, W. J. (2002). Measuring network competence: Some international evidence. *Journal of Business & Industrial Marketing*, 17(2/3), 119–138.
- Schepis, D., Ellis, N., & Purchase, S. (2018). Exploring strategies and dynamic capabilities for net formation and management. *Industrial Marketing Management*, 74, 115–125. <https://doi.org/10.1016/j.indmarman.2017.09.023>
- Schilke, O. (2014). On the contingent value of dynamic capabilities for competitive advantage: The nonlinear moderating effect of environmental dynamism. *Strategic Management Journal*, 35(2), 179–203.
- Schilke, O., Hu, S., & Helfat, C. E. (2018). Quo vadis, dynamic capabilities? A content-analytic review of the current state of knowledge and recommendations for future research. *Academy of management annals*, 12(1), 390–439.
- Schmitz, T., Schweiger, B., & Daft, J. (2016). The emergence of dependence and lock-in effects in buyer-supplier relationships—A buyer perspective. *Industrial Marketing Management*, 55, 22–34.
- Seuring, S. (2011). Supply chain management for sustainable products—insights from research applying mixed methodologies. *Business Strategy and the Environment*, 20(7), 471–484.
- Sheth, J. N., & Parvatiyar, A. (2000). The domain and conceptual foundations of relationship marketing. In *Handbook of relationship marketing* (pp. 3–38). Snehota, I., & Hakansson, H. (1995). *Developing relationships in business networks*. Routledge London.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.
- Torre, A. (2008). On the role played by temporary geographical proximity in knowledge transmission. *Regional Studies*, 42(6), 869–889.
- Wacker, J. G. (1998). A definition of theory: Research guidelines for different theory-building research methods in operations management. *Journal of Operations Management*, 16(4), 361–385.
- Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *Journal of Business Venturing*, 21(4), 541–567.
- Yin, R. K. (2003). *Case study research: Design and methods* (Vol. 181, p. 15). SAGE.
- Zhang, J. F., & Wu, W. P. (2017). Leveraging internal resources and external business networks for new product success: A dynamic capabilities perspective. *Industrial Marketing Management*, 61, 170–181. <https://doi.org/10.1016/j.indmarman.2016.06.001>