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Exploring the Evolution of a Manufacturer's Capabilities and Managers' Mindsets When Transitioning from Closed Innovation to Open Innovation Ecosystem

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Tiivistelmä:
2000-luvulla organisaatiot ovat alkaneet valita avoimen innovaation suljetun innovaation sijaan monista syistä. Avoimen innovaation valitseminen antaa organisaatioille mahdollisuuden päättää, miten innovointi toteutetaan ja yksi suosittu avoimen innovoinnin toteutustapa on innovaatioekosysteemi. Tässä tutkimuksessa tarkastellaan, miten teollisuusyrityksen valmiudet ja johtajien ajattelutavat kehittyvät siirryttäessä suljetusta innovaatiosta avoimen innovaatioekosysteemin organisointiin. Yrityksen kyvykkyyksien ja johtajien ajattelutapojen kehittymistä tarkastellaan mikroperusteiden näkökulmasta.

Tämän tutkimuksen teoreettinen tausta rakentuu kolmen pääkäsitteen tarkastelun kautta. Ensiksi tarkastellaan suljettua ja avointa innovointia ja syitä, joiden vuoksi organisaatiot käyttävät avointa innovointia. Toiseksi syvennytään ekosysteemin käsitteeseen, erityisesti innovaatioekosysteemin käsitteeseen. Kolmanneksi tarkastellaan dynaamisia kyvykkyyksiä mikroperusteiden avulla. Nämä kolme käsitettä yhdistetään toimivaksi teoreettiseksi kehykseksi.

Tämä empiirinen tutkimus on yksittäinen tapaustutkimus. Tutkimuksen tapausorganisaatio on pörssilistattu ja se valittiin sen organisoiman ainutlaatuisen innovaatioekosysteemin vuoksi. Lisäksi innovaatioekosysteemi on kehitysvaiheessa, joten johtajien ajattelutavoissa ja kyvyissä on nähtävissä muutoksia. Ensisijainen aineisto kerättiin puolistrukturoiduilla haastatteluilla. Toissijaista aineistoa kerättiin vuosikertomuksista, pääomamarkkinapäivistä ja muista julkisesti saatavilla olevista tiedotteista.

Tutkimuksen tulokset osoittavat lukuisia erilaisia ajattelutapoja, kognitiota, työmenetelmiä, prosesseja ja organisaation rutiinimuutoksia, jotka mahdollistavat avoimen innovaation toteutumisen innovaatioekosysteemissä. Tämän tutkimuksen tärkein anti on empiirisen kehyksen luominen, jonka avulla voidaan ymmärtää, miten mikroperustat auttavat tämän tutkimuksen teollisuusyritystä saavuttamaan dynaamisen kyvykkyyden, kun organisaatio siirtyy suljetusta innovaatioprosessista kohti avointa innovaatioekosysteemiä.

AVAINSANAT: Innovaatioekosysteemi; ekosysteemi; ekosysteemin hallinta; innovaatio; avoin innovaatio; suljettu innovaatio; dynaamiset kyvykkyydet; tavanomaiset kyvykkyydet; kyvykkyydet; mikroperustat; johtamisprosessit. innovation ecosystem; ecosystem; ecosystem management; innovation; open innovation; closed innovation; dynamic capabilities; ordinary capabilities; capabilities; microfoundations; managerial processes.

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ABSTRACT:
Organizations in the 21st century have started to opt for open innovation instead of closed innovation for numerous reasons. Opting for open innovation allows organizations to decide how to orchestrate it. One popular theme of open innovation is innovation ecosystems. This study scrutinizes how a manufacturer's capabilities and managers' mindsets evolve when transitioning from closed innovation to orchestrating an open innovation ecosystem. To be able to scrutinize how the manufacturer's capabilities and the managers' mindsets evolve, it is essential to employ a microfoundational approach.

This study's theoretical background is built by examining three main concepts. First, closed and open innovation are examined, and reasons for organizations employing open innovation are explicitly looked at. Secondly, the ecosystem concept, specifically the innovation ecosystem concept, is delved into. Thirdly, the dynamic capability is examined thoroughly, and microfoundational research has a role important in this part. Altogether, the three concepts are combined for a working theoretical framework.

This empirical study employs a single case study. The case organization in this study is stock-listed and was selected due to the unique innovation ecosystem it orchestrates. Furthermore, the innovation ecosystem is in the evolution phase, and this is why there are visible changes in managers' mindsets and capabilities. Primary data was gathered through semi-structured interviews, while secondary data was gathered from annual reports, capital market days, and other publicly available information. The data analysis occurs through a within-case study.

This study's findings showcase numerous mindset, cognition, work method, process, and organizational routines, which enable open innovation in an innovation ecosystem. This study's main contribution is building an empirical framework that can be used to understand how microfoundations aid the manufacturing organization in achieving dynamic capability when the organization transitions from a closed innovation process towards an open innovation ecosystem.

KEYWORDS: Innovaatioekosysteemi; ekosysteemi; ekosysteemin hallinta; innovaatio; avoin innovaatio; suljettu innovaatio; dynaamiset kyvykkyydet; tavanomaiset kyvykkyydet; kyvykkyydet; mikroperustat; johtamisprosessit. innovation ecosystem; ecosystem; ecosystem management; innovation; open innovation; closed innovation; dynamic capabilities; ordinary capabilities; capabilities; microfoundations; managerial processes.

Contents

Figures

Tables

1 Introduction

The delineation of activities organizations performs themselves and what they do not have been a central point of interest for management scholars (Kapoor & Lee, 2013). In the 1980s and 1990s, organizations structured their production with the help of various complex chains leading to the emergence of supply chain management (De Vasconcelos Gomes et al., 2021). However, the innovation activities of organizations have come under particular review, which has resulted in changes in how organizations innovate and operate. A breakthrough occurred at the turn of the 21st century when organizations began to strive for more open innovation, which practically means the innovation funnel is opened (Chesbrough, 2003a). This approach differs significantly from the previous paradigm, which emphasized closed innovation (Chesbrough, 2003a) and favored a vertically integrated organizational structure. The decision to choose open innovation over closed innovation is driven by numerous factors, including the need for faster time to market of products and services (Chesbrough, 2003a), and as organizations have realized that the higher quality and quantity of outputs relies on the quantity and quality of inputs (Felin & Zenger, 2020), thereby motivating organizations to opt a more open policy to their innovation. Furthermore, contemporary customers demand complex integrated solutions, which cannot be achieved by single vertically integrated companies and their internal knowledge and capabilities (Williamson & Meyer, 2012). Consequently, new ways of operating and innovating are required.

This shift towards embracing open innovation has made companies explore different approaches for leading open innovation, such as crowdsourcing, coopetition, science-based (Lee et al., 2019), and ecosystems (e.g., Adner, 2006; Adner, 2017; Jacobides et al., 2018). Amongst these options, ecosystems, particularly innovation ecosystems, have become popular. Innovation in ecosystems occurs at the macro level instead of the micro level (Adner, 2017). Ecosystems, known initially as a metaphor for a biological ecosystem (Moore, 1996), are a set of actors that depend on each other's competencies to co-create a value proposition, thus exemplifying interdependency between actors and difference to vertically integrated supply chains (Linde et al., 2021; Ander, 2017; Jacobides et

al., 2018; De Vasconcelos Gomes et al., 2021). It has been argued that these ecosystems enable the creation of value that one company alone is not capable of (Adner, 2006). Consequently, competition has shifted from organization versus organization towards ecosystem versus ecosystem (Cennamo & Santaló, 2019). Moreover, it is worth noting that while supply chain management was relevant through the 1980s and 1990s, the new paradigm has become ecosystem management (De Vasconcelos Gomes et al., 2021).

This growing interest in ecosystems is visible in both business-to-customer and business-to-business markets. Prominent technology companies, such as Apple and Google, have built and successfully leveraged their platform ecosystems to grow into trillion-dollar market capitalization organizations (Cusumano et al., 2020). These ecosystems have produced unmatched value-add for end users. Furthermore, the business-to-business market has also seen evolution as organizations have begun transitioning from closed innovation to open innovation by building ecosystems around them (Ritala & Stefan, 2021). Some organizations not only orchestrate ecosystems but are also involved in other ecosystems. Notable examples of business-to-business ecosystems include Finnish companies such as Nokia and its Unlocking Industrial 5G Beyond Connectivity and Competitive Edge ecosystems, TietoEvry and its Trust-Based Digital Society ecosystem, Meyer Turku and its NECOLEAP – Climate Neutral Cruise Ship ecosystem and KONE's The Flow of Urban Life ecosystem (Business Finland, n.d.). These ecosystems have also received funding from the government-owned and controlled entity Business Finland (Business Finland, n.d.), showcasing that governments also recognize ecosystems as important innovation activities on the macro level and their potential broader societal value. Consequently, it is visible that organizations have started to take innovation ecosystems as strategic focal points and are building ecosystems with which they can compete against other ecosystems.

In numerous industries, a company's ability to produce innovations allows it to succeed (Jantunen et al., 2012). Jantunen et al. (2012) add that bringing new products or services to the market depends on the organization's knowledge and capabilities it can leverage,

as well as external pressure that stems from the organizations' environment. It is worth noting that changes in the organization's operating environment not only open the possibility for new opportunities but also may render existing offerings obsolete (Jantunen et al., 2012). For a company to seize these opportunities that arise from the changes in the operating environment, the organization must renew its resources and capabilities (Jantunen et al., 2012). This can be achieved by leveraging dynamic capabilities, which enable organizations to create, extend, and modify their resources and ordinary capabilities, in doing so creating sustainable competitive advantage (Helfat et al., 2007; Helfat & Raubitschel, 2018; Teece et al., 1997)

Dynamic capabilities can be perceived through sensing, seizing, and reconfiguring (Teece et al., 1997). These capabilities are not dynamic capabilities themselves, but instead there are microfoundations underlying them that make sensing, seizing, and reconfiguring possible (Ambrosini & Bowman, 2009; Teece, 2007). Examining microfoundations in the context of dynamic capabilities has drawn attention from researchers (see, e.g., Teece, 2007; Felin et al., 2012), resulting in the examination of the effects micro-level factors have on macro-level outcomes. For example, the micro-level can be used to analyze what managerial and operational processes the sensing, seizing, and reconfiguring are made of (Ambrosini & Bowman, 2009). Moreover, while a large portion of research has studied an individual organization, interest in the ecosystem context has grown. Research indicates that microfoundations of sensing include the sub-routines for searching for potential partners while seizing involves ecosystem formation, and reconfiguring involves modifying the ecosystem to improve its resilience (Linde et al., 2021). However, it is worth noting that the micro-level can be examined at the level of the individual managers, in which case managers' cognitions can be examined (Helfat & Peteraf, 2015). Examining this level is important because in organizations that transform their innovation policy from closed innovation to open innovation, research and development professionals must undergo a transformation process and change their identity to adopt open innovation (Lifshitz-Assaf, 2018). Moreover, adopting open innovation requires new organizational routines (Chiaroni et al., 2010), thereby exemplifying micro-level changes.

1.1 Research gap

Despite the growing interest during the past two decades in both the “innovation ecosystem” concept and “dynamic capability” theory, a significant gap in research still exists that incorporates both fields. An analysis of search results made in Scopus reveals that both research fields have grown largely independently. The innovation ecosystem concept, first introduced by Adner (2006), has grown from 35 [1]results before the year 2010 to 2003 [2]search results from 2010 to 2023. Meanwhile, dynamic capability research, first introduced by Teece et al. (1997), has also grown enormously as the search results[3] have grown from 959 search results[4] to 5574 search results in the same time frame. However, the growth in both fields has yet to translate into solid interest in the interplay between the two fields, as a Scopus search[5] showcased merely five search results in top scientific journals.

Recent theoretical studies by Teece (2018), Teece et al. (2023), and Helfat and Raubitschek (2018), as well as empirical studies by Linde et al. (2021) and Lütjen et al. (2019) have started to bridge this gap by adopting a dynamic capability perspective into ecosystem research. This has resulted in valuable insights and the realization of the research gap. In particular, Helfat and Raubitschek (2018, p. 1393) have argued that “we know little about the capabilities of firms that orchestrate ecosystems in general…” while Linde et al. (2021, p. 1) emphasize that “prior research lacks insights into the dynamic capabilities and routines required for ecosystem innovation.”

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[1] TITLE-ABS-KEY (“innovation ecosystem”) AND PUBYEAR BEF 2010
[2] TITLE-ABS-KEY (“innovation ecosystem”) AND PUBYEAR AFT 2010
[3] TITLE-ABS-KEY (“dynamic capability”) AND PUBYEAR BEF 2010
[4] TITLE-ABS-KEY (“dynamic capability”) AND PUBYEAR AFT 2010
[5] TITLE-ABS-KEY (“dynamic capability”) AND (“innovation ecosystem) EXACTSRCTITLE ("Administrative Science Quarterly" OR "Journal of Management Studies" OR "British Journal of Management" OR "Journal of Management" OR "Academy of Management Journal" OR "Academy of Management Review" OR "Organizational Science" OR "Strategic Management Journal" OR "Organizational Studies" OR "Leadership Quarterly" OR "Human Relations" OR "Organizational Research Methods" OR "research policy" OR "International Journal of Management Review" OR "Administrative Science Quarterly" OR "Business Ethics Quarterly" OR "MIT Sloan Management Review" OR "Harvard Business Review" OR "European Management Review")

Moreover, while microfoundational research of dynamic capabilities has gained interest, it has primarily focused on the firm level (see, e.g., Teece, 2007), which means that more knowledge is still needed about microfoundations at the manager level. Consequently, there needs to be more knowledge about mindset changes, manager cognition, and managerial heuristics and how they evolve when organizations move from closed to more open innovation, particularly in an innovation context. This and the small amount of research that integrates both research fields validate the need for more empirical research about microfoundations on both firm and manager levels in an innovation ecosystem context.

1.2 Research purpose, question, and theoretical contribution

This study aims to scrutinize how a manufacturer's capabilities and managers' mindsets evolve when transitioning from closed innovation to orchestrating an open innovation ecosystem. The research purpose will be researched through one broader research question. It is worth noting that to be able to scrutinize how the manufacturer's capabilities and managers' mindset evolve, it is essential to look at this from a microfoundational approach. This is why the research question takes on a microfoundational emphasis. The research question is as follows:

How do the individual managers' microfoundations affect the manufacturer's dynamic capabilities when the organization transitions from closed innovation towards more open innovation occurring in an innovation ecosystem?

This thesis employs an explanatory case study as the study's strategy, which allows to delve more deeply into the microfoundations that can be found. The research question of this study follows a case study question, as it answers a how question (Yin, 2009). Furthermore, as this study aims to scrutinize how a manufacturer's capabilities and managers' mindsets evolve when transitioning from closed innovation to orchestrating open innovation in an innovation ecosystem, it is essential to collect qualitative data.

Additionally, as research into this topic is in its nascent phase and complex, qualitative data can open discussion on the topic, and it brings a specific perspective of the ecosystem and although it is not generalizable, it provides insights into the ecosystem capability theory. Qualitative data in this thesis is collected in two ways. Primary data is gathered through semi-structured interviews with different managers that have worked with the innovation ecosystem, while secondary data is gathered by analyzing public statements made by the organization.

The contributions of this study are threefold. Firstly, this study provides an empirical framework that can be used to understand the underlying microfoundations of managers and the manufacturing organization when an organization implements an open innovation paradigm in an innovation ecosystem. Secondly, this study answers the research gap argued by Helfat and Raubitschek (2018), as this study discusses the capabilities and their changes in an organization that orchestrates an ecosystem. Thirdly, this thesis strengthens the bridge between ecosystem and dynamic capability literature by viewing how microfoundations aid the manufacturing organization in achieving dynamic capability in an innovation ecosystem.

1.3 Thesis structure

This thesis is divided into five sections. The first section is the introduction, which includes the background, motivation, research gap, research purpose, and the research question. The second section of this thesis is the literature review. The literature review begins by describing the differences between closed and open innovation, thus describing the phenomenon that is taking place in this thesis. The literature review then shifts toward discussing the ecosystem concept and the different types of ecosystems. It examines the innovation ecosystem in more detail, as it is the context of this study. After the ecosystem concept is discussed, the literature review provides an understanding of dynamic capabilities and their purpose. Furthermore, this part also compares ordinary capabilities to dynamic capabilities. The literature review delves deeper into microfoundational research on dynamic capabilities. In that part, empirical studies are discussed.

Lastly, the empirical framework is created, which employs the phenomenon, the context, and the theory of this study.

The third section of this study is the research methodology section. The research methodology begins by discussing this study's research approach by utilizing the research onion to illustrate and describe it. This part will thereby provide more detailed explanations for the philosophical and theoretical approaches, the choice of methodology, the strategy employed, and the time horizon used. Next, the case organization and the innovation ecosystem studied in this thesis are introduced. After this, the data collection method used is elaborated on. Additionally, why this study collects data from one source is argued. Furthermore, this section also discusses the data analysis method and showcases it through the data structure. Lastly, this section analysis how the validity and reliability are maintained throughout the study. The methodology of this study is clearly described for validity and reliability reasons.

The fourth section, the findings, portrays the findings of this study by utilizing the Gioia method. Furthermore, the empirical framework introduced at the end of the literature review is revised and showcased here in more detail. The empirical framework allows the reader to understand how microfoundations aid the manufacturing organization in achieving dynamic capability when the organization transitions from a closed innovation process towards open innovation ecosystem. Furthermore, this framework illustrates the transformation process.

The last section of this study is the discussion section that discusses the theoretical contributions this study provides, as well as the managerial contributions are discussed. Furthermore, of the limitations of this study are considered. Lastly, further studies that could be made to gain an even more profound understanding of the phenomenon, the capability changes, and mindset changes of managers are debated.

2 Literature Review

A literature review was conducted to gain a more profound understanding of the underlying theoretical concepts in this study. First, research on closed and open innovation was conducted, after which research about the ecosystem concept was employed. Research into closed and open innovation was conducted because it has links to the ecosystem concept and because the case organization in this study has moved from closed towards more open innovation, thus demonstrating the phenomenon that is taking place. Furthermore, an overview of the ecosystem concept and the different types of ecosystems are provided. However, more emphasis is placed on innovation ecosystems, as the case organization orchestrates an innovation ecosystem. Secondly, research on dynamic capabilities was reviewed. This section emphasizes the different perspectives, definitions, and outcomes. Additionally, microfoundation research and specifically microfoundation research of dynamic capabilities were also reviewed. Different empirical studies that have studied microfoundations of dynamic capabilities were examined, and the microfoundations were gathered into a separate table to provide a more comprehensive understanding. Lastly, the three concepts are synthesized, and a framework is introduced. This framework examines the microfoundations of dynamic capabilities in the context of an innovation ecosystem.

This study pursues to study the topic critically by using highly rated articles; thus, the literature review used AJB's rating system. AJB is a scientific journal rating system made by the Academic Journal Guide. Scientific journals rated 3 or 4 were selected to ensure that the sources used were of high quality. These scientific journals were from the fields of strategic management, general management, operations leading, and innovation management because they provide important insights into dynamic capability, ecosystem, open and closed innovation, and microfoundational research and theory. Furthermore, the information from this literature review was gathered by using a search strategy that included Boolean and ABS-Title-Key searches. The most crucial words used in the literature search included "innovation ecosystem", "ecosystem", "ecosystem management", "innovation", "open innovation", "closed innovation", "strategic management",

“dynamic capabilities”, “ordinary capabilities”, “capabilities”, “microfoundations”, and “managerial processes”.

2.1 Innovation policy and the ecosystem concept

Organizations can innovate in different ways through closed or open innovation activities. The choice between closed or open innovation is associated with the organization’s innovation policy. Furthermore, in the past two decades, organizations have begun to form innovation ecosystems, which involve open innovation characteristics, as innovation takes place in a more interconnected and collaborative way between different actors (Thomas & Ritala, 2022; Adner, 2006; Adner, 2017). The next part of this study will first compare the differences between the two innovation policies and their benefits. Additionally, because the case organization in this study has altered its innovation policy from closed towards open innovation, which occurs in an innovation ecosystem, how open innovation is associated with an innovation ecosystem is discussed. Secondly, as the ecosystem term has become the next new buzzword, according to Forbes (Hwang, 2014), the concept is discussed more thoroughly to gain a more comprehensive understanding. Furthermore, the different perspectives on ecosystem study are introduced, and the different types of ecosystems are showcased. Lastly, the innovation ecosystem concept is examined in more detail.

2.1.1 Closed versus open innovation

Innovation was first introduced into economic studies by Schumpeter’s (1942) seminal work. In his work, he provides a clear clarification between invention and innovation. The former involves generating new ideas (new products or pioneering production methods), while the latter emphasizes leveraging these inventions and generating economic profit from these (Schumpeter, 1942). Thus, innovation focuses on the implementation and the economic benefit of inventions. Furthermore, he emphasized the pivotal role of entrepreneurs, who worked to create new opportunities for growth, employment, and investments. The seminal work by Schumpeter (1942) around innovation has gained

general acceptance that innovation is key for long-term firm performance, according to Colombo et al. (2021).

For most of the 20th century, organizations followed an innovation approach that found important the organization's internal abilities (Chesbrough, 2003a). Organizations emphasized outcompeting their rivals with their internal research and development activities for innovations and saw internal research and development as their strategic asset (Chesbrough, 2003b). Large organizations could compete as they could invest largely into research and development and could grasp the most economic profits (Chesbrough, 2003b). Most organizations focused on traditional vertical integration, which focused on generating ideas internally (Arora et al., 2016), which they would then manufacture and distribute themselves (Chesbrough, 2003b). This type of innovation mindset focuses on hiring the best professionals and making all choices by themselves, as innovation requires control and protecting their ideas from competitors using intellectual properties (Chesbrough, 2003b; Almirall & Casadesus-Masanell, 2010). This type of closed system for innovations has become known as closed innovation.

In comparison to the 20th century, organizations in the 21st century operate in a VUCA[6] environment while facing faster time to market of products and services (Chesbrough, 2003a), as well as the complexity of modern technology, has grown so high that even large organizations cannot invest in developing products by themselves; thus organizations have begun to form partnerships and alliances (Hagerdoorn & Duyster, 2002). Furthermore, organizations have come to realize that the quantity and quality of inputs create the quantity and quality of outputs; this has resulted in organizations opening their funnel of inputs and their organizational boundaries (Felin & Zenger, 2020). This opening of the funnel is illustrated below (see Figure 1). Chesbrough (2003a) sees this new shift in organizations' innovation approach as a new paradigm shift from closed to open innovation where research and development is treated as an open system rather than a closed one (Chesbrough et al., 2018). Open innovation is defined as "the use of

[6] VUCA stands for volatility, uncertainty, complexity, and ambiguity (Bennett & Lemoine, 2014).

purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation" (Chesbrough, 2006, p. 1). Chesbrough and Bogers (2014, p. 3) further define open innovation as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model." This viewpoint adds to the importance of the business model.

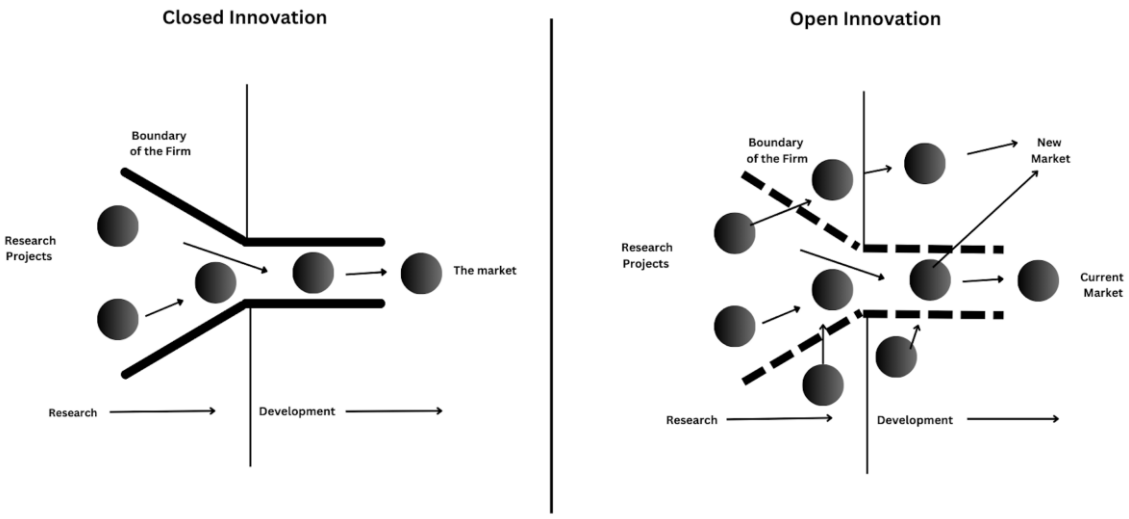


Figure 1. Closed versus open innovation funnel (Adapted from Chesbrough, 2003b, pp. 36-37).

The new paradigm of open innovation revolves around changes in the innovation approach of organizations. This emerging innovation paradigm comprises of two dimensions inbound open innovation, and outbound open innovation (Chiaroni et al., 2010). The inbound dimension centers on the idea that organizations, instead of relying only on their ideas (Almirall & Casadesus-Masanell, 2010), they can and should interact with external partners to gather external ideas in addition to internal ideas (Radziwon & Bogers, 2019; Chesbrough, 2003a). This means that organizations should expand their search scope to involve external knowledge (Dahlander et al., 2021) and interact with external partners to advance innovation (Chesbrough, 2003a; Chesbrough & Bogers, 2014). The centric idea behind opening to external ideas is that knowledge outside the

organizations' boundaries is more significant than their own (Kogut, 2000), and the best ideas and people are elsewhere (Bogers et al., 2019). Opening the inbound of ideas can result in an increase in product diversity (Almirall & Casadesus-Masanell, 2010), financial performance (Leiponen & Helfat, 2010), and improved innovation outcomes (West & Bogers, 2011). Furthermore, open innovation can expand the range of problem-solving methods (Jeppensen & Lakhani, 2010). On the other hand, outbound open innovation revolves around the idea that organizations that are not exploiting their internal innovations should take these to the market through external channels, such as licensing or joint ventures (Chesbrough, 2003a) to generate additional value, which occurs outside the organization's boundaries (Chesbrough et al., 2018).

Closed Innovation Principles	**Open Innovation Principles**
The smart people in our field work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commerclialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control out intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we shou buy others' IP whenever it advances our own business model.

Figure 2. Closed versus open innovation principles (Chesbrough, 2003b, p. 38).

Open innovation can occur through multiple different models. Lee et al. (2019) argue that open innovation can occur in four different models: crowdsourcing, coopetition,

science-based, and networks. In crowdsourcing, there is usually a well-defined problem statement given to the public to solve, which means there are many problem solvers (Lee et al., 2019). This model relies on the numerical amount of problem solvers to solve the underlying problem. On the other hand, coopetition open innovation occurs between competitive organizations in the same industry. It can occur either upstream or downstream in the value chain. In addition to the competitive side of this view, there is also a collaborative side, which seeks to solve a problem together with the competition (Lee et al., 2019). Additionally, science-based open innovation is based on the collaboration between organizations and research organizations, such as universities. Science-based open innovation aims to add scientific knowledge and understanding (Lee et al., 2019). Lastly, there is the network open innovation. Network open innovation can occur in either ecosystems, consortia, or networks (Lee et al., 2019). This type of open innovation model emphasizes the importance of multiple participants. This type of network open innovation is suitable for solving “grand challenges” (Olsen et al., 2016), such as climate change, and projects with high levels of complexity (Lee et al., 2019), such as vaccines.

The open innovation paradigm has gained a bandwagon effect, which has resulted in managers who favor closed innovation under pressure to adopt open innovation (Chesbrough, 2017). However, scholars have no unified understanding of whether organizations should adopt open or closed innovation. Choosing which approach to adopt has become a trade-off dilemma, especially in complex product development (Lee et al., 2019). While open innovation allows organizations to access outside ideas in addition to internal ideas (Radziwon & Bogers, 2019), open innovation also comes at a cost. In open innovation, the product developer’s control declines, and some choices are made by external organizations, who drive their interests instead of the developer’s (Almirall & Casadesus-Masanell, 2010). Furthermore, accessing outside ideas usually comes at a financial cost (Felin & Zegner, 2020).

Suppose managers of organizations choose to shift their innovation approach from a closed innovation approach to an open innovation approach. In that case, they might face new boundaries and challenges, which they must resolve to grasp the value of open innovation. Open innovation can become a source of friction inside the organization because the shift towards open innovation can make employees feel intimidated by being possibly replaced (Lifshitz-Assaf, 2018). Furthermore, R&D professionals in organizations adopting an open innovation approach must undergo a multifaceted transformation process and changes to their identity in order for them to adopt open innovation (Lifshitz-Assaf, 2018). Additionally, it is important for organizations and their professionals to release the mentality of Not-Invented-Here and Not-Sold-Here when open innovation is introduced to the organization (Chesbrough, 2003). Furthermore, adopting open innovation requires changes in the management system and the creation of new organizational routines (Chiaroni et al., 2010).

Research around the open innovation domain has been studied through a firm-centric approach (Chesbrough, 2003), and thus, research around open innovation has lacked on other levels (West et al., 2006). However, the innovation and business ecosystem perspectives have recently begun to gain interest in the open innovation domain (see, e.g., Rohrbeck et al., 2009; Radziwan & Bogers, 2019; Randhawa et al., 2021; Adner & Kapoor, 2010; Adner, 2017; Van de Borgh et al., 2012). While this perspective emphasizes collaboration in innovations (Thomas & Ritala, 2022), this perspective also underlines the complex interdependent relationships between partners for innovation to succeed (Adner, 2006; Adner, 2017). Consequently, this provides a new and exciting perspective on open innovation.

2.1.2 The ecosystem concept and the different underlying perspectives

In the domain of management literature, the idea of an ecosystem was first introduced by Moore (1993), who drew a resemblance between the economic world and the coexistence evident in the natural environment. Moore (1996, p. 9) describes a business ecosystem as “an economic community supported by a foundation of interconnected

organizations and individuals – the organism of the business world." Moore later explained what the economic community consists of and thus added that a business ecosystem is an "extended system of mutually supportive organizations, communities of customers, suppliers, lead producers, and other stakeholders, financing, trade associations standard bodies, labor unions, governmental and quasi-governmental institutions, and other interested parties" (Moore, 1998, p. 168). Iansiti and Levein (2004b) agree that Moore's drawing of resemblance by comparing a business ecosystem to a biological ecosystem is viable as they have parts in common. Both ecosystems have a complex structure of loosely interconnected actors, the interdependence of ecosystem members, and each member's distinct functions.

Moore (1993) suggested that the term "industry" should be replaced with "business ecosystem" since, in a modern business landscape, economic activities cannot be confined within a specific industry but rather in part of a business ecosystem that cuts across many industries. In addition, Moore (1993) argues that at the core of a business ecosystem are the capabilities that are coevolved and leveraged for innovations because out-innovating provides a sustainable advantage over competitors.

Moore (1993) proposed that business ecosystems undergo a four-stage life cycle. In the first stage, titled the birth stage, all ecosystem members must clearly understand the customer's needs, which is achieved by working with customers and suppliers. This common customer understanding enables the cooperation between the ecosystem members towards common goals they share, with the "leader" organization playing a central role in collaborating between the members. Furthermore, cooperation enables the building of a fuller package of value for customers. In the second stage, titled the expansion stage, the business ecosystem advances to new domains. In this stage, it is crucial to work with ecosystem partners to improve supply and accomplish market coverage. Furthermore, the competition between ecosystems can become fierce; thus, it is important to have a business concept that provides value and one that can be scaled and gain broad market coverage. In the third stage, the leadership stage, the business

ecosystem attains equilibrium. In the final stage, either self-renewal (or death) occurs as a response to how the ecosystem responds to the rise of new competitive ecosystems or to sudden changes in environmental changes such as regulation or the buying patterns of customers.

Different perspectives have evolved from the first mention of the term business ecosystem. Adner's (2017) study was the first to make the separation between the ecosystem perspectives either ecosystem-as-affiliation or ecosystem-as-structure. Ecosystem-as-affiliation focuses on the symbiotic relationships among the partners in the ecosystem while also emphasizing the dismantling of traditional industry boundaries and the growing interdependence between actors (Adner, 2017), thus it is related to that of business ecosystems introduced by Moore (1993; 1996). Furthermore, this perspective emphasizes the number of partners, the network's density, and the actors' centrality as the measurement of success while holding the focal firm's motives at the center of the analysis (Adner, 2017).

The ecosystem-as-affiliation viewpoint has been criticized for lacking details on value creation. As a result, Adner (2017) introduced a complementary definition of an ecosystem and an approach called ecosystem-as-structure to tackle this issue. Adner (2017) defines an ecosystem as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p. 40). This alternative approach starts with the value proposition of the ecosystem and then moves its focus to seeking actors that can materialize this value proposition through their interaction. This means that the ecosystem evolves from the value proposition, not the network. Jacobides et al. (2018) build onto Adner's (2017) ecosystem-as-structure perspective. Jacobides et al. (2018) define an ecosystem as "a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled" (p. 2264). Their argument on the structured approach varies slightly from Adner's (2017) perspective, as they argue that an ecosystem provides a governance

structure, thus the ecosystem works to facilitate coordination rather than value cocreation (Adner, 2017; Jacobides et al., 2018).

Hou and Shi (2021) present a new approach to the existing perspectives of ecosystem-as-affiliation versus ecosystem-as-structure, adding coevolutionary as a new approach. Their suggested coevolutionary approach argues that Moore's (1996) business ecosystem study had introduced a coevolutionary approach to ecosystems, however, it largely went unnoticed by scholars. Moore (1996) argued that the only way to fight against competition and commoditization is to innovate continuously; thus the evolutionary approach views the purpose of ecosystems to provide continuous innovation. Hou and Shi (2021) suggest that affiliation versus structure should be replaced with a structure versus coevolution approach. Their argument relies on the fact that the affiliation approach is not relevant as an independent approach anymore, however, they state that the affiliation approach can be viewed as the linkage between the coevolutionary and structure approach. The table below gathers different perspectives (see Table 1).

	Ecosystem-as-affiliation	**Ecosystem-as-structure**	**Ecosystem-as-coevolution**
Strategy theory	Alignment between actors	Value creation & Competitive advantage	Dynamic capabilities
Logic	Focal firm	A focal innovation	Continous innovation
Function of ecosystem	Provide bargainning power	Provide value cocreation and enable coordination	Provide coevolution
Researchers	Moore (1993; 1996); Iansiti & Levien (2004)	Adner (2017); Jacobides et al., (2018)	Hou & Shi (2021)

Table 1. The three perspectives of ecosystem research summarized (adapted from Hou & Shi, 2021).

2.1.3 Different types of ecosystems

The term ecosystem has yet to be used with a clear definition, which has resulted in partially overlapping ecosystem concepts (Valkokari, 2015). Furthermore, as the ecosystem management literature has grown in a fragmented way, this has introduced different terminologies on ecosystems (De Vasconcelos Gomes et al., 2021). To understand what

ecosystem concept is discussed in this study more profoundly, it is worthwhile to understand the different ecosystem concepts that have emerged and how they differ. Valkokari (2015) argues that there are three ecosystem concepts: business, knowledge, and innovation ecosystems. On the other hand, De Vasconcelos Gomes et al. (2021) argue that entrepreneurial and platform-based ecosystems have evolved in addition to the business, knowledge, and innovation ecosystem concepts. This chapter introduces the different ecosystem concepts, the definitions of these, and the outcomes and actors are discussed in more detail.

Business ecosystem

Business ecosystems, which was introduced by Moore (1993; 1996) and Iansiti and Levien (2004b), focus on creating customer value, with large companies typically serving as the keystone player within these ecosystems (Valkokari, 2015; Iansiti & Levein, 2004b). Iansiti and Levein (2004b) argue that the keystone player is essential to the business ecosystem and its overall health. Removing the keystone player can disrupt the ecosystem and even collapse it. According to Valkokari (2015), business ecosystems work towards commercializing the new products or services that have been developed in an innovation ecosystem. Iansiti and Levien (2004a, p. 2) define a business ecosystem as a:

> *Loose networks – of suppliers, distributors, outsourcing firms, makers of related products or services, technology providers, and a host of other organizations – affect, and are affected by, the creation and delivery of a company's own offerings. Like an individual species in a biological ecosystem, each member of a business ecosystem ultimately shares the fate of the network as a whole, regardless of that member's apparent strength.*

Innovation ecosystem

An innovation ecosystem is distinct from a business ecosystem in that the innovation ecosystem emphasizes value creation, while the business ecosystem emphasizes value capture (Valkokari, 2015). In addition, the innovation ecosystem focuses more on cooperation, while the business ecosystem focuses on competition within the ecosystem (De Vasconcelos Gomes et al., 2018). Valkokari (2015) argues that the innovation ecosystem

acts as a link in the search for new information and its exploitation in the business ecosystem. Granstrand and Holgersson (2020, p.3) define an innovation ecosystem as follows:

> *An innovation ecosystem is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors*.

Platform ecosystem

A platform ecosystem's central actor is the platform, and the platform owner is the keystone player in this type of ecosystem (Cozzolino et al., 2021). In addition to the platform owner, these ecosystems typically have providers, producers, and consumers (Cozzolino et al., 2021). A platform ecosystem is a network where the owner incentivizes third-party firms to create complementary innovations (Cozzolino et al., 2021). Furthermore, it is worth noting that in a platform ecosystem, the competitive position of the complements is commonly weaker compared to the platform owner's position (Gawer & Cusumano, 2002). Gawer and Cusumano (2014, p. 1) define a platform-based ecosystem as follows:

> *[…] build hardware and software products as well as applications, and provide a variety of services, for computers, cell phones, and consumer electronics devices that in one form or another serve as industry platforms*.

Knowledge ecosystem

The concept of a knowledge ecosystem emphasizes creating new knowledge by collaborating with research institutes, such as universities and innovators (Valkokari, 2015). Because the targeted result of knowledge ecosystems is creating new knowledge, these ecosystems focus on exploration instead of exploitation (Clarysse et al., 2014). Knowledge ecosystems differ from business ecosystems as in knowledge ecosystems, value creation moves from upstream to downstream, while in business ecosystems, value creation is non-linear (Clarysse et al., 2014). These knowledge ecosystems are distinguished by their geographic clustering (Clarysse et al., 2014), similar to an entrepreneurial ecosystem (Spigel, 2017). Clarysse et al. (2014, p.1) define a knowledge ecosystem as:

> *the flow of tacit knowledge between companies and the mobility of personnel have been advanced as the main advantages of geographic colocation which characterize these hotspots. Such hotspots have been characterized as knowledge ecosystems where local universities and public research organizations play a central role in advancing technological innovation within the system*.

Entrepreneurial ecosystem

Entrepreneurial ecosystems have gained popularity in the 21st century (Boutillier et al., 2016) to explain the high-growth entrepreneurship within a specific place (Spigel, 2017). According to Spigel (2017), entrepreneurial ecosystems are characterized by a combination of social, political, economic, and cultural elements that reinforce the development and growth of startups. From Spigel's (2017, p. 50) quote below, it can be concluded that the output of entrepreneurial ecosystems refers to the creation of new startups.

> *A combination of social, political, economic, and cultural elements within a region that support the development and growth of innovative startups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assisting high-risk ventures*.

2.1.4 Examination of the innovation ecosystem concept

During the past two decades, the concept of an innovation ecosystem has become popular and notable in the strategy, innovation, and entrepreneurship literature (De Vasconcelos Gomes et al., 2018; Dattée et al., 2018). Utilizing Moore's (1996) business ecosystem, the innovation ecosystem concept was first introduced by Ron Adner (2006), to tackle the procedure of collaborative value creation. According to researchers, his definition of innovation ecosystem has become the most cited definition. He defines an innovation ecosystem as "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution" (Adner, 2006, p. 2). After Adner defined the innovation ecosystem, other definitions have also evolved during the last decade, emphasizing slightly different things. These definitions are showcased below in Table 2.

Author(s)	Definition
Adner (2006, p. 2)	"The collaborative arrangements through which firms combine their offerings into a coherent, customer-facing solution"
Autio & Thomas (2014, p. 3)	"we define an innovation ecosystem as: a network of interconnected organizations, organized around a focal firm or a platform, and incorporating both production and use side participants, and focusing on the development of new value through innovation."
De Vasconcelos Gomes et al. (2018, p. 45)	"We proposed a conceptual framework, in which we characterized the innovation construct with respect to the following features: an innovation ecosystem is set for the co-creation, or the jointly creation of value. It is composed of interconnected and interdependent networked actors, which includes the focal firm, customers, suppliers, complementary innovators and other agents as regulators. This definition implies that members face cooperation and competition in the innovation ecosystem and an innovation ecosystem has a lifecycle, which follows a co-evolution process".
Gobble (2014, p. 55)	"Innovation ecosystems are dynamic, purposive communities with complex, interlocking relationships built on collaboration, trust, and co-creation of value and specializing in exploitation of a shares set of complementary technologies and competencies."
Granstrand & Holgerson (2020, p. 3).	"An *innovation ecosystem* is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors."

Table 2 Different definitions of an innovation ecosystem.

By analyzing the definitions mentioned above it can be concluded that the term innovation ecosystem has distinctive traits. The heterogeneous actors in an innovation ecosystem are interconnected and interdependent (De Vasconcelos Gomes et al., 2018; Autio

& Thomas, 2020), and they work together to co-create value (De Vasconcelos Gomes et al., 2018; Gobble, 2014). Interdependency in an innovation ecosystem means that the failure of one actor can influence the outcome of the whole ecosystem. De Vasconcelos Gomes et al. (2018) also argue that the relationship between the actors can be both collaborative and competitive. In addition to the above-mentioned definitions, Autio (2022) adds that innovation ecosystem actors do not have formal contracts, thus differing from supply chains. Furthermore, Autio and Thomas (2014) emphasize the importance of the co-evolving of the actors in the ecosystem.

While the innovation ecosystem concept has gained popularity, Moore's (1993; 1996) business ecosystem and Adner's (2006) innovation ecosystem have been used synonymously (De Vasconcelos Gomes et al., 2018). Some scholars see the two concepts as the same (e.g., Gawer & Cusumano, 2014), while others argue that they are partly different (see, e.g., Valkokari, 2015; De Vasconcelos Gomes et al., 2018). Notably, the two concepts have numerous features in common (De Vasconcelos Gomes et al., 2018). De Vasconcelos Gomes et al. (2018) and Valkokari (2015) argue that innovation ecosystems emphasize value creation, contrary to business ecosystems, which emphasize value capture. Adner and Kapoor (2010) argue that value creation occurs before value capture. This is in line with the idea of Valkokari (2015), who sees that innovation ecosystems, which focus on value creation, can precede that of business ecosystems because business ecosystems focus on the commercializing of the innovations created in the innovation ecosystem. In addition to the value creation emphasis in innovation ecosystems, this concept emphasizes the collaboration between the network actors rather than competition between the actors (De Vasconcelos Gomes et al., 2018). However, according to Granstrand and Holgersson (2020), the emphasis could have overly shifted towards collaboration.

Innovation ecosystem literature has intensely concentrated on studying the quintessential role of the central actor of the ecosystem (Dedehayir et al., 2018). The central actor, known as the keystone (Iansiti & Levien, 2004b), hub (Iyer et al., 2006), platform leader

(Cusumano & Gawer, 2002), ecosystem leader (Adner, 2017), orchestrator (Humelinna-Laukkanen & Nätti, 2018), and architect (Gulati et al., 2012) has an important role in the emerging of ecosystems (Autio & Thomas, 2020; Dattée et al., 2018), as it provides the alignment structure, which aligns the actors towards the set joint value proposition (Lingens et al., 2021). While the central actor's important role has been noted in the emergence of an innovation ecosystem, ecosystems can also emerge through self-organization (Williamson & De Meyer, 2012).

Furthermore, the concept of a keystone player in an innovation ecosystem can be more profoundly understood by drawing parallels to keystone species in natural biological ecosystems. Such as in an innovation ecosystem, the keystone species in a biological ecosystem greatly impact the whole ecosystem as the keystone species help with the overall health of the entire ecosystem. Ochre Sea Stars are an example of a keystone species, as they keep the equilibrium of mussels and barnacles on the correct balance, enabling the right amount of seaweed on which other animals feed on (National Geography, n.d.). Furthermore, such as in innovation ecosystems and biological ecosystems, the removal of the keystone player/species can trigger an enormous negative effect on the whole ecosystem and eventually the collapse of the ecosystem (Iansiti & Levien, 2004a). While the ecosystem literature argues about the indispensability of the role of keystones, it is worth noting that the keystones are scarce in number (Iansiti & Levien, 2004a; Moore, 1996).

The keystone of an innovation ecosystem has different essential activities it should take upon. These include but are not limited to shaping the ecosystem (Williamson & De Meyer, 2012), enhancing robustness, and aligning niche creation (Iansiti & Levien, 2004a). Dedehayir and colleagues (2018) have researched and gathered the activities of keystones and divided the activities into four groups: ecosystem governance, forging of partnerships, platform management, and management of value. Ecosystem governance includes designing the roles of other actors in the ecosystem and orchestrating their collaboration (Dedehayir et al., 2018). The keystone is also responsible for providing

incentives and attracting partners to join the network, thus having an essential role in forging partnerships (Dedehayir et al., 2018; Willaimson & De Meyer, 2018). Platform management activities include designing and constructing the core platform (Dedehayir et al., 2018; Gawer & Cusumano, 2008). This platform, which consists of tools, services, and technologies (Iansiti & Levien, 2004a), forms the framework onto which the associated firms can offer complementary products and services to increase the customer value of the ecosystem's products and services (Gawer & Cusumano, 2008; Kapoor, 2018; Iansiti & Levien, 2004a). In addition to value creation and capture, the management of value activities also includes ensuring that the actors accumulate their own value (Dedehayir et al., 2018).

In addition to the leadership role of the keystone, four roles directly affect the ecosystem's value creation. These are the roles of the supplier, assembler complementor, and user (Dedehayir et al., 2018). While the roles of supplier, assembler, and user are also visible in traditional value chains, it is that of the complementor that distinguishes innovation ecosystems from traditional supply chains (Dedehayir et al., 2018). Complementor's role is to extend the core offering (Dedehayir et al., 2018). On the other hand, the user provides the need that must be met and, thus, the motivation as to why the ecosystem is created (Dedehayir et al., 2018). Furthermore, Dedehayir and colleagues (2018) also identify two supporting roles that indirectly support value creation: the expert and champion, and three entrepreneurial ecosystem roles: the entrepreneur, sponsor, and regulator.

There are distinctive traits that differentiate innovation ecosystems from comparable structures that portray organizational structures (Dedehayir et al., 2018), for example, value networks (see, e.g., Christensen and Rosenbloom, 1995) and clusters (see, e.g., Porter, 1998). Compared to value networks, innovation ecosystems also consider the end-user (Dedehayir et al., 2018). Furthermore, innovation ecosystems emphasize the co-evolutionary processes that occur between the different organizations that take part and interact in the ecosystem (Dedehayir et al., 2018). In addition, clusters and

innovation ecosystems differ as clusters focus on distinct geographical locations and those locations' regional competitiveness. In contrast, innovation ecosystems are not defined by a specific location but rather can be global, and the 'collective functionality' works as the innovation ecosystem barrier (Dedehayir et al., 2018). On the other hand, Oh et al. (2016) criticized the analogy of natural ecosystems in innovation ecosystems and argued that innovation ecosystems resemble those of innovation systems. Thus, the resemblance of 'eco' does not provide value-add to the definition. While Ritala and Almpanopoulou (2017) agree with Oh et al.'s (2016) argument about the low robustness of the definition of innovation ecosystems, however, they are more open to the idea of incorporating 'eco' in innovation ecosystem research as it provides an understanding of the co-evolution and interdependency between the actors.

In concluding marks, there has been a shift from closed innovation to open innovation in the 21st century. Furthermore, organizations have also started to engage in ecosystem activities, which means that organizations have started to build and maintain ecosystems for new innovations. This type of innovation activity involves characteristics of open innovation but also considers more interdependency between actors and differs from earlier notions such as alliances.

2.2 Dynamic capabilities

The dynamic capability theory has become a well-known theory of strategic management; however, as argued in the next section, dynamic capabilities have many different definitions and are seen as differing things. The concept of dynamic capabilities is discussed in more detail in the next chapter. In addition, dynamic capabilities are compared to ordinary capabilities to understand how they differ from each other and what they try to accomplish. After, Teece's (2007) sensing, seizing, and reconfiguring are introduced and briefly examined. As the research on microfoundations of dynamic capabilities has grown and because this study is studying more concrete aspects of dynamic capabilities, the micro-level of dynamic capabilities is examined. This is why this study examines

different empirical studies and managerial cognition studies through Teece's sensing, seizing, and reconfiguring clusters.

2.2.1 Overview of the concept of dynamic capabilities

Gaining and sustaining competitive advantage has been one of the key research topics in strategic management literature (Ambrosini & Bowman, 2009). During the past two decades, various paradigms have developed, including positioning school (Porter, 1980; 1985) and resource-based view (Wernerfelt, 1984; Barney, 1991), which have studied how organizations can achieve competitive advantage. However, the competitive environment in which organizations are situated has become more dynamic, resulting in paradigms such as the resource-based view becoming partly outdated due to its static nature (Priem & Butler, 2001). To explain why some organizations have been able to maintain competitiveness in a dynamic environment, the new dynamic capabilities theory evolved (see Teece et al., 1997). This new theory's primary objective is to explain organizations' competitive advantage over time (Teece & Pisano, 1994) and fill the gap in RBV's criticism of a static environment (Priem & Butler, 2001). After its introduction, this new theory has influenced other management fields, including entrepreneurship, operations management, and human resource management (Barreto, 2010). It is worth diving deeper into the topic to understand this new and growing but also multi-faceted theory.

Dynamic capabilities theory is timely; however, partly due to its youngness, there are many distinct definitions of the concept (Barreto, 2010). The most used definitions of the concept are gathered below (see Table 3). The conceptualization of the dynamic capabilities concept is, up to this day, still divided (Barreto, 2010), and the construct has received criticism as being confusing (Winter, 2003). Barreto (2010) argues that more consolidation on the concept is needed, and he strives to provide more conceptualization of the concept by providing a sevenfold way to conceptualize the concept. He argues that the concept can be conceptualized through the following characteristics: 1) nature, 2) specific role, 3) relevant context, 4) creation and development mechanism, 5) heterogeneity assumptions, 6) outcomes, and 7) purpose (Barreto, 2010). Before diving deeper

into the dynamic capability concept, defining what a capability is necessary. Amit and Shoemaker (1993, p. 35) define capabilities as a firm's "capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end."

Author(s)	Definition
Wang & Ahmed, (2007, p. 35)	"We define dynamic capabilities as a firm's behavioral orientation to constantly integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage."
Winter (2003, p. 991)	"Those (capabilities) that operate to extend, modify, or create ordinary capabilities."
Teece et al., (1997, p. 516)	"The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments."
Helfat et al., (2007, p. 4)	"the capacity of an organization to purposefully create, extend, or modify its resource base."
Barreto, (2010, p. 271)	"A dynamic capability is the 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."
Eisenhardt & Martin, (2010, p. 3)	"The firm's processes that use resources (specifically, the processes to integrate, reconfigure, gain and release resources) to match and even create market change. Dynamic capabilities are thus the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die."
Zollo & Winter, (2002, p. 340)	"A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness."

Table 3 Definitions of dynamic capabilities.

Dynamic capability theory was first introduced by Teece et al. (1997) as an extension of the resource-based view (Ambrosini & Bowman, 2009). Resource-based view, or RBV in short, views organizations as heterogeneous due to them possessing heterogeneous resources (Barney, 1991). The organization's resources can provide the organization with

a sustainable competitive advantage if its resources are valuable, rare, inimitable, and non-substitutable (Barney, 1991). RBV theory has been criticized for its static nature, and it is argued that RBV does not have the ability to explain why some organizations have a sustainable competitive advantage in times of change in the environment; thus, the dynamic capability theory was introduced to fill in this gap (Teece et al., 1997; Teece, 2007; Eisenhardt & Martin, 2000; Barreto, 2010). While RBV emphasizes resources, which follow a VRIN framework as essential to gain sustainable competitive advantage, dynamic capabilities emphasize dynamic change in the environment and how the organizations' resource base is modified to respond to its external environment (Teece et al., 1997; Teece, 2007; Eisenhardt & Martin, 2000). This modified resource base includes tangible, and intangible assets in addition to capabilities and human assets (Helfat et al., 2007).

The nature of dynamic capabilities varies between different researchers (Barreto, 2010). Eisenhardt and Martin (2000) argue that dynamic capabilities are processes, while Teece et al. (1997) see dynamic capabilities as abilities, and Zollo and Winter (2002) see them as routines. Eisenhardt and Martin (2000) argue that dynamic capabilities are certain processes, such as research and development, partnership formation and decision-making. On the other hand, Zollo and Winter (2002) argue that dynamic capabilities are routines, as they are characterized as stable patterns. This definition of dynamic capabilities as routines is in line with the definition of routines, which are "repetitive, recognizable patterns…" (Feldman & Pentland, 2003, p.95).

As noted earlier, Teece et al. (1997) emphasize rapid environmental change as relevant for dynamic capabilities. Teece (2007) further strengthens this argument by adding that dynamic capabilities are relevant in environments that are characterized by "fast-moving business environments open to global competition" (Teece, 2007, p. 1319). While Teece's perspective on the strong dynamism of the external environment has gained popularity, Barreto (2010) argues that there are differing perspectives on the dynamism of the environment and that there is no clear agreement as to what type of environment is essential for dynamic capabilities to be relevant. In his argument, he considers the

countering perspectives of Eisenhardt and Martin (2000), Zahra et al. (2006), and Zollo and Winter (2002). Eisenhardt and Martin (2000) argue that dynamic capabilities are relevant in both a high-velocity environment and a "moderately dynamic" environment, thus arguing that the environment does not explicitly have to be one with a high-velocity of change. On the other hand, both Huikkola et al. (2022) and Zahra et al. (2006) argue that the environment does not have to be volatile for dynamic capabilities to be relevant. Lastly, Zollo and Winter (2002) view that dynamic capabilities are practiced also in environments with lower rates of change. These countering perspectives offer a compelling argument that dynamic capabilities are not only relevant in environments with characteristics mentioned by Teece but also relevant in environments with lower rates of change.

Multiple researchers acknowledge a two-level hierarchical structure between ordinary and dynamic capabilities (e.g., Winter, 2003; Wang & Ahmed, 2007). Ordinary capabilities, also known as 'zero-level' capabilities, allow an organization to make a living in the current moment, according to Winter (2003). On the other hand, dynamic capabilities, also known as 'higher-level' capabilities, facilitate the change of ordinary capabilities (Zollo & Winter, 2003). While researchers use the words lower-level and higher-level *capabilities,* lower-level and higher-level *routines* are also used (e.g., Schulze & Brusoni, 2022; Zollo & Winter, 2002). In this sense, the lower-level routines are called operating routines, and the higher-level routines are known as dynamic capabilities, which essentially work to change these operating routines (Zollo & Winter, 2002). Furthermore, while Wang and Ahmed (2007) agree on the idea of a hierarchal structure, their argument differs from others, as they see four different hierarchies: zero-order, first-order, second-order, and third-order. They refer to zero-order as the organizations' resources, first-order as capabilities, second-order as core capabilities, and third-order as dynamic capabilities (Wang & Ahmed, 2007).

To gain a more profound understanding of dynamic capabilities, comparing them to the recently mentioned ordinary capabilities is worthwhile. Ordinary and dynamic

capabilities have distinctive outcomes and purposes. However, the line between the two different capabilities is blurred (Helfat & Winter, 2003). Ordinary capabilities are about "production and sale of a defined (but static) set of products and services" (Teece, 2014, p. 343). Ordinary capabilities can be divided into three capabilities: administration, operation, and governance capabilities (Teece, 2014). According to Teece (2014), ordinary capabilities are ingrained in 1) facilities and equipment, 2) organizational routines and processes, 3) skilled personnel, and 4) administrative coordination.

Furthermore, ordinary capabilities center around technical efficiency (Teece, 2014). This means that ordinary capabilities are about "doing things right" and thus support technical fitness (Teece, 2007; 2014). Ordinary capabilities can be measured against best practices throughout the industry (Teece, 2014). However, as ordinary capabilities are static in nature (Barreto, 2010), and because best practices in globally competitive industries are nearly standard as well as because they can be bought and imitated, this means that best practices on their own will not provide organizations with a sustainable competitive advantage as any competitive advantage will erode through the acquisition or imitating of best practices (Teece, 2014). In summary, ordinary capabilities allow an organization to produce and sell its current products and services (Teece, 2014). While efficiency is at the center of ordinary capabilities, they will not provide a sustainable competitive advantage on their own. However, ordinary capabilities can enable an organization to "make a living" in the short term, as Winter (2003, p. 991) describes it.

Compared to ordinary capabilities, which support technical fitness, dynamic capabilities support evolutionary fitness (Teece, 2014). Dynamic capabilities revolve around the idea of doing the right things at the right time, which enables evolutionary fitness and emphasizes innovation instead of efficiency (Teece, 2014). Organizations with strong dynamic capabilities enable organizations to stay in harmony with shifts in markets and technological development (Teece, 2014). Furthermore, they enable organizations to build and renew their internal and external resources to respond to environmental changes (Teece, 2014). There is no clear agreement as to whether dynamic capabilities

are unique to the firm or similar across organizations (Barreto, 2010). Furthermore, it is interesting to note that while best practices can be bought, dynamic capabilities cannot be bought (excluding the acquisition of a whole organization), rather, they must be built (Shuen et al., 2014). This idea of built, not bought, comes from signature processes. The organizations' heritage shapes these signature processes and has been steered by decisions made by managers in the past (Teece, 2014). This further enhances the idea that unlike ordinary capabilities, dynamic capabilities are imitable as they have organizational-specific roots (Teece, 2014). In conclusion, organizations can achieve operational efficiency through ordinary capabilities, whilst organizations cannot only sense but also seize business opportunities through dynamic capabilities (Teece, 2007; 2014).

Different perspectives exist on how direct or indirect the impact of dynamic capabilities on organizational performance is (Barreto, 2010). Teece et al. (1997) initially argued that there is a direct link between the two. However, differing perspectives have evolved, and these argue there to be more of an indirect link between the two (Barreto, 2010). In these viewpoints, more emphasis is placed on competitive advantage being achieved through changes in the resource base, capabilities, or routines rather than the dynamic capabilities themselves (Barreto, 2010).

Teece (2007) states that dynamic capabilities can be perceived through sensing, seizing, and reconfiguring. These capabilities are not dynamic capabilities themselves, but rather, they are seen as managerial and organizational processes that enable the deployment of dynamic capabilities (Ambrosini & Bowman, 2009). Sensing is about detecting weak signals across different local and distant markets and technologies (Teece, 2007; Shoemaker et al., 2018). These weak signals can be either opportunities or threats and can include understanding customer needs, government regulation, technological developments, and latent demand (Teece, 2007; Shoemaker et al., 2018). Sensing and shaping these opportunities include scanning, creating, learning, and interpreting activities (Teece, 2007). Through sensing activities, organizations can portray possible future evolutionary paths that are available to them (Teece, 2007). Organizations with strong

dynamic capabilities are able to sense new opportunities from the market before their competition can (Shoemaker et al., 2018).

After an organization has sensed a new technological or market opportunity, the organization must be able to address this opportunity through new products, services, or processes (Teece, 2007). Seizing capabilities are linked to business model development, decision-making, investments, and building of a complex strategy (Teece, 2007; Ott & Eisenhardt, 2020). Seizing an opportunity can involve making investments under uncertainty that can become irreversible (Helfat & Peteraf, 2015), which can greatly affect the organization. The third capability of dynamic capabilities is reconfiguring, which is used to maintain evolutionary fitness (Teece, 2007). Reconfiguring is about the organization's ability to recognize and modify its business model, routines, assets, and structures to detach from its current path and create a new one (Teece, 2007). Furthermore, reconfiguring resources can occur by inventorying them, bundling them, and leveraging them (Sirmon & Hitt, 2003).

In this chapter, an overview of the dynamic capability concept was provided. It is noticeable that the concept is a multi-faceted one with many different definitions. Furthermore, in this chapter, the three different capabilities of dynamic capabilities were introduced. In the next chapter, microfoundations of dynamic capabilities are looked, and empirical studies are discussed to showcase what type of microfoundations are found in these studies with different contexts.

2.2.2 Microfoundations of dynamic capabilities

Dynamic capability is a critical concept in strategic management theory. However, the concept has been criticized for its abstract nature (Schilke et al., 2018), leading researchers to shift their research into microfoundations in this research field. Microfoundation research has gained interest in the past two decades (see, e.g., Felin & Foss, 2005; Teece, 2007), and it can be viewed as a new way of thinking (Felin et al., 2015). The microfoundation movement is about understanding the links between micro-level and macro-level

(Barney & Felin, 2013). According to Foss and Pedersen (2016, p.3), microfoundations are about "locating…the proximate causes of a phenomenon…at levels of analysis lower than that of the phenomenon itself", thus illustrating the connection between the higher macro-level and the lower micro-level. Furthermore, in the context of dynamic capabilities, the microfoundation movement is about understanding what micro-level elements macro-level dynamic capabilities are built on (Schilke et al., 2018).

To understand microfoundation research and specifically the connection between the micro-level and macro-level more profoundly, it is beneficial to understand Coleman's (1990) bathtub, also known as Coleman's boat model, which is located below (see Figure 3). The top half of the diagram illustrates the macro-level, which can be an organization, industry, or economy, while the lower half is the micro-level, which can be individuals (Abell et al., 2008; Cowen et al., 2022). In the boat, the first and third arrows illustrate the connection between the micro- and macro-levels (Cowen et al., 2022). On the other hand, the fourth arrow illustrates a causal claim between two macro-level issues (Cowen et al., 2022). To illustrate this, Cowen et al. (2022) provide an example of a causal claim when they mention that the line could illustrate how organizational capabilities are related to firm performance. This arrow is dotted due to the argument that the beforementioned causal claim is incomplete without understanding the micro-level (Cowen et al., 2022). On the other hand, the second arrow, located at the micro-level, showcases how the characteristics of individuals could have effects on behavior (Cowen et al., 2022).

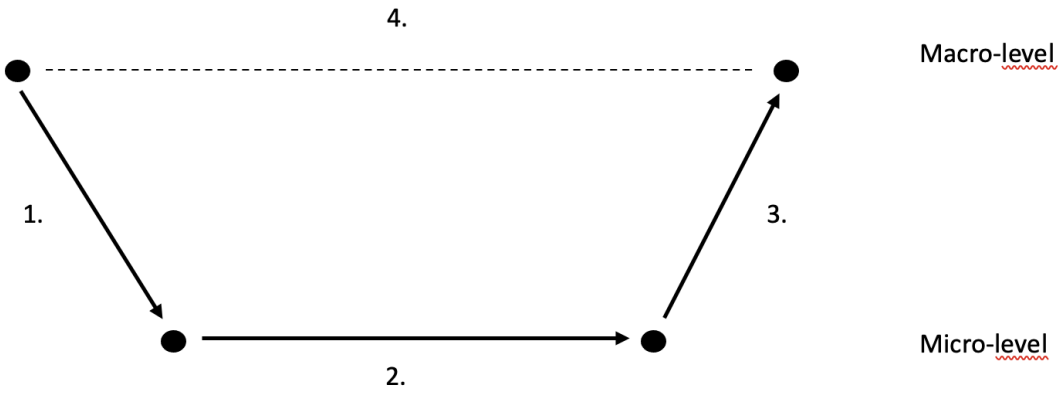


Figure 3. Illustration of Coleman's boat (Coleman, 1990; Hedström & Ylikoski, 2010; Cowen et al., 2022; Abell et al., 2008).

Microfoundational research on dynamic capabilities has largely resided on the firm level (see Teece, 2007). That being the case, Teece (2007, p. 1319) argues that dynamic capabilities' microfoundations include "skills, procedures, processes, organizational structures, decision rules and disciplines," which form the base for the sensing, seizing, and reconfiguring at the firm-level. However, individual-level microfoundational research has recently gained interest through the rise in dynamic managerial capability research (see, e.g., Adner & Helfat, 2003; Helfat & Peteraf, 2015). Adner and Helfat's (2003) study underlines that certain managers encompass dynamic managerial capabilities with which they can build, integrate, and reconfigure organizational capabilities and resources. Furthermore, they argue that these dynamic managerial capabilities rely in some measure on the microfoundation of managerial cognition. To understand managerial cognition more deeply, it is essential to define it. Managerial cognition is one of three managerial attributes, and it refers to the beliefs and mental models of managers that serve as a foundation for decision-making (Adner & Helfat, 2003). Fundamentally, cognition can be viewed as either mental activities or as mental structures, according to Helfat and Peteraf (2015). Mental activities might occur as automatic and uncontrollable or as deliberate and controllable, and they are used amongst other tasks in the acquiring and processing of knowledge (Helfat & Peteraf, 2015). On the other hand, mental structures refer to the content of the process (Helfat & Peteraf, 2015). All in all, it could be argued

that managerial cognition is linked to dynamic capabilities, as it affects managers' decisions, and it is also linked to how managers respond to changes in the environment (Adner & Helfat, 2003).

Moreover, managerial cognition and managerial heuristics are essentially linked to each other. As managers are bound by reality, they have limited information (Adner & Helfat, 2003). Thus, managers can use different heuristics to endure the bounded reality (Johnson & Hoopes, 2003). It is worth noting that heuristics, known as cognitive shortcuts, are simplified representations of how managers view their environment (Tripas & Gavetti, 2000; Bingham et al., 2019). Moreover, according to Bingham et al. (2019), managerial heuristics can also be viewed as a microfoundation.

In addition to Adner and Helfat's (2003) study, where dynamic managerial capabilities were first mentioned, Helfat and Peteraf's (2015) study bridges the gap between capabilities and managerial cognition by introducing a term called managerial cognitive capability. They define it as "the capacity of individual managers to perform mental activities that comprise cognition" (Helfat & Peteraf, 2015, p. 835). Their study underlines that capabilities involve both physical and mental activities and that these managerial cognitive capabilities are related to cognitions of managers' perception, attention, problem-solving, reasoning, language, communication, and social cognition.

In summary, microfoundational research can be used to understand how micro-level elements affect macro-level outcomes. Thus, looking at the micro-level is important, and because microfoundational research is relatively new in the dynamic capability research context, it provides novelty value for dynamic capability research. This study follows Teece's (2007) triad of sensing, seizing, and reconfiguring, which is why in the next section, the microfoundations of dynamic capabilities will also be analyzed through the three clusters. It is worth noting that while sensing, seizing, and reconfiguring are discussed separately, in practice, organizations orchestrate all three simultaneously (Teece et al., 2016). In the next section, Teece's (2007) mentioned microfoundations are

introduced, and empirical studies that study microfoundations of dynamic capabilities on the firm level in different contexts are more broadly discussed. Furthermore, the cognitions of managers are also discussed, as they are essentially linked to microfoundations and the sensing, seizing, and reconfiguring of clusters on the individual level.

2.2.2.1 Microfoundations of sensing capabilities

Organizations engage in sensing to seek opportunities and threats from the broader market (Teece, 2007). According to Teece (2007), sensing, seizing, and reconfiguring capabilities are made of different distinctive processes, viewed as the microfoundations. While specific individuals in the organization have the cognitive ability to recognize opportunities and shape developments, the more beneficial approach to this is to implement the scanning, interpretative, and creative processes into the organization as processes (Teece, 2007). Sensing processes include processes for directing internal research and development activities and selecting new technologies, making use of exogenous science and technology developments, exploiting suppliers' and complementors' innovations. Lastly, it also includes processes to identify target customer needs and how customer needs have changed (Teece, 2007).

Moving to the individual managers' level of analysis for microfoundations, Helfat and Peteraf's (2015) study provides insights into the cognitive capabilities of managers that underpin sensing, seizing, and reconfiguring capabilities. To recognize and create opportunities, perception, and attention as managerial cognitive capabilities are needed (Helfat & Peteraf, 2015). Perception affects sensing because, through perception, managers can recognize emerging patterns from the broader market (Helfat & Peteraf, 2015). These recognized patterns can be either new opportunities or threats. Furthermore, perception aids sensing as it helps make sense of the data, which helps in recognition and creating opportunities (Helfat & Peteraf, 2015). The second managerial cognitive capability, attention, is vital for perception (Helfat & Peteraf, 2015). Attention in sensing is about focusing on relevant opportunities and threats in the market (Helfat & Peteraf, 2015).

While Teece's (2007) theoretical study is important for launching microfoundational research in the dynamic capability theory, and thus his research has novelty value, empirical studies provide valuable insights on microfoundations of dynamic capabilities in different contexts. Following empirical studies that research the microfoundations of dynamic capabilities, which use Teece's (2007) sensing, seizing, and reconfiguring, are showcased in more detail.

Vallaster et al.'s (2019) empirical research studies the role of microfoundations of dynamic capabilities in managing tensions of organizations that consider both profit and sustainability objectives, which they call for-profit hybrids in their study. Their study found three sensing microfoundations, four seizing microfoundations, and three transforming microfoundations. In this section, the sensing microfoundations are discussed. The dynamic capability of sensing opportunities and creating a sense of opportunity includes experiential/grounded scouting, attention to the functional core, and paradoxical framing as microfoundations. However, paradoxical framing is the only microfoundation of the three that addresses the hybridity-related tensions (Vallaster et al., 2019); thus this will only be looked at. Managers use paradoxical framing to deviate from profit-focused sensing and include values-based processes (Vallaster et al., 2019). This means managers develop a cognitive approach that considers social and business demands (Vallaster et al., 2019). A cognitive approach that considers both social and business aspects affect the broadness and outcomes of the organization's sensing (Vallaster et al., 2019).

Linde et al.'s (2021) empirical study focuses on providing insights into the microfoundations (in this context, systematic routines) that underly an ecosystem leader's sensing, seizing, and reconfiguring capabilities. The outcome of these dynamic capabilities in this study is to achieve ecosystem innovation. Their study found that sensing capabilities for ecosystem innovation could be divided into two main groups, opportunity screening and partnership scouting, and their underlying systematic routines and sub-activities, which will be further discussed. Sensing capabilities are attached to launching routines with

which opportunities are screened. In this context evaluating new potential technologies was associated with seeking technologies that could help the ecosystem deliver an innovative value proposition (Linde et al., 2021). This is possible by utilizing the sensing activities of other ecosystem partners, which showcases the broadening of sensing activities to others.

Furthermore, the ecosystem leader needs systematic activities to scan new potential market segments. In addition to new opportunity screening, partnership scouting is part of the scanning capability. Partnership scouting has formalized routines. Because the ecosystem's value proposition depends on other actors, the leader should have a formalized routine to scout the most suitable partners for its ecosystem. This means that these routines are used to identify the best complementarities for that ecosystem.

The study by Lütjen et al. (2019) continues with the theme of ecosystems. However, their study focuses on the ecosystem-related capabilities for developing service innovation. Their study finds twelve capabilities related to sensing, seizing, and reconfiguring external resources. While their study does not essentially mention the word microfoundations, it is apparent that the ecosystem-related sensing, seizing, and reconfiguring capabilities that this study finds are argued through microfoundations. Ecosystem-related sensing capabilities include creating an open mindset that allows for collaboration with many different ecosystem actors (Lütjen et al., 2019). They further notice that sensing includes evaluating opportunities with different partners. By this, they found that some learn, interpret, and prob customers' needs and new technological developments with different partners rather than by themselves. Furthermore, their study finds that universities and research institutions have a key role in aiding in screening markets and technologies. Lastly, firms with highly innovative services screen the broader ecosystem, which means they include local and more distant stakeholders in their screening. In this sense, local stakeholders are municipal communities, while more distant stakeholders can be national governments.

Moving towards sustainable innovation, the following study focuses on the dynamic capabilities of sustainable innovation (Mousavi & Bossink, 2017). This study discovers twelve microfoundations that form the sensing, seizing, and reconfiguring clusters of dynamic capabilities. The microfoundations of sensing, which are discussed more thoroughly in this paragraph, include the company's procedures to identify its environmental impact, proactive sustainability strategy, and anticipation processes. Having existing procedures in the case organization found that they were able to strengthen their sensing capabilities for recognizing new innovative opportunities linked to sustainability. In addition, to strengthen the organization's sensing capability, they applied a proactive sustainability strategy. The sensing cluster also includes anticipation processes, which in their study helped the organization anticipate possible future impacts and, with this, also help the organization recognize opportunities for competitive advantage in the future.

Continuing with the sustainability theme, Khan et al.'s (2020) empirical research article studies the microfoundations of dynamic capabilities in circular economy implementation through a multiple-case study. Altogether, their study found eleven different microfoundations that form the sensing, seizing, and reconfiguring clusters of dynamic capabilities. In their study, Khan et al. (2020) figure that sensing occurs through market monitoring and technology scanning, idea generation, knowledge creation, and experiential learning. They find that market monitoring strongly emphasizes market trends in the context of sustainability. Besides customer need and technology development monitoring, market monitoring also includes monitoring of competitors' actions. On the other hand, idea generation involves brainstorming involving customers and suppliers. Furthermore, idea generation was done simultaneously with market monitoring. The knowledge creation microfoundation involves research and development activities, and it primarily focuses on identifying insights for new products and processes in production. Experiential learning is the last microfoundation of the sensing cluster, and this includes engaging in conferences, seminars, and trade shows.

The sensing cluster of dynamic capabilities includes numerous different microfoundations. As noticeable from the microfoundations discovered through the empirical studies, they involve different activities, routines, processes, and skills. Market monitoring is a microfoundation that occurs multiple times and is orchestrated either by the organizations themselves or through ecosystem partners. Additionally, in the ecosystem context, partnerships were underlined in the sensing cluster. This not only included searching for the most suitable partners for the ecosystem but also searching with them. Furthermore, managerial cognitive capabilities of perception and attention were noticeable.

2.2.2.2 Microfoundations of seizing capabilities

After the organization has sensed the opportunities, it must seize these opportunities through new products, processes, or services (Teece, 2007). Such as in sensing, Teece (2007) argues that seizing evolves from four types of processes as its microfoundations. These processes include the processes for selecting the best customer solution and the business model, the processes for forming decision-making protocols for more unbiased decision-making, the processes for selecting the organization's boundaries and control platforms, and lastly, the processes for growing loyalty and commitment (Teece, 2007).

Looking at the microfoundations of dynamic capabilities at the individual manager level, Helfat and Peteraf (2015) argue that problem-solving and reasoning are two managerial cognitive capabilities that underline the seizing capability. Their study notes that reasoning and problem-solving capabilities can aid in developing investment options (Helfat & Peteraf, 2015). Furthermore, problem-solving can be used for business model design as the designing of a business model has many different parts that need to fit together (Helfat & Peteraf, 2015).

Vallaster et al.'s (2019) empirical study recognizes systems thinking, bending institutional norms, building resilience, and integrative learning as microfoundations of seizing opportunities. However, bending institutional norms does not contribute to addressing hybrid-related tensions and will not be further discussed. Systems thinking is about seeing

the big picture at hand, and it is closely associated with Helfat and Peteraf's (2015) problem-solving and reasoning managerial cognitive capabilities (Vallaster et al., 2019). In addition to systems thinking, building resilience is also a tension-spanning microfoundation. This microfoundation is about building resilience throughout the organization, which helps the organization cope with unforeseen events. Additionally, integrative learning is about developing an integrative learning capacity by attracting people to the organization who are willing to learn and process knowledge. Integrative learning enables the organization to seize opportunities and co-construct possibilities (Vallaster et al., 2019).

Linde et al.'s (2021) empirical study's findings illustrated that the seizing capabilities comprised of value proposition development and ecosystem formation and their underlying routines and sub-activities. Value proposition development is a key routine for ecosystem leaders, and because the value proposition is at the center of the innovation ecosystem routines for evaluating pains and gains of customers are needed. Furthermore, the ecosystem leader needs additional routines to experiment with the offer configuration as this enables the value proposition to tackle the most relevant customer pains and gains by associating the correct actors to these issues. Additionally, the need for routines for ecosystem formations was underlined. Ecosystem formation highlights the routines for directing the roles and responsibilities in the ecosystem. Additionally, enabling routines for resource allocation processes allows a win-win situation in the ecosystem for all. Lastly, ecosystem formation also includes the activity of creating effective and transparent communication channels.

There are four ecosystem-related seizing capabilities that Lütjen et al. (2019) find in their study. Firstly, their study indicates that for seizing service opportunities, the firm's innovation management competencies and supportive top management are seen to be vital. Secondly, their study finds that service-intense firms' decision-making process involves other ecosystem actors. This means that value-adding as well as non-value-adding actors were integrated into the decision-making process, from which can receive direct input

from them or exchange ideas. Thirdly, their study finds that highly innovative firms seek a keystone position in the ecosystems, which means that they drive the ecosystem and become the innovator in the ecosystem. Furthermore, it is underlined that being an innovator has a positive effect as others might want to approach them for collaborating with them for innovations. Finally, they also find that highly innovative firms pursue to resolve bottlenecks by seeking information and by urging change.

Mousavi and Bossnik's (2017) case study about dynamic capabilities for sustainable innovation found five microfoundations for the seizing cluster. Once an opportunity is sensed a strategy should be formulated to address the opportunity. In this case study, they noticed that the case organization produced a project by making a program strategy. Additionally, the case organization took part in market introduction activities to commercialize the sensed opportunity. The case organization not only showed an example but also the need for the product, and thus helped stimulate market demand. Furthermore, Mousvai and Bossnik (2017) found that seizing includes the use of institutional dialogue. The case organization used institutional dialogue at the national and European levels to influence changes. In their case, institutional dialogue was used to create more governmental regulation to even the playing field. Resource co-specialization was also found, which is associated with the idea of seeking strategic partners to collaborate with for gaining synergistic gains. Lastly, business model redesign, mainly modifying the revenue model, took place to seize the opportunity.

The study by Khan et al. (2020) showcases strategic planning, business model and governance, and collaboration as microfoundations of the seizing cluster. In their study, they note that strategic planning involves activities around not only formulating a sustainability strategy but also discovering suitable strategic partners, planning investments, and recruiting new employees. On the other hand, the business model and governance microfoundation was about modifying their existing business model in order to seize new opportunities that were sensed. Furthermore, the restructuring of the organizational governance structure in two of the four cases took place. It was restructuring the

governance structure that allowed for enhancing collaboration with partners. The third microfoundation that was found is collaboration. In their study, collaboration meant that the case organizations would collaborate to be able to gather and acquire the necessary knowledge and resources.

In addition to the empirical studies that study the microfoundations of sensing, seizing, and reconfiguring, Ott and Eisenhardt's (2020) study focuses explicitly on the seizing cluster. In their study, they provide a new decision-making process named decision weaving, which can enable more novel and complex strategy formation and thus works to seize the sensed opportunities. Decision-weaving comprises three distinctive parts: sequential focus, pausing at learning plateaus and using steppingstones (Ott & Eisenhardt, 2020).

Altogether, the empirical studies showcased eighteen microfoundations of seizing capabilities. As noted by Teece (2007), business model modification and changing decision-making rules were also visible in the empirical studies. For example, in Lütjen et al., (2019) study, they noticed that the decision-making processes in a case organization integrated different partners instead of making all decisions by themselves. Furthermore, the cognitive capabilities of problem-solving and reasoning were noted by Helfat and Peteraf (2015).

2.2.2.3 Microfoundations of reconfiguring capabilities

Once opportunities are sensed and seized through new products, processes, or services, which demands investments and business model reconfiguration, this might lead to growth and profitability for the organization (Teece, 2007). Success causes the organization to evolve in a path-dependent way, and thus, to sustain profitable growth, the organization needs to reconfigure its asset and organizational structures when there will be changes in the market or technology (Teece, 2007). Following sensing and seizing capabilities, Teece (2007) illustrates four processes as microfoundations that form the base for reconfiguring capabilities. These processes include processes for attaining

decentralization and near decomposability, processes for establishing governance, processes for creating co-specialization, and finally, processes for managing knowledge (Teece, 2007).

Analyzing microfoundations at an individual manager level, Helfat and Peteraf (2015) recognize language, communication, and social cognition as managerial cognitive capabilities that can aid in reconfiguring activities, such as strategic asset alignment and overcoming resistance to change. Their study notes that language and communication is linked to persuading others in the organizations to accept new initiatives. On the other hand, social cognition can help in inducing cooperation between employees and thus aiding in asset reconfiguration (Helfat & Peteraf, 2015). In addition to Helfat and Peteraf's (2015) study, Dannéels's (2010) study also sheds light on managerial cognition in reconfiguring clusters. His study argues that managerial cognitions can become a source of dynamic capabilities, as managerial cognitions help in identifying resources and their fungibility and what direction is implemented for renewing the resources.

Vallaster et al.'s (2019) study recognize cross-vergence orchestration, flexible linking structures, and organizational entrenchments as the three microfoundations that support transforming capabilities. Cross-vergence orchestration refers to the complex managerial skill of promoting collaborative interactions between socio-environmental and economic objectives (Vallaster et al., 2019). This includes balancing multiple logics and setting strategic and asset-related priorities, while also arbitrating conflicting demands (Vallaster et al., 2019). Adopting this approach can support the organization in developing a unique value system and management expertise that can guide its policies and actions "that integrate the strategic multiplicities that characterize for-profit hybrids" (Vallaster et al., p.17). On the other hand, flexible linking structures mean that a parallel temporary structure is created, for example, a project-based group, which produces innovative thinking because it combines different logic and ways of thinking. In addition, it enables the buy-in of personnel (Vallaster et al., 2019). Lastly, organizational

entrenchment is strongly related to practices of developing performance monitoring, which helps implement sustainability-related thinking and doing into the organization.

Reconfiguring capabilities can be divided into adaptive value creation and ecosystem resilience and their underlying routines and sub-activities, according to Linde et al. (2021). They argue that by reassessing customer value-creation opportunities regularly, the ecosystem can understand and implement new opportunities that were previously not sensed. Furthermore, adjusting operational processes is needed to ensure that the ecosystem's own competence is up to par. On the other hand, ecosystem resilience its routines are associated with keeping the ecosystem competitive over time (Linde et al., 2021). Realigning incentives among ecosystem actors is a routine where ecosystem synergies should be scanned repeatedly to maintain complementarity with the actors in the ecosystem. Furthermore, ecosystem resilience occurs through the reorganizing of ecosystem structures and activities, which happens by either through closer collaboration, divesting from unproductive collaborations, taking new ecosystem partners inside, or making the decision between making rather than buying (Linde et al., 2021).

Lütjen et al.'s (2019) study indicates four different ecosystem-related reconfiguration capabilities. The first capability involves the orchestration of the service system. Orchestration, in this sense, implies that re-evaluation and re-orchestration of the whole ecosystem is needed to keep it relevant. This means that the roles and contributions of external stakeholders are measured and, if needed, includes replacing innovation partners. On the other hand, the continuous realignment of the ecosystem means that the firms continuously seek and implement new partners. They also underline the importance of communication in convincing the realigning of the ecosystem, as through communication, the firm can convince existing ecosystem partners to support innovations and invest in the strategy. The third reconfiguring capability that Lütjen et al. (2019) discovered is establishing a functional governance structure for the ecosystem. They state that a governance structure helps coordinate actors and their environment from a regulatory

aspect. Lastly, they find maintaining ecosystem-related relationships as the fourth capability.

In Mousvavi and Bossink's (2017) study, the reconfiguring cluster includes four microfoundations. They notice that in the case organization, new methods of organizing work responsibilities were used. This meant that modifications in decision-making and work responsibilities occurred as cross-functional teams for collaborating on the sensed and seized opportunity were introduced. Forming a cross-functional team allowed the project to have people with different expertise to work on the project. Furthermore, new business practices for organizing procedures were noticed in the case organization. In their case, new business practices included moving towards open innovation and thus adopting open innovation routines. Additionally, Mousvavi and Bossini (2017) found new methods of organizing external relations. This means they worked for systematic change by collaborating with governments and environmental NGOs instead of trying to make systematic change alone. Orchestrating the business ecosystem is the last microfoundation that was found. This wraps around the idea of orchestrating a whole ecosystem for innovation in sustainability.

The empirical study by Khan et al. (2020) found four microfoundations for the reconfiguring cluster. Their study found that organizational restructuring is a microfoundation. They showcase that restructuring involves the acquisitions of another firm. Additionally, restructuring includes the addition of a new unit and the selling of a subsidiary. Thus, it is noticeable that restructuring is about acquiring new assets, such as a new firm and selling non-core business subsidiaries. In addition to organizational restructuring, technological upgradation is also an underlined microfoundation. Technological upgradation is about acquiring a new plant or modifying existing assets. The microfoundation of knowledge integration is about providing technical training for employees of the organization, as well as implementing a new culture that emphasizes sustainability throughout the organization and amongst suppliers (Khan et al., 2020). Furthermore, the fourth

microfoundation that was found is about adapting best practices. Best practices included implementing of new work methods (Khan et al., 2020).

Such as in the sensing and seizing clusters, the reconfiguring cluster also includes many different microfoundations. Microfoundations such as organizational restructuring, establishing new governance structures, as well as building resilience were discovered in the empirical studies. In the table below (see Table 4), the top half of the table showcases Teece's (2007) conceptualization of the microfoundation sof dynamic capabilities. On the other hand, the different microfoundations from the empirical studies and from Helfat and Peteraf's (2015) study are gathered and grouped according to the sensing, seizing, and reconfiguring clusters of dynamic capabilities.

Authors	Microfoundations of Dynamic Capabilities: Sensing	Seizing	Reconfiguring
Conceptualization			
Teece (2007)	- Directing internal research and development activities - Exploiting suppliers's and complementors' innovations - Identify target customer needs	- Selecting best customer solution and business model - Forming decision-making protocols - Selecting organizational boundaries and control platforms - Growing loyalty and commitment.	- Attaining decentralization and near decomposability. - Establishin governance - Creating co-specialization - Managing knowledge
Empirical studies			
Vallaster et al. (2019)	- Paradoxical framing	- Systems thinking - Integrative learning - Building resilience	- Cross-vergence orchestration - Flexible linking structures - Organizational entrenchment
Linde et al. (2021)	- Opportunity screening - Partnership scouting	- Value proposition development - Ecosystem formation	- Adaptive value creation - Ecosystem resilience
Lütjen et al. (2019)	- Creating an open mindset for a diverse set of different ecosystem partners - Evaluating opportunities with different partners - Screening distant markets and technologies - Gathering information from institutions, regulators, and influencers	- Management competence for open innovation - Integration of value-adding and non-value-adding partners in decision-making processes - Pursuing a keystone position in the ecosystem - Controlling the bottleneck of the ecosystem	- Orchestration of the service system - Realignment of knowledge-transfer to adapt cross-industry innovation - Establishing a useful governance structure for the ecosystem - Maintaining relationships to value-adding and non-value-adding partners
Mousavi & Bossink (2017)	- Procedures within the company to identify its enviromental impact - Proactive sustainability strategy - Anticipation processes	- Strategy formation - Market introduction activities - Institutional dialogues - Resource co-specialization - Business model redesign	- New methods of organizing work responsibilities - New business practices for organizing procedures - New methods of organizing external relations - Orchestrating the business ecosystem
Khan et al. (2020)	- Market monitoring and technology scanning - Idea generation - Knowledge creation - Experiential learning	- Strategic planning - Business model and governanace - Collaboration	- Organizational restructuring - Technological upgradation - Knowledge integration - Best practices adaptation
Eisenhardt & Ott (2020)	- N/A	- Decision weaving (sequential focus, learning plateaus, stepping stones)	- N/A
Helfat & Peteraf (2015)	- Perception - Attention	- Problem-solving - Reasoning	- Language & Communication - Social Cognition

Table 4. Microfoundations of dynamic capabilities gathered from different studies.

2.3 Theoretical synthesis and framework

The literature review of this study concentrated on three main parts: open versus closed innovation, the ecosystem concept, and dynamic capabilities. These three parts were chosen for the literature review as the closed versus open innovation reflects the

phenomenon at hand in the case organization. In contrast, the ecosystem concept and mainly the innovation ecosystem concept were chosen as it portrays the context of this case study. Lastly, the dynamic capability theory and, specifically, the microfoundations of dynamic capabilities on the firm level and the individual level were chosen for this study as it works as the main theory. All three parts have received interest from researchers during the past two decades (e.g., Chesbrough, 2003a; Adner, 2017; Moore, 1996; Teece, 1997; Teece, 2007). While they have individually gained interest, only individual studies have considered the microfoundations of dynamic capabilities in an ecosystem concept (see Lütjen et al., 2019; Linde et al., 2021). These two studies have provided insights into underlying microfoundations in the ecosystem context and argued the importance of microfoundational research. To my knowledge, there is still little research on how capabilities change when an organization reconfigures its innovation from closed to open, which relies on an ecosystem context. Furthermore, there still hitherto lacks insights into the individual-level microfoundations in this context. Thus, the framework showcased in this section will allow for research on this discovered gap in research.

Organizations in the 21st century have begun to opt for open innovation over closed innovation as their innovation policy because they are faced with faster time to market of products and services (Chesbrough, 2003a). As such, open innovation is about opening the funnel of inputs, as the quantity and quality of outputs rely on the quality and quantity of inputs (Felin & Zenger, 2020). In addition to organizations seeking open innovation, they have also begun to orchestrate ecosystems, which have become a substitute for traditional supply chains. Ecosystems, specifically innovation ecosystems, have characteristics of open innovation, as innovation in ecosystems relies on the interconnected and interdependence of actors (Adner, 2017; De Vasconcelos Gomes et al., 2018; Autio & Thomas, 2020), who center around the innovation ecosystem's value proposition (Adner, 2017).

The dynamic capability theory has become a mainstream theory in strategic management literature. Dynamic capabilities enable change as a way to survive shifts in the

environment. As argued earlier, dynamic capability research has revolved around its definition, and thus, there are many differing definitions and outcomes of dynamic capabilities. The dynamic capability theory was introduced in the literature review to understand the underlying microfoundations of dynamic capabilities and understand how companies react to change at a micro-level. While Teece (2007) pioneered the research on microfoundations at the firm level of dynamic capabilities, empirical research on the matter has grown during the past seven years. Furthermore, individual managerial-level perspective on microfoundations has also gained interest. This study embraces Teece's (2007) trifold of sensing, seizing, and reconfiguring capabilities of dynamic capabilities to study their microfoundations.

The empirical framework below (see Figure 4) will be used to understand how microfoundations aid the manufacturing organization in achieving dynamic capability when the organization transitions from a closed innovation process towards an open innovation ecosystem. As this study aims to scrutinize how manufacturer's capabilities and managers' mindsets evolve when transitioning from closed innovation towards orchestrating an open innovation ecosystem, it is essential to study what changes in the leaders' thinking and how they shape practices related to dynamic capabilities. Furthermore, it is vital to understand the firm-level capability changes. In conclusion, this framework provides organizational-level and individual-level insights into the microfoundations of a dynamic capability and insights into how the capabilities of the Case organization change.

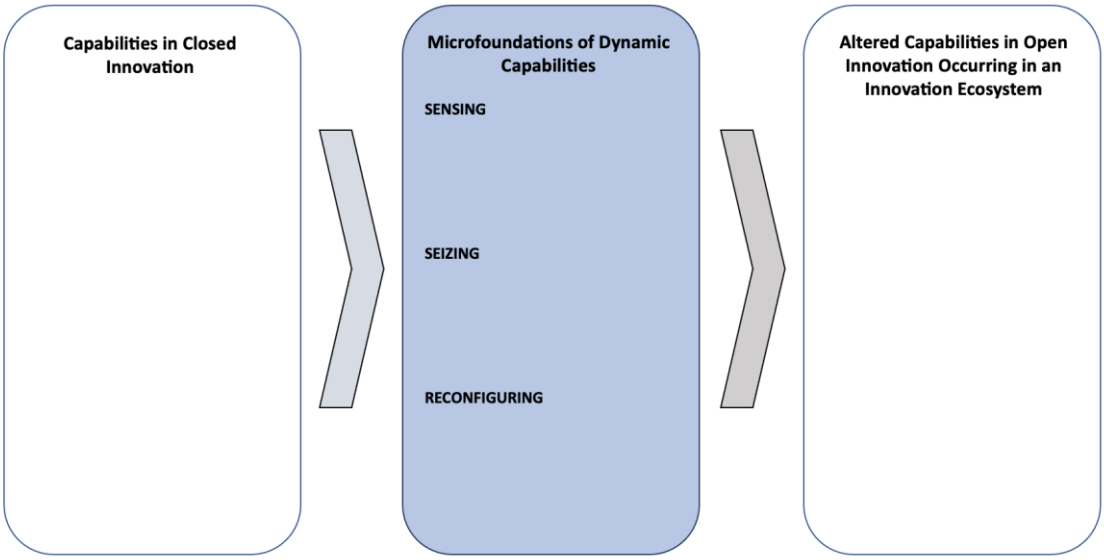


Figure 4. Empirical framework.

3 Methodology

The methodological approach of a study is a critical part of any empirical study, as it describes how the research was conducted. This section begins by introducing the research onion (see Saunders et al., 2019), and it is used to illustrate and describe how this study's research is conducted. After the research approach is discussed, the case company in this study is introduced. Thereafter, the data collection and the data analysis are described. Lastly, the validity and reliability are explained, and how they are maintained in this study is discussed in more detail.

3.1 Research approach

This study's research can be reviewed with the help of the research onion presented by Saunders et al. (2019). The research onion is a systematic framework with which researchers can conduct a study. The research onion begins with the outer layer, focusing on the philosophical orientation of the researcher. Moving on to the second layer, this layer focuses on the researcher's approach to theory development. Once the researcher has selected their approach to theory development, they move towards the third layer, the methodological approach. In the fourth layer, the strategy of the study is selected. Moving closer to the research onion's core, the study's time horizon is chosen. At the core, the researcher must select the techniques and procedures of the study, which involve data collection and analysis. The research onion is illustrated in the figure below (see Figure 5). Furthermore, the selected parts are bolded and underlined to showcase the different possibilities and what was selected. In the next part, the different layers are discussed in more detail and why the distinct choices were argued.

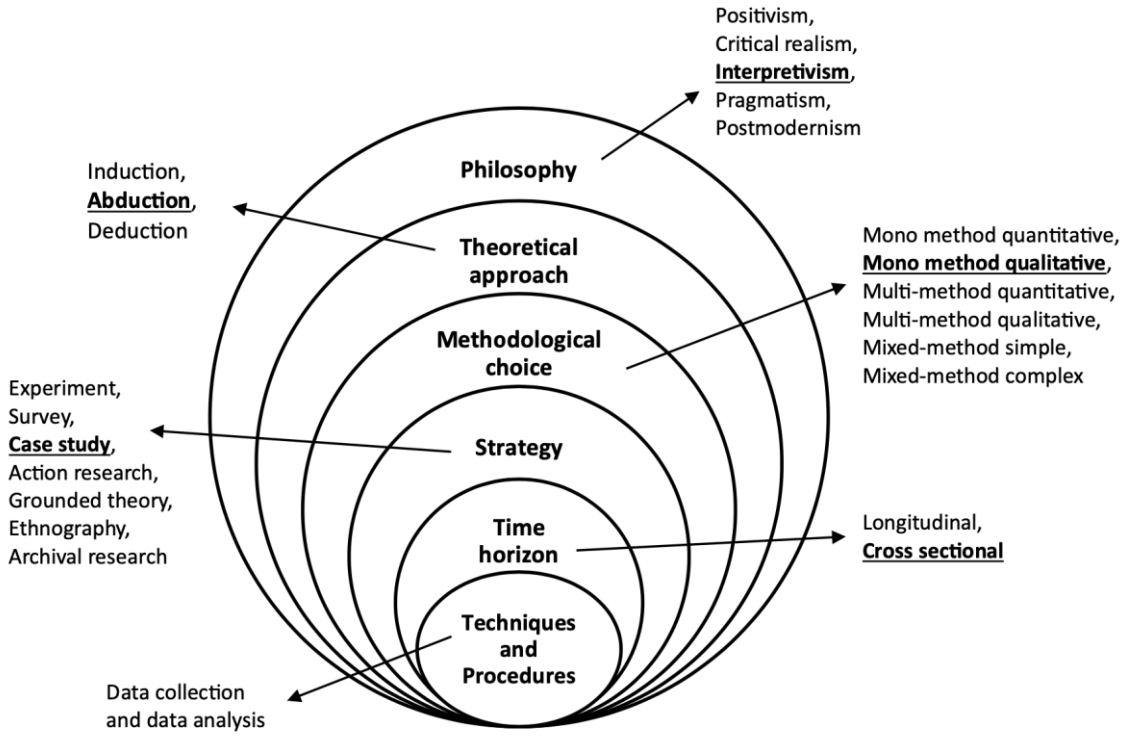


Figure 5. Research onion (adapted from Saunders et al., 2019).

The philosophical orientation of the researcher is the first layer of the research onion. Saunders et al. (2019) argue that there exist five research philosophies: positivism, critical realism, interpretivism, postmodernism, and pragmatism. This study follows interpretivism as the underlying philosophical approach. Developed in the 1970s for critiquing positivism (Hennink et al., 2020), interpretivism is about doing research for "richer understandings and interpretation of social worlds and contexts" (Saunders et al., 2019, p. 149). Moreover, the interpretive paradigm emphasizes qualitative research (Hennink et al., 2020), which is also followed in this study, and it also works to understand people's experiences (Hennink et al., 2020).

The approach to theory development in research is the second layer of the onion. This approach has been seen to be either moving from theory to data or from data to theory (Saunders et al., 2019). The first illustrates the deductive approach, and the latter illustrates the inductive approach (Saunders et al., 2019). However, Saunders et al. (2019) argue that in addition to inductive and deductive approaches, there is also a third, which

combines both inductive and deductive approaches. The abductive approach, which is followed in this study, starts by seeing a “surprising fact” and then works to figure it out through a probable theory (Saunders et al., 2019). The abductive approach was selected for this study because there is yet to be a theory and a framework for the deductive approach to be used and because an abductive approach works to understand the “surprising fact”, which in this case is the orchestrating of closed towards open innovation ecosystem by working out a plausible theory.

The third layer revolves around the methodological choice the study follows. This methodological choice is essentially about two decisions. The first decision is whether the study follows a quantitative, qualitative, or mixed-method approach. The quantitative approach uses numerical data, numbers, while the qualitative approach uses non-numerical data, which can be seen as words, images, or audio (Saunders et al., 2019). Moreover, quantitative studies are used to quantify data, while qualitative studies are used to understand people’s experiences, including behaviors, beliefs, and motivation (Hennink et al., 2020). The second choice the researcher must make is whether the study gathers data from a singular source or multiple sources (Saunders et al., 2019). This study follows a mono-method qualitative research, which means that the primary data is collected through interviews, and the secondary is gathered through annual reports and other publicly available data. This methodological approach is used in this study because this study works to figure out how managers' mindsets and capabilities have changed when the case organization has reconstructed its innovation from a closed to an open innovation ecosystem, thus qualitative data must be gathered.

There are numerous different strategies that researchers can choose from and adopt in their study (Saunders et al., 2019). This study utilizes a single case study. A case study uses research questions how and why and is used to understand a complicated social phenomenon in depth (Yin, 2009). Case studies can be either single case studies or multiple case studies. Single case studies focus on one singular phenomenon, while research utilizing multiple case studies can understand the differences and similarities across the

cases (Gustafson, 2017). Furthermore, case study research can be exploratory, descriptive, or explanatory (Yin, 2009). All in all, this study employs a singular explanatory case study because it works to understand *how* managers' mindsets and organizational capabilities have changed.

The second to last layer of the research onion is whether the study employs a longitudinal or cross-sectional time horizon (Saunders et al., 2019). A longitudinal study refers to gathering data over a long period, while a cross-sectional study gathers data over a shorter period (Saunders et al., 2019). This study uses a cross-sectional time frame due to time restrictions, thus not making a longitudinal study possible. The final layer of the research onion is about the techniques and procedures used in the study. This includes how data is collected and analyzed. In this study, primary data is collected through semi-structured interviews and secondary data is collected through public reports about the case organization. This data is then analyzed using the Gioia method (see Gioia, 2020). The data collection and analysis will be discussed in more detail in the according chapters below.

3.2 Introducing the case company

The case organization in this study is a Finnish manufacturing organization listed on the Large Cap list of the Nasdaq Helsinki. The case organization has a long history that began over 150 years ago. The organization has over 15 000 employees globally, and its headquarters is located in Helsinki. Through numerous mergers and acquisitions, divestments of organizations, and restructurings, the case organization today has two main businesses.

The case company has constructed an innovation ecosystem, which they orchestrate. The primary focus of the innovation ecosystem is making one industry carbon neutral by creating different innovations and by collaborating with partners. The orchestrator has involved different Large Cap organizations, start-ups, and universities in the ecosystem. Furthermore, they have also built a hub for this ecosystem, where innovation work and

testing in a collaborative way can be made. It is worth noting that the case organization has taken steps to reconstruct its innovation from closed innovation towards more open innovation, which occurs in the ecosystem. However, opening the innovation policy of the organization does not mean, in their case, that innovation is entirely open, rather openness occurs in the ecosystem through collaboration with selected partners.

This case company was selected as it portrays a dominant paradigm in a unique context. Having a large manufacturing organization that has reconstructed its innovation policy from a closed to an open innovation ecosystem provides unique insights about this phenomenon in a manufacturing organization. Furthermore, while there have begun to be more ecosystems in a short timeframe (e.g., Nokia, TietoEvry, KONE) in Finland, this case company and its orchestrated ecosystem was selected as it has already been ongoing for around five years, thus providing more information about the mindset changes of leaders and capability changes of the organization when compared to before the phenomenon took place.

3.3 Data collection

The data for this study was collected through semi-structured interviews of managers from the case organization as well as from public statements. Yin (2009) emphasizes the importance of multiple data sources for the validity of a study; thus this study uses semi-structured interviews as the primary data, and secondary data was gathered from public statements. Other non-public secondary data was not gathered, as non-disclosure agreements were not signed. Moreover, the secondary data could have included confidential information, and because the organization is a publicly listed company, this was not seen as possible. The interviewees and the case organization are anonymized to protect their identities and possible confidential information.

The interview was divided into four main parts (see Appendix 1). Firstly, introductory questions were asked, after which the interview moved into the microfoundations of the sensing, seizing, and reconfiguring clusters by utilizing open-ended questions. Semi-

structured interviews are beneficial as they enable one to dive deeper into topics that arise during the interview (Saunders et al., 2019). Furthermore, the interviews allowed for gathering information about how the managers experienced the mindset and capability changes in the Case organization. It is worth noting that the interviews were completed in Finnish, as this was the mother tongue of the interviewees. The interviews were completed in Microsoft Teams and Zoom, and the videos were recorded for reliability reasons.

Altogether, five semi-structured interviews were conducted. The people selected for the interviews were chosen jointly with the case organization representative. The selected people for the interviews all have experience with the innovation ecosystem that the case organization orchestrates. These people ranged from senior managers and general managers to team leads. Furthermore, people from different areas and responsibilities were interviewed to understand the managerial mindset changes and capability changes more profoundly. The table below (see Table 5) summarizes the interviews. Altogether, the transcript was 89 pages long.

Person	Length of interview	Length of transcript	Date
Interviewee 1	41:49min & 25:11 min	23 pages	26.5.2023 & 9.6.2023
Interviewee 2	28:47 min	11 pages	29.6.2023
Interviewee 3	48:25 min	20 pages	29.6.2023
Interviewee 4	55:36 min	19 pages	30.6.2023
Interviewee 5	56:54 min	16 pages	11.7.2023

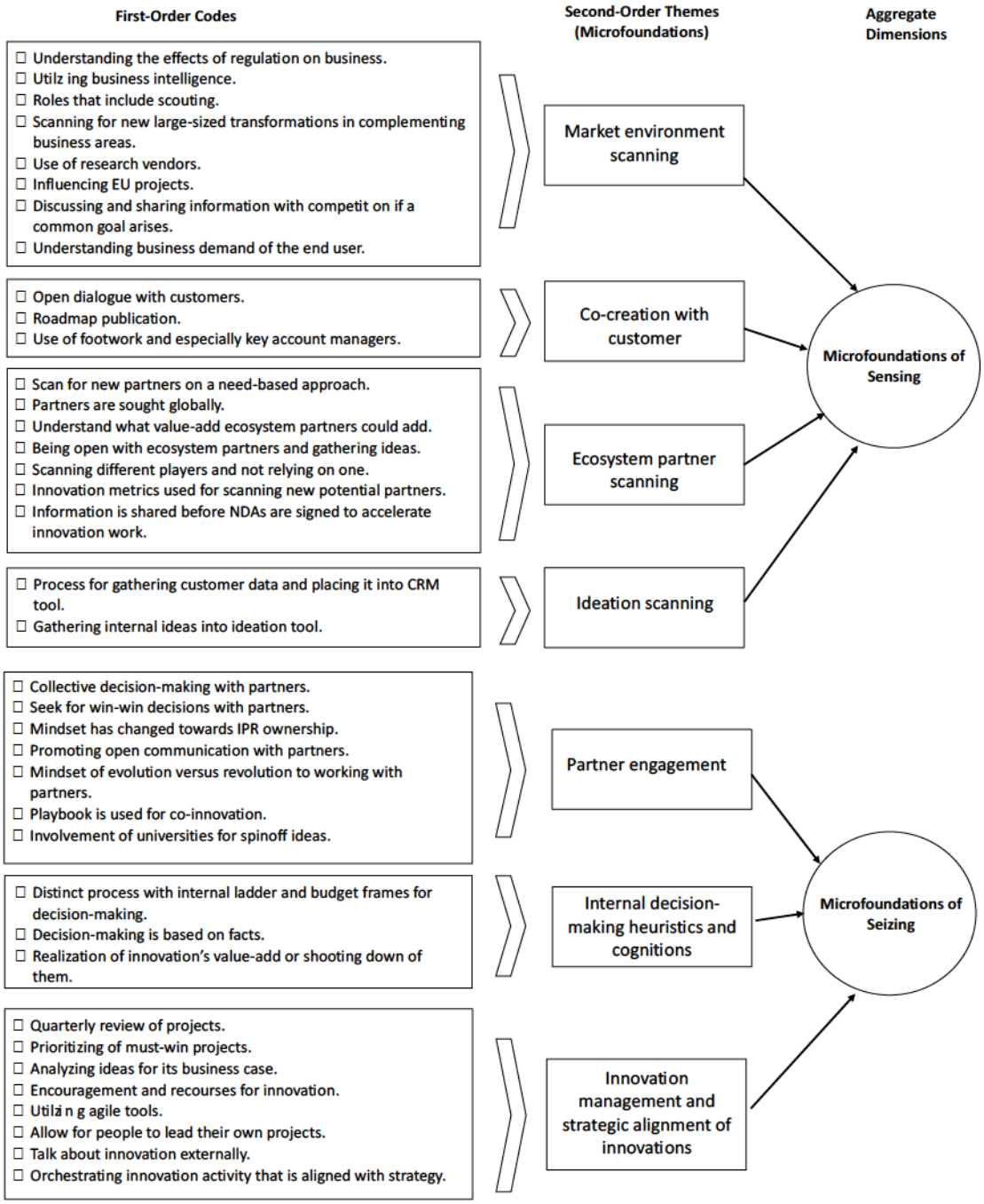
Table 5. Summary of interviews.

3.4 Data analysis

Next, the transcribed texts and notes were carefully reviewed and organized, ensuring accuracy. This process involved re-reading each page of the transcribed interviews and checking it with the original interview data to check for any errors. Additionally, Microsoft Word's Dictate function was used to not only aid in transcribing the interviews.

With the data collection stage completed, this study moves onto the critical analysis stage. This study employs a systematic methodology created by Gioia, called the Gioia method. While used mainly in inductive research and grounded theory (Gehman et al., 2017; Gioia, 2020), in this study, the Gioia method will be applied to abductive research and a case study. This qualitative research methodological approach is used to meet standards for trustworthy research (Magnani & Gioia, 2023). The Gioia method has three distinctive steps which were followed. After the data was collected, it was transcribed and turned into raw text. The first step is to start categorizing the raw text and finding similarities among the categories, which helps reduce the number of categories (Gioia, 2020). Secondly, first-order codes were created, which are informant-centered (Gioia, 2020). After the first-order codes are created, the more abstract second-order themes, which are theory-centered, are created (Magnani & Gioia, 2023; Gioia, 2020). Lastly, the aggregate dimensions were created by combining the second-order themes. According to Gioia (2020) and Magnani and Gioia (2023), a data structure is born through these steps. The data structure, as seen below (see Figure 6), showcases how the terms, themes, and dimensions are connected (Magnani & Gioia, 2023; Gioia, 2020). Furthermore, it showcases the journey from raw text to aggregate dimensions (Magnani & Gioia, 2023).

As stated in the previous paragraph, the figure below (see. Figure 6.) demonstrates the Gioia method in use in this study. Altogether this study uncovered 189 first-order codes, and from these first-order codes, 11 second-order themes were constructed. These second-order themes are also described as the microfoundations in this study. Even though 189 first-order codes were uncovered, not all codes were considered in this study, as they were not underpinned by the sensing, seizing, or reconfiguring activities. Different procedures, processes, routines, mindset changes, heuristics, and cognitions were discovered.


First-Order Codes
Second-Order Themes (Microfoundations)
Aggregate Dimensions
Understanding the effects of regulation on business.
Utilz ing business intelligence.
Roles that include scouting.
Scanning for new large-sized transformations in complementing business areas.
Use of research vendors.
Influencing EU projects.
Discussing and sharing information with competit on if a common goal arises.
Understanding business demand of the end user.
Market environment scanning
Open dialogue with customers.
Roadmap publication.
Use of footwork and especially key account managers.
Co-creation with customer
Scan for new partners on a need-based approach.
Partners are sought globally.
Understand what value-add ecosystem partners could add.
Being open with ecosystem partners and gathering ideas.
Scanning different players and not relying on one.
Innovation metrics used for scanning new potential partners.
Information is shared before NDAs are signed to accelerate innovation work.
Ecosystem partner scanning
Microfoundations of Sensing
Process for gathering customer data and placing it into CRM tool.
Gathering internal ideas into ideation tool.
Ideation scanning
Collective decision-making with partners.
Seek for win-win decisions with partners.
Mindset has changed towards IPR ownership.
Promoting open communication with partners.
Mindset of evolution versus revolution to working with partners.
Playbook is used for co-innovation.
Involvement of universities for spinoff ideas.
Partner engagement
Distinct process with internal ladder and budget frames for decision-making.
Decision-making is based on facts.
Realization of innovation's value-add or shooting down of them.
Internal decision-making heuristics and cognitions
Microfoundations of Seizing
Quarterly review of projects.
Prioritizing of must-win projects.
Analyzing ideas for its business case.
Encouragement and recourses for innovation.
Utilzi n g agile tools.
Allow for people to lead their own projects.
Talk about innovation externally.
Orchestrating innovation activity that is aligned with strategy.
Innovation management and strategic alignment of innovations

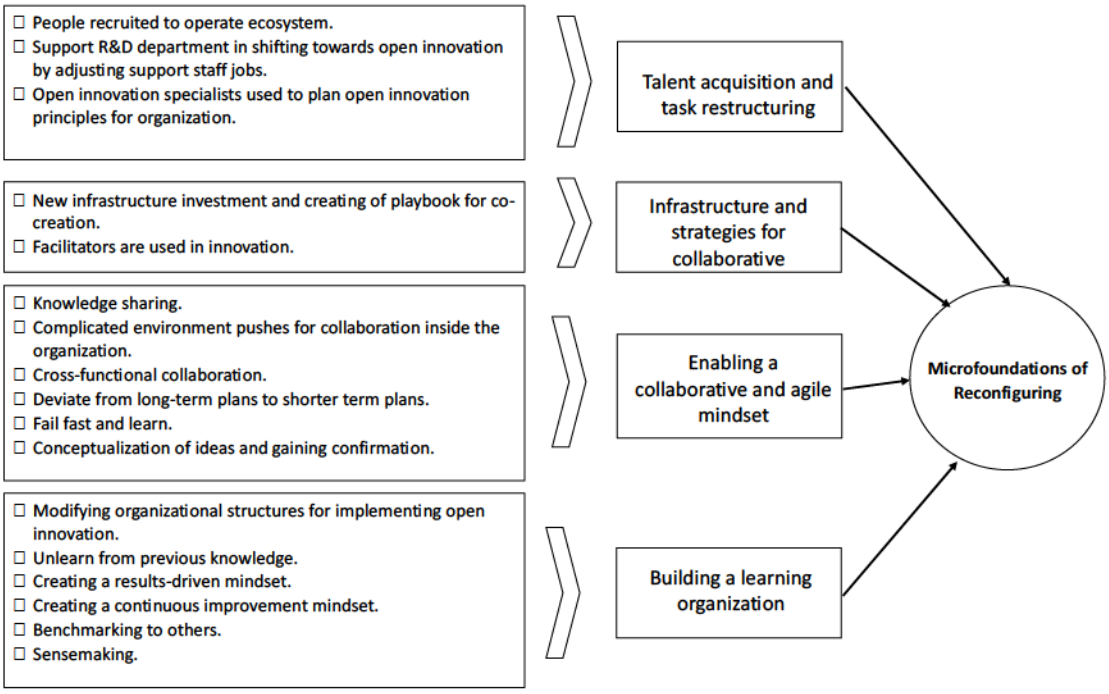


Figure 6. Data structure of the study.

3.5 Validity and reliability

Utilizing Yin's (2009), Gibber et al.'s (2008), and Saunders et al.'s (2019) presented criteria, the validity and reliability of this case study were maintained to meet the criteria for a high-quality case study. Four criteria can be utilized to investigate a case study's validity and reliability: internal validity, construct validity, external validity, and reliability (Yin, 2009; Gibbert et al., 2008). Validity in research refers to the extent to which the data collection method used measures what was set to be measured (Saunders et al., 2019). The first group of validity, internal validity, refers to the causal relationship the study is investigating (Gibbert et al., 2008; Saunders et al., 2019). Furthermore, internal validity is about making a strong argument about the causal relationship between the variables and results (Gibbert et al., 2008). To gain internal validity, this study gathered theory from three main concepts to build the framework. The second validity group, construct validity, refers to "the quality of the conceptualization or operationalization of the concepts" (Gibbert et al., 2008, p. 1466). Essentially, construct validity is about investigating

what the study claims it is investigating. To make this visible to the reader, a clear chain of evidence should be illustrated (Gibbert et al., 2008). A clear chain of evidence is evident in this study, as this study showcases the research process from the research questions to the conclusions and implications. The third validity group, external validity, is about the generalization of the study in another relevant context (Saunders et al., 2019; Gibbert et al., 2008). As this study is a single case study, the findings of this study cannot be generalized in other contexts (Yin, 1994). However, this study does provide empirical evidence and novelty value to theory by investigating the mindset changes of managers and the capability changes of the organization when the organization reconstructs its innovation policy from a closed to an open innovation ecosystem, which, to the researcher's best knowledge, has never been investigated.

Reliability refers to the consistency of the study, which means that the study could be repeated, yielding the same results (Yin, 2009; Saunders et al., 2019). Reliability can further be divided into internal and external reliability. On the one hand, internal reliability can be achieved by ensuring consistency throughout the study. On the other hand, external reliability is about the data collection and analysis methods used in the study and whether they would produce consistent results if the study were made by another researcher (Saunders et al., 2019.) In this study, internal reliability was maintained by writing internal memos for stability reasons. Furthermore, the reliability of this study is improved through different protocols. All interviews were recorded and transcribed, and all interviewees were asked the same main questions. Moreover, the transcribed text was re-checked with the original data to spot any errors. Furthermore, transparency is emphasized in this study by displaying the interview questions in the Appendix, and the data collection and analysis are argued.

4 Findings

In this section, the findings of this study will be examined and discussed in detail. This will happen with a within-case analysis approach. Furthermore, in the summary of the findings part, the findings are summarised, as well as the revised framework showcasing how the case organization's capabilities have evolved when it has transitioned from closed innovation towards open innovation is shown. Additionally, this section showcases the microfoundations of sensing, seizing, and reconfiguring in more detail. As microfoundations were analyzed in this study, different routines, processes, procedures, work methods, cognitions, and heuristics are highlighted.

4.1 Microfoundations of sensing

In the realm of dynamic capability theory, sensing encompasses different types of processes and activities for gathering and interpreting information. Information is gathered by sensing the broader business environment to discover new opportunities and threats and understand how these opportunities and threats can be either leveraged or avoided. Sensing builds a strong base for dynamic capabilities, as it provides the needed information that is required for strategic actions, such as seizing these opportunities and restructuring the organization's recourses.

This part delves deeper into sensing and sheds light upon the microfoundations visible in sensing. By analyzing the interviews extensively, this research uncovered four distinctive themes that establish the act of sensing. These four are market environment scanning, co-creation with customers, ecosystem partner scanning, and ideation scanning.

4.1.1 Market environment scanning

Organizations orchestrate their business in an ever-more challenging and changing environment, where regulation, customer needs, and innovations drive market change. This first discovered theme, market environment scanning, delves into the different

cognitions, routines, processes, and work methods that enable the organization to understand its market environment. Furthermore, this theme discusses the underlying cognitive changes that have occurred through implementing an open innovation paradigm while moving away from a closed innovation paradigm.

Within market dynamics, regulation can have a considerable impact on the business and whole industry in the short- and long-term time horizons. The case organization reveals an approach to understanding regulation through a routine. As expressed by Interviewee 1, the case organization recognizes the effects of general societal constraints and opportunities, particularly from a regulatory aspect, on their business. Furthermore, the interviewee also acknowledges the role regulation has on safety, thus illustrating the impact of regulation on the organization's activities.

Furthermore, Interviewee 1's statement, "They set the standards" demonstrates the understanding that regulation affects the whole industry's practices and standards. This acknowledgment with the first quote also means that regulation not only affects the immediate market environment but can also provide the benchmark for the industry and the possible direction.

> *"Another aspect, of course, in today's world, is the general societal constraints and opportunities, regulations […] And naturally, yes, when it comes to safety, regulations play a role as well […] They set the standards." (Interviewee 1)*

The utilization of business intelligence in the case organization showcases the process of gathering intelligence about customer needs and insights about the market. This is strongly showcased by Interviewee 3, who highlights the important role of business intelligence in monitoring market trends and customer needs. The interview data also showcases a shift in the narrative through the adaption of open innovation in the case organization. Before open innovation, business intelligence already had a functioning role in gathering market and customer need intelligence. However, open innovation has shifted the importance of business intelligence to emphasize its role in scouting, thus

strongly associated with sensing new opportunities. Furthermore, the statement "monitors the market and customer needs all the time" by Interviewee 3 highlights data gathering continuously rather than periodically or on a single time, thus resembling that of a routine. In summary, there has been a shift in cognition through open innovation as business intelligence is associated with scouting rather than only gathering intelligence continuously.

> *"[…] business intelligence, which monitors the market and customer needs all the time […]The business intelligence side has been there, but it is utilization to scout." (Interviewee 3)*

Relating to the previous findings, the interviews also reveal an interesting remark concerning that specific employee roles in the organization are associated with exploring business intelligence. This differs from the mindset that scanning activities are dispersed across the organization between different employees or even the whole organization. As discussed by Interviewee 3, this type of allocation stresses the significance of distinct roles associated with business intelligence activities demonstrating a working method. This further demonstrates that the case organization has a focused strategy when thinking about roles and functions of the organization, as tasks are associated with roles. This type of thinking demonstrates that specific actions and cognitions as microfoundations are valued in those roles, which enable business intelligence activities.

> *"[…] there are certain roles that explore that." (Interviewee 3)*

Based on the case organization transitioning towards an open innovation approach it made a notable structural adaptation. While this following finding can also be in the reconfiguring section, it is demonstrated here because the newly specified team is used for scanning activities. This structural adaption outcome was a separate function strategically located between the crossroads of centralized innovation functions and mergers and acquisitions. The central job of this team is evaluating emergent digital technologies and potential new vendors, which would have synergistic value-add to the organization by complementing the existing business areas in the case organization operates in.

In addition to the physical building of the team, there also exists a paradigm shift in cognition in this activity. The paradigm shift occurred when the case organization decided to share what new vendors and digital technologies they were seeking for on an online platform. This transition in paradigm showcases the withdrawal away from keeping all information inside the organization towards proactively and transparently showcasing the organization's strategic needs.

As highlighted by Interviewee 4, the team's function is to seek new large-sized transformation through digital technologies and vendors. This mindset showcases that rather than focusing on incremental improvements in the organization, the organization is seeking more monumental growth in its business areas. In addition to this mindset, searching for new digital technologies or vendors can be seen as a process, as it begins by realizing the gap in knowledge to making an acquisition.

> *"[…] look for underlying new digital technologies or new vendors popping up in this space that could be complementary to what we have through that acquisition and now after […] Also, how this team was formed was to initially look at really big transformations. So looking at. Umm. You know how do you create two, three, 500 million plus new business." (interviewee 4)*

A distinctive open innovation aspect is visible in the case organization as to how it orchestrates its sensing. As described below by Interviewee 4, the case organization has shifted its cognition from relying exclusively on internal sensing capabilities, to rather emphasize the use of a wider range of research vendors. This transformation that has taken place strengthens the thinking to embrace and exploit external sensing capabilities.

The interview data from Interviewee 4 displays the transformation, as collaboration with external research vendors has become a new norm. This is emphasized explicitly by Interviewee 4 when discussing that external research vendors have strong knowledge and expertise about the broader industry. The use of research vendors, in addition to internal sensing also can be seen as a routine activity the organization embarks on.

“So we quite often work with market research vendors and sometimes we take a lot of the macro research in collaboration with those guys” (Interviewee 4)

”They might have very strong expertise in certain areas itself like understanding the technologies and like what kind of players are out there on the landscape, but what we need as a business also in addition to that is kind of like kind of a help some. After that can help us understand or interpret it in our context.” (Interviewee 4)

“We have a lot of research consultants that we use.” (Interviewee 3)

The case organization utilizes a process aimed at systematically influencing projects conducted on the European Union scale. This finding is interesting as it showcases that the case organization takes a strong proactive stance in scanning by aiming to influence projects that might affect its business area. Interviewee 2 emphasizes that the case organization seeks to influence European Union-scaled projects already in its nascent phase. Furthermore, influencing these types of more extensive projects also displays a cognition change from only monitoring the market to trying to influence projects to positively affect the organization and its business area. In summary, the microfoundation that is visible is the cognitive change from market scanning towards a more proactive and influential approach to its markets.

“[…] influence already when the EU project is being planned […] mainly influencing EU projects" (Interviewee 2)

Another interesting cognitive transformation due to the new paradigm of open innovation is how the organization has shaped its attitude toward its competition. This cognitive transformation is apparent in how the organization discusses and shares information outside its boundaries and, even with its competitors, whether a common goal arises. The event that is emphasized through the interviews is the common goals, such as Interviewee 1 notes it to be regulation. Moreover, the text below displays that the case organization is willing to share information through discourse if the data provides a bridge toward a positive common goal.

> *"It can be almost anything, even a competitor. It may happen that if someone has a brilliant idea, we will talk about it, even if they are a competitor. But then they won't compete against us if there's no common benefit, so if there's no common enemy, so to speak […] If it relates to a regulation or something like that, then one or two competitors can be the best partners." (Interviewee 1)*

In addition to understanding how regulation could affect the overall market environment, the Capital Markets Day meeting demonstrates that the case organization also works to sense the actual business demand of the end customer for greener transport. They see that both the actual demand and the change in regulation have an accelerating effect on the speed of change.

> *"Regulations and demand for green transport will accelerate the speed of change […]" (Capital Markets Day Meeting 2021)*

In conclusion, the visible cognitive shifts in the market environment scanning have affected the case organization's transition toward an open innovation paradigm. The case organization has established distinctive routines and processes for gathering customer need intelligence, market data, and regulatory data, which have been altered due to cognitive changes. Business intelligence in the organization has transformed as it has taken a more proactive scouting approach rather than relying on gathering market and customer intelligence. Furthermore, introducing a new team focusing on large-scale transformations signals an innovation-driven mindset in the organization. On the other hand, the preparedness to collaborate with competition to influence a common goal, such as regulation, showcases the open innovation paradigm in sensing.

4.1.2 Co-creation with customer

By implementing an open innovation mindset throughout the organization, there has been a change in how the case organization collaborates with its customers. As discussed below, the theme of co-creation with customers is visible in how the case organization communicates and collaborates with its customers. Furthermore, the case organization also focuses on a more proactive and collaborative mindset with its customers by showcasing a roadmap for future scenarios.

A transformation that has occurred on the operational level due to open innovation is the mindset toward promoting open dialogue with customers. Prior to the open innovation implementation, the case organization had a cognitive stance that the organization itself knew the customer needs best and thus communicated solutions to customers. However, implementing open innovation changed the cognition towards more openness, and open dialogue with customers should be fostered. Interviewee 2 demonstrated the stance by discussing about the research and development function of the organization, knowing what the customers' needs are. This essentially meant that customers were provided products and services that R&D sought most fit. The transformation is evident as Interviewee 2 articulates that not only open dialogue was used with customers but also interviews were conducted. Furthermore, Interviewee 2 also stresses the possibility of finding solutions through collaboration rather than the case organization having to figure out the solution themselves.

> *"[…] there was a culture where it is said that R&D knows quite well what the customers need […] we told the customers more, perhaps, what they need, that here are the products and solutions that are suitable for you […] now we have come to a situation where we focus a lot on diologue and interviews with customers directly […]Let's discuss and find the solution together with the customers […]" (Interviewee 2.)*

Moreover, the theme of co-creation with customers is expressed through the routine and cognitive change that enables the publication of a comprehensive roadmap. The publication of a future-orientated roadmap showcases a routine and a cognitive change. The development and publication of the roadmap is a routine, as the case organization works towards updating this roadmap every six months. Development is enabled by internal and external development and scanning work; thus, it resembles scenario planning. On the other hand, the publication of a roadmap showcases a cognitive shift, working towards more collaborative and proactive scenario planning with the help of customers. As discussed by Interviewee 1, the publication of a roadmap revolves around the cognition of openly communicating about the future direction and availability of

products to customers. This, on the other hand, can help find the best solution for the customer depending on the underlying scenario.

> *”It is then used to build an example of a fuel road map.” (Interviewee 2)*

> *"For example, in February, we made it public with this kind of roadmap for future fuels, indicating which products will be available with what fuels and when." (Interviewee 1)*

> *”We are perhaps more open. In this way, the forest also responds when you shout something there, so without revealing all the secrets, we are more open, and this also applies to our customers. Through this, we can achieve a better understanding of what this is really about. For example, in February, we made it public with this kind of roadmap for future fuels, indicating which products will be available with what fuels and when. But of course, there was a disclaimer stating that it's based on the current situation and current outlook, and we intend to do it this way. We hadn't done that before; previously, we would have said, "Well, when someone buys it." So, we are already giving indications that according to our view, this and this product will be available with this and this fuel at that time.” (Interviewee 1)*

The final finding of the co-creation with customers theme shows how the case organization orchestrates its footwork and the importance of key account managers. When working with customers, using key account managers showcases a routine to sustain contact with them. As discussed by Interviewee 1, co-creation with customers is evident with how footwork is used, specifically through key account managers to keep contact with customers. The use of key account managers is important in the sensing of the business environment. This is exemplified explicitly by Interviewee 1, who talks about insights arising. On the other hand, Interviewee 3 further demonstrates the importance of key account managers and their jobs due to their proximity to customers.

> *"And yes, we do follow various things, but probably the biggest and most important one. In this kind of business, it's all about footwork, so our key account managers, the sales powerhouses, engage in discussions with customers, and that's where the insights arise." (Interviewee 1)*

> *"[…]the account managers are the closest customer service job already in the business that we already have." (Interviewee 3)*

In conclusion, through the implementation of open innovation, the organization was able to transform fundamentally toward a more customer-orientated and collaborative approach. While the organization previously had a strong mindset that the research and development team knew the customer's needs the best, the case organization transformed its cognition and routines towards discussing and interviewing customers. Co-creation is further emphasized by Interviewee 2, who discussed the need for collaboration to create new solutions. Moreover, co-creation was also visible in the publication of the future-orientated roadmap, showcasing a strong cognitive shift. While previously, the organization upheld its intelligence about its future foresight, through open innovation, it wanted to share its thinking by sharing its future scenarios. Lastly, co-creation was also evident in how the organization emphasized the importance of footwork, specifically its key account managers and their role in communicating with customers.

4.1.3 Ecosystem partner scanning

The next theme investigates how the case organization selects its partners for its innovation ecosystem. The organization follows a distinctive cognitive approach and work methods and processes it uses to scan for new ecosystem partners. Analyzing the ecosystem partner scanning theme, partner scanning, the value-add of partners, globality mindset, and the importance of open communication as microfoundations were discovered. Furthermore, this theme bears a resemblance to Linde et al.'s (2021) partnership scanning microfoundation, which they associate with ecosystem partner scanning. However, Linde et al. (2021) study and this study differ as the underlying aspects of the microfoundations differ.

Scanning for new partners to join the innovation ecosystem, the organization orchestration occurs through a needs-based approach. As noted by Interviewee 3, this type of cognition showcases that scanning new partners relies on the need for specific information or skills from selected partners. Furthermore, Interviewee 3 also discusses the use of a standardized pipeline, which can be seen as a process used to help the case

organization orchestrate its scanning approach. There is also a visible purpose for using different partners rather than relying on a single partner.

> *"It often is need-based […] We are trying to guide them through the same pipeline, so that we can have peace of mind at work and then look for that partner based on need when we see an opportunity." (Interviewee 3)*

When the case organization expands its ecosystem, it showcases a mindset of seeking new partners globally rather than only relying on a restricted area. Interviewee 1 confirms this thinking by discussing the need to seek global partners due to the importance of customer-driven imperatives. This means that customer centricity cannot be confined to one local area but rather should expand its mindset towards a global mindset.

> *"It's completely global. Of course, it may depend on the context, if it's customer-driven, then it's truly global. So, it's seen there that once again, it's about where someone is willing to pay, and that's where we go." (Interviewee 1)*

In addition to scanning new partners on a need-based approach and seeking new partners globally, the value-add of the partners also has a vital role in the selection process. Interviewee 1 discusses about cognitive orientation. Each partner that is used should provide value-add to the ecosystem. Furthermore, the case organization realizes that the value-add comes from all its partners, whether it is a customer, supplier, partner, university, or research institution. Moreover, this type of value-add cognition is also visible in a case-by-case mindset. This means that the potential partners' value-add is assessed for each case it might be in, thus having a strong context matter.

> *"Yes, it works simply by providing added value through solving that specific challenge or problem. So sometimes we need input from customers, suppliers, multiple players, universities, research institutes. It's really a case-by-case basis, but the important thing is that there should be something to offer and contribute in order for us to not take it for granted. So, yeah, it's about bringing that added value to the value chain and what it brings. Yeah, that's it briefly […] But it's essential that they have something to offer and contribute to it, so it's not just us making decisions." (Interviewee 1)*

Furthermore, the interviewees' discourse showcases the importance of open communication with its partners in the ecosystem. Interviewee 2 emphasizes that open communication is a catalyst for receiving new ideas with which they can proceed. Furthermore, Interviewee 1's discourse emphasizes open innovation and communication in times of uncertainty with innovations. This means that when a new innovation starts, there might not be any facts that could be used as a basis; thus, Interviewee 1 stresses the importance of open communication in this type of situation. Moreover, Interviewee 1 also discusses the nature of making mistakes and also discusses the need for open communication to minimize the probability of making mistakes.

> *"If we open up, we will also get new ideas and through that we will move the matter forward." (Interviewee 2)*

> *"I'm not saying that, but the openness is there too. Of course, it's fact-based as well. Of course, when you go to something new, it's always difficult. What is a fact when you don't know. They are all estimates anyway, if it was a fact it would have been tested and then we would know. Then there is no risk. Then it can be said that it is worth it or not. That's a bit of an chicken and egg on the other side, but can you sometimes completely avoid the head-butting of the few in this case. Well, it's not absolute, but it's clear that with this kind of more open exchange of information and this kind of discussion, yes. Yes, it avoids a lot, because no matter how much you are an engineer, misunderstandings can and always happen to people, and they happen every day." (Interviewee 1)*

While scanning for different partners for the ecosystem, there is a visible cognitive shift and a work method. As articulated by Interviewee 3, the case organization scans multiple players, or partners, to potentially include in their ecosystem rather than relying on one partner. The underlying cognition is that the intelligence and synergy are stronger through multiple ecosystem partners than relying on one partner.

> *"Basically, if we look at the ecosystem, it is quite strong that we scan many players and not just one player, and from the suppliers as well, that is pretty good." (Interviewee 3)*

As discussed, the case organization demonstrates a structured approach to scanning new potential partners for its ecosystem. This is further showcased through a routine for examining the innovation metric, also known as the innovation potentiality of potential partners. This case organization specifically uses this measurement method for particularly measuring the innovation capability of IT suppliers. Using an organized measurement framework for innovation capability showcases its importance in the decision-making of either pursuing a partnership or not. As discussed by Interviewee 5, the organization has used this framework for several years to analyze the supplier's innovation capability.

Furthermore, using an innovation metric also indicates a cognitive shift within the organization. As traditional partnership evolution considers factors such as price, quality, and functionality, the case organization showcases an evolution in cognition as they think about the innovation capability of potential partners and how it can help the case organization itself.

> *"I know that for a few years, for example, on the IT side, they have. They have quite a metric for what level of innovation the suppliers have. That is, they then I remember how this meter is placed in relation to other big meters. Yes, they are like that when they saw that the IT supplier has to do it so that there is some meter there in the background." (Interviewee 5)*

In the context of ecosystem partner scanning microfoundation, a notable cognitive shift has occurred regarding non-disclosure agreements. While the organization had a closed innovation paradigm, there was an underlying cognition that any information should only be shared with potential partners once all parties signed a formal non-disclosure agreement (NDA). However, this cognition has changed after adopting an open innovation paradigm in the organization. Currently, the organization is advocating for sharing necessary information with potential partners before NDAs are signed. This shift allows the organization to begin the innovation process more quickly and understand if the potential partnership is worthwhile to be used.

As described by Interviewee 1, the organization would uphold all information and stay silent before formal non-disclosure agreements were formalized. Despite that, the altered mindset is now closer to providing needed information, however, at a more general level, to start potential discussions with the partners. This more open approach allows both the case organization and the potential partners to see if the potential partnership has potentiality for future collaboration and co-creation.

> *"Previously, we would remain completely silent, not even utter a word before signing NDAs (Non-Disclosure Agreements). Yeah, but now there's perhaps a change in that regard, and this is how I would like to see it […] provide relevant information at a general level during discussions to reach an understanding of whether it's worth continuing." (Interviewee 1)*

In conclusion, by analyzing the interview transcripts, the specific type of partner scanning occurs due to the underlying cognition within the organization, and thus, how partners are scanned. There is a strong cognition towards need-based scanning, and partners are evaluated for their value-add to the innovation ecosystem. Furthermore, the case organization scans for partners globally rather than relying on local partners. These findings showcase a specific cognition and procedure with which the case organization scans for new partners.

4.1.4 Ideation scanning

The fourth discovered microfoundation of scanning is ideation scanning, which within this organization occurs through the use of external and internal resources. The case organization demonstrates a distinctive process for gathering and storing customer data by using a customer-relation management tool. These inputs are gathered from the customers and are subject to a routine analysis, which occurs every six months by the research and development team. As discussed earlier about the importance of key account managers in co-creation, Interviewee 3 argues about the important role of key account managers in gathering ideas from customers, as they are the closest connection to the customer. This type of idea scanning from customers and analyzing the data each six months with the research and development, allows the R&D team to understand

customer needs more profoundly, thus showcasing a more customer-centric approach to innovation.

> *"[…] the account managers are the closest customer service job already in the business that we already have […] And from there, they can provide insights and feedback to product development, like, 'Hey, now there's something like this." (Interviewee 3)*

> *"When they notice that multiple customers are interested, it can be brought to the R&D team's attention." (Interviewee 1)*

In addition to gathering customer-driven input in the form of customer ideas, the organization has implemented a distinct ideation tool that all employees can access. This tool showcases a work method employees can use to submit their ideas. The ideation is initiated by placing ideas into the tool. This tool is accessible to all employees, thus allowing anyone across different functions and roles to place their idea into the tool, thus building an idea basket as Interviewee 2 describes. After this, when an R&D team starts to open the basket as Interviewee 2 discusses. Here the R&D team has an important role in analyzing the idea and also thinking about whether the idea should be proceeded with.

> *"In the beginning, when it comes and we have it in use, this is called the so-called ***** [tool name anonymized] tool that every person uses. It is a tool in which you can put your own idea or your own innovation and describe it. It goes, as they say, in such idea baskets, and then a small team of R&D people gather around it and open that basket and see what's in there." (Interviewee 2)*

In conclusion, the case organization has established a process for gathering and utilizing intelligence that it gathered from customers to drive its innovation and development activities. Throughout the microfoundations of ideation scanning, the case organization, explicitly relies on their key account managers to gather customer needs and preferences and store this data in the CRM tool. The CRM tool is important in storing customer need data and helps managers and research and development experts make the correct decisions based on the data gathered. Additionally, the organization uses an internal ideation tool, which promotes an innovation culture throughout the organization, allowing all

employees to contribute to the innovation. The internal SPARK tool is a work method for ideation. By having both external and internal tools for gathering inputs and ideas, the case organization can stay up to date with customer needs and preferences and innovate internally.

4.2 Microfoundations of seizing

Seizing is about clinching onto the new business opportunities the organization has found by first sensing them. This clenching to new opportunities can happen through product, service, or solution changes. This study's findings delve into how open innovation is seen in the seizing activity the organization orchestrates. The findings show that partner engagement, internal decision-making and resource allocation, innovation management and strategic alignment, and their underlining microfoundations are important in the case organization seizing new opportunities.

4.2.1 Partner engagement

The first theme that was found within the organization's seizing activity is that of partner engagement. Partner engagement is key in the case organization seizing activities, specifically through an open innovation and innovation ecosystem perspective, because it enables the organization to engage its partners. This theme discusses different processes, work methods, and cognitions that allow the organization to have more efficient partner engagement.

The interview transcripts illustrate a type of heuristic about the collective decision-making amongst the case organization partners. This heuristic underlines an understanding that each organization in the ecosystem first decides whether it wants to move forward. Then, the ecosystem also decides collectively if it wants to advance. Predominantly, this resembles the interconnected relationship occurring in innovation ecosystems. Interviewee 1 discusses how this type of collective decision-making is specifically seen with

ecosystem partners. Furthermore, the collective decision-making processes evaluate the division of work each partner has and their level of involvement.

> *”Yes, yes, and perhaps if it's a project within an ecosystem, then after that, a decision is made together with the ecosystem partners who are involved in developing the idea, deciding if and how to proceed, and each party determines their level of involvement.[…]It's a multi-stage process, so initially, each party decides individually whether to participate, and then collectively, a decision is made on whether to proceed and in what capacity, as well as determining the division of work.” (interviewee 1)*

A theme emphasized in the discourse focuses on the transformation of cognition characterized by the importance of collaboration and mutual benefit in the innovation ecosystem. The fundamental cognition has shifted from a zero-sum game mindset towards seeking mutual benefit from decisions. Interviewee 2 illustrates this by discussing about everyone having something to gain from the ecosystem. Furthermore, they use the wording “win-win,” demonstrating the cognition that each partner should win from the decisions made. Moreover, this type of mutual benefit cognition is close to what ecosystems and their interconnection and co-creation of value are based on. This is exemplified by Interviewee 3 when they talk about how everyone has to benefit from the ecosystem. In addition, this type of win-win cognition can enable the ecosystem to gain commitment from all its partners, as they have something to win from it.

> *"Yes, that's a good question, because that ecosystem must be built in such a way that everyone has something to gain from it. It's kind of a win-win for everyone. No one is involved as much as out of interest, but everyone has a contribution to it and for that there are many planning meetings with these ecosystem partners, what would be your work contribution here and what opportunities do you have?" (Interviewee 2)*

> *"If I'm the one who makes the decisions, it means that joint innovation and winning together requires that we are committed and that we find the kind of ground where we all win together and produce added value. In other words, every ecosystem event like this has to lead from decision-making to the fact that everyone benefits, otherwise it's not as if, and the decisions have definitely involved ecosystem players in their decision-making." (Interviewee 3)*

In addition to shifting towards collective decision-making and providing value for all partners in the ecosystem through a win-win mindset, the case organization has shifted its mindset about its intellectual property rights (IPRs). The case organization has shifted its mindset from owning all IPRs towards a mindset of not owning all IPRs but being able to use others' IPRs. This is illustrated by Interviewee 1, who discusses about the right to use IPRs without needing to own them. This finding aligns with previous literature about open innovation that promotes utilizing IPRs rather than owning them. This is also emphasized by Interviewee 1 when talking about this mindset aligning more with ecosystem thinking.

> *"It's not necessarily required for us to own the intellectual property rights (IPR). It's not mandatory […] We should have the right to use it, whether it's with compensation or without, or however we agree. But that IP mentality, where everything belongs to us, has been overcome, and maybe it's for the best because it also aligns with the "walk the talk" approach in ecosystem thinking." (Interviewee 1).*

One essential finding that arises from the interview data is promoting open communication with partners, which relates to open communication and open innovation in the ecosystem context. Interviewee 1 discussed communicating as openly as possible within the ecosystem. However, it is worth noting that Interviewee 1 also stresses that agreements should be in place before open communication can be conducted. Thus, while there is a cognitive transformation to promote open communication in the organization, it should be orchestrated only when boundaries are set.

Further analysis of the interview data also shows that open communication is a valid tool for avoiding misunderstandings with partners. This is visible when Interviewee 1 discusses how a more open exchange of information can help avoid misunderstandings while completely avoiding misunderstandings is impossible. In addition to this finding, Interviewee 2 argued about the importance of open discussion in the nascent stage of the innovation phase of an idea.

In summary, Interviewees 1 and 2 both emphasize a positive mindset towards open communication. The interview transcripts illustrate that the organizations follow a more ecosystem-type of communication and work towards a more transparent communication type, where information is shared, there are fewer misunderstandings, and it is also used in ideation.

> *But the goal is to have it as open as possible internally or within the ecosystem, if we are in that context and have agreements and everything is okay […] So, in a way, it's a bit of a dilemma, but can decision-making ever completely avoid misunderstandings in rare cases like this? No, it's not absolute, but it's clear that with more open exchange of information, discussions, and conversations, yes, a lot can be avoided." (Interviewee 1)*

> *"[…] but what is important in the beginning is precisely the open discussion around the idea." (Interviewee 2)*

The following finding is that having a mindset of evolution versus revolution to working with partners, showcases the want for continuous improvement with its partners. However, it contradicts a previous finding. This finding differs from the one in scanning, which was about seeking for new partners rather than relying on one. It contradicts the previous finding, as interviewee 2 discusses how the relationship between partners is more about evolution rather than revolution, which in this case would mean seeking for new partners. Moreover, Interviewee 2's interview also showcases a cognition that partners are valued and the relationship between the partners evolves.

> *"It's actually rarer to find such a new partner. So I forgot to mention that, of course, research institutes and universities and colleges also play an important role in these projects. Yes, then look for a new partner, you can't really find one in our industry. Yes, it's more of an evolution than a revolution with partners." (Interviewee 2)*

The case organization has created a type of work method called a playbook that showcases the underlying cognition of how the organization wants to conduct business with its potential partners. This playbook contains different procedures on how the organization orchestrates its collaboration with partners in an open innovation manner. Notable

procedures that gained attention are those of Non-Disclosure Agreements (NDAs) and Intellectual Property Rights (IPRs), which are closely related to open innovation.

Interviewee 1 stresses in the discourse that different IPRs can be used. This showcases a shift in cognition that there is a diverse set of different producers that are possible for IPRs rather than in closed innovation where the case organization typically had to own all IPRs. On the other hand, Interviewee 2 emphasizes the proactive use of the playbook, which is visible as the playbook is published online for anyone to access it. Interviewee 1 also discusses about the NDA aspect, which is an essential part of their innovation activity, and has seen a strong cognitive shift from not sharing anything to sharing needed information before NDAs. This playbook further showcases different potential partners and competitors and how the organization illustrates its innovation activity. Lastly, Interviewee 2 mentioned that experts of open innovation were used to create the playbook. Using experts strengthens the playbook's credibility and showcases that the organization is truly invested in open innovation.

> *"Well, it is, in practice, we have made a Playbook-style tool, which can also be found online. When there are companies or partners interested in developing something with us. They have some ideas. Because not all ideas come from within our company, but ideas are suggested from outside, so around that playbook, they can come up with ideas and put those ideas in, then at the same time we look a little at the Non Disclosure element and IPR regulations. This way, after they have filled it out and gone through it, we can talk with them. There is such a starting level and around it there have been, let's say, such experts in their field on the innovation side of how this open open innovation of ours actually works and through that, more people have been hired for it." (Interviewee 2)*

> *"There are some other things in our playbook too. There's a segment that roughly explains the couple of possibilities regarding intellectual property rights." (Interviewee 1)*

Another interesting finding that aligns with open innovation is that of utilizing spinoff ideas. Interviewee 2 discusses the importance of participating of higher education institutions in the ideation process, which might result in a spinoff idea. This showcases a mindset that rather than shooting down ideas and not letting them advance forward,

the organization encourages collaborating with research institutions for potential spinoff ideas.

> *“[…] where there are now higher education institutions, people from them can also be included, because often these ideas also come up in discussions with the higher education institutions at some event or along with another project, so this kind of spinoff idea is born." (Interviewee 2)*

In conclusion, the theme of partner engagement underlined different types of hierarchies, work methods, and cognitions. The interviews showcased that there is a heuristic that emphasizes collective decision-making within the innovation ecosystem. This heuristic occurred when each organization first made an independent decision on whether to move forward with the partnership and then engage in a collective decision. Furthermore, the interview also demonstrated a cognitive shift in how the case organization has shifted towards seeking win-win solutions with its partners, rather than only emphasizing their winnings in decisions. This is closely linked to previous findings about innovation ecosystem work, where the partners are interconnected and seek co-creation, and each partner has something to gain. The mindset changes towards IPRs, and their ownership was another underlying aspect of the partner engagement theme. Furthermore, this theme also has close links to open innovation work.

The theme of partner engagement was also showcased by how the case organization promotes open communication with its partners for different reasons. They promote open communication so that there would be fewer misunderstandings, and to promote ideation. The case organization also has developed a playbook, which works as a work method for the case organization and demonstrates a cognition shift towards open innovation and ecosystem work. Lastly, this theme also discussed how there is a cognition about evolution with partners rather than revolution and continuously seeking new partners.

4.2.2 Internal decision-making heuristics and cognitions

The third discovered theme, internal decision-making heuristics and cognition, discusses specifically heuristics, processes, and criteria used in the organization for efficient internal decision-making. Interviewee 1's discourse emphasizes that the case organization has a distinct process for its decision-making, which includes a ladder and frameworks. Internal decision-making about whether to move forward with ideas can be seen as a process, such as Interviewee 1, eludes it to be. Moreover, Interviewee 1 also discusses the organization having levels and frameworks, that are associated with budgets, thus showcasing different work methods with decision-making. These frameworks are numbered, which further encourages a laddered approach to making decisions, as higher management will make the last decision.

> *"Now, when we talk about big investments like our R&D projects, we have certain levels internally. It depends on who gets to decide on what, and if they are significant investments, then it goes up to the board level. There are clear procedures for that internally, so there's no need to explain further. But as you probably understand, if it's a €1000 matter, less authority is needed, whereas if it's tens of thousands, hundreds of thousands, or more, then it escalates quickly within the organization regarding decision-making authority. However, these are structures and internal boundaries we have established. But, of course, there are parties that make the decisions. It's clear who gets to decide within certain frameworks. There are frameworks and processes in place." (Interviewee 1)*

A finding closely linked to heuristics is the comment below by Interviewee 1, about decision-making. Interviewee 1 stresses that decisions are also based on facts, and thus means that the managers value the importance of facts when making decisions.

> *"I'm not saying that's the case, but openness is important even in that scenario. It's also based on facts, of course." (Interviewee 1).*

The third finding about internal decision-making is about the mindset of valuing both the value-add of projects, but also the actual shooting down of ideas. In the interview,

Interviewee 1, discussed value-add as having an important aspect in internal decision-making, but also as valued is the shooting down of the idea if it does not work.

> *"But the best lesson is still learned through personal experience. So, you'll notice that it works, that it brings added value. In different ways, and that added value doesn't necessarily have to be that it immediately becomes a product or an innovative solution. It can also be added value in the sense that by doing things this way, we managed to shoot down that duck faster. We realized it couldn't fly. And that's also added value." (Interviewee 1)*

In summary, this theme discussed how there is a distinctive process with budget frames for effective decision-making. Furthermore, the interviews also showcased that managers value facts in their decision-making and that being able to shoot down an idea is equally important as gaining value-add from an idea.

4.2.3 Innovation management and strategic alignment of innovation

The last theme emphasized throughout the interviews and linked to seizing activities is innovation management and strategic alignment of innovation. While the previous theme focused specifically on decision-making, this theme focuses on how innovation is managed and encouraged. Furthermore, this theme also discusses how the innovation activities the case organization made were in line with the strategy of the time.

The interview data illustrates that the case organization utilizes a routine of reviewing projects. This is emphasized by Interviewee 2, who discusses about projects being reviewed each quarter. This finding is linked to the theme of innovation management because it showcases a distinct routine with which innovation projects are reviewed on a routine basis.

> *"[…] so we have a quarterly review of projects." (Interviewee 2)*

Adding to the previous finding, the case organization also utilizes a work method for prioritizing projects each quarter. These projects that receive priority are called must-

win projects. The interview transcript also illustrates an underlying cognition about selected projects being more of value for the organization, which is why these projects should be focused on. This finding is associated with innovation management, as it works to prioritize innovation projects the organization must focus on.

> *"We might have sixty projects or job numbers open. From them, 10–12 projects are selected every quarter, which are named must win and have the first priority." (interviewee 2)*

In innovation management, the organization has a cognition and routine, which they use to gain commitment for investments. Interviewee 4 emphasizes using a business case, which means that innovations or investments should be thought of by their business aspect. This routine activity of understanding the business case considers the profitability and scalability of the innovation or investment.

> *"It all comes down to that business case and really, I think that type of thinking has been a bit. Umm, how should I say? Lacking previously so kind of people jumping into new innovation initiatives, but quite often we don't see it yielding anything fruitful because we think about the business aspects quite late. So you do all the. You know, typical Um. Use case value prop. You develop all that, but you don't know how it's going to be profitable or scalable, in what ways. So these type of things have to come in at the very beginning." (Interviewee 4)*

An important aspect of innovation management is encouraging employees to innovate by providing needed resources, time, money, and tools. The case organization gathers employees together to innovate and encourages employees to set aside time for innovation work. These showcase a cognition that employees are encouraged to innovate, as well as needed recourses through time and employees are provided. Furthermore, the organization also allocates money for innovation work, and projects are given job numbers.

> *"[…] where a group of representatives is gathered around it and for a day or half a day they innovate together, and how to take this forward […] Then a job number is opened for it and the team is gathered for it and of course the money needed for it is allocated." (Interviewee 2)*

> *"Depending on the way we work, we try to set aside time for innovation work in such a normal everyday job in some environments. In other words, we have a couple of planned days where you have freedom to either make your own innovations or participate in Workshops." (Interviewee 3)*

Another interesting aspect of the innovation management theme is how the organization utilizes open innovation by utilizing agile tools. The broader discourse of the interviews contributes to an understanding that the organization views open innovation to provide agile tools, which they see as both innovation sprints and service design. The use of innovation sprints can be seen as a process because these sprints are used in a process manner in the nascent phase of innovation to enhance the innovation if it is seen as important, as Interviewee 2 describes. On the other hand, service design as a work method is also used in the organization to understand end-to-end customer journeys and seek gaps in those, as Interviewee 4 illustrates. Utilizing and encouraging the use of these agile and open innovation tools showcases that there is a mindset in the organization towards agility.

> *"And when it is determined that it is a good idea, then an Innovation Sprint may or may not be made around it, where a group of representatives is gathered around it and for a day or half a day they innovate together, and how to take this forward." (Interviewee 2).*

> *"Yeah, well, as I mentioned earlier, open innovation is more about tools and service design thinking, or service design, to be precise. Not full-fledged service design, but using those tools, they are perhaps something new." (Interviewee 1).*

> *"So you kind of go through the standard, you know with the service design approach, end to end customer journey mapping." (Interviewee 4).*

Another aspect of innovation management that is associated with seizing is gaining commitment for innovations from employees. These findings are discussed in two separate parts, firstly through an internal work method and then through a broader mindset. The case organization utilizes a work method, which is used to enable employees of the organization to realize their innovation. Interviewee 2 highlights the importance of employees realizing their ideas in order to gain commitment from the employee.

Furthermore, Interviewee 2 also discusses how providing money as a resource to the employees managing their idea binds them to the idea.

> *"Yes, it comes from the fact that the employee gets to realize his own idea, that it is usually or always actually the team or persons who invented and brought out that innovation […] When you give them the opportunity to also implement and the resources they need, the money they need to take their own idea forward, it really binds them." (Interviewee 2)*

In addition to committing employees to innovations, the organization communicates its innovation agenda to the outside through newsletter articles, annual reports, and publishing its playbook for everyone to see. According to one Interviewee, the organization sees it as important to communicate the organization's mindset and agenda toward open innovation for gaining commitment. In addition to Interviewee 3, the case organization also communicates its mindset towards open innovation and its need throughout different reports. In the 2019 annual report of the case organization, the organization discusses building partnerships with different stakeholders and what benefits are possible through ecosystem activity. On the other hand, a newsletter published in 2023 emphasizes cooperation for achieving decarbonization. Furthermore, the interviewed in the newsletter emphasizes on a new mindset needed for this type of closer innovation activity in the value chain. Lastly, collaboration is seen as the only way forward, thus showing a must-do. Furthermore, openness the training and developing of a new mindset are also discussed on the case organizations webpage.

> *"In terms of communication, it's really important that our own team and our own employees hear that we also talk about it outside, that it's not just like an internal conversation, but that we talk in public arenas about how we want to work and how we want to be open." (Interviewee 3)*

> *"Creating meaningful connections with various stakeholders, such as customers, suppliers, partners, government agencies, academia and startups, is the basis of our open innovation activities. In cooperation with our ecosystem, we are able to significantly shorten the time it takes to introduce innovations to the market and respond more quickly to the new needs of the market. In addition, in cooperation with customers, we ensure that all new products and solutions create as much*

added value as possible from the assembly line to the end of the entire equipment life cycle." (Annual Report 2019 of Case organization).

"To achieve the goal of decarbonization, cooperation is key. There is a need for a new kind of collaboration, where different parts of the value chain work more closely together than before….This way of working calls for a new mindset […]" (Newsletter article of case organization, 2023.)

"Your question already captures the essence. It has to happen in partnerships, ecosystems. The only way forward to fully succeed with innovation and different types of venturing models is collaboration, and thus it becomes crucial that your organisation is open and collaborative. This has to become a core value for the organisation. But you also have to train people to become more collaborative. You can train and develop a mindset, as well as practical tools, on this fairly intangible topic. It requires some effort and preparation to make this happen, but it's doable." (Published on case organizations website, 2022).

In addition to discussing about innovation management in the organization, another important aspect of the theme is the strategic alignment of innovation. The interview transcript illustrates that there is a strong cognition in the organization that the innovation activity should align with the organization's overall strategy. Interviewee 3 emphasizes two aspects of this cognition. The first one is associated to what type of innovation that should occur in the organization. Interviewee 3, for example, uses the phrasing "radical", meaning a more radical approach to innovation. The second aspect of the cognition related to which projects receive focus due to the underlining strategy at the time in the organization.

"But the potential side, yes, we don't have the radical side at the moment, it has been stronger, but it is said that it really depends on what kind of strategy we have […]" (Interviewee 3.)

"In other words, if an idea is found, you must first understand where it lands in our portfolio, and who is the owner of it. It's probably the most challenging phase, that when we see a hot topic, the first thing is of course the strategy check, to see if we have room for it at all. And now that we have a pretty strong strategy, it often happens that it stays in the back log waiting." (Interviewee 3)

In summary, innovation management and strategic alignment of innovations in the case organization occur through multiple work methods, processes, tools, and cognitions. The

case organization encourages for innovation work, by orchestrating agile tools such as innovation sprints to take the innovation further. The organization also encourages innovation work by providing resources through time and money. Furthermore, the organization also commits its people to innovation, specifically to open innovation, by allowing them to lead their innovations, as well as by communicating its needs and benefits through multiple channels. Lastly, the organization strives for innovation that is according to its strategy, which either encourages radical or incremental innovation at times.

4.3 Microfoundations of reconfiguring

The third aspect of Teece's division of dynamic capabilities is that of reconfiguring. While the first two aspects, that of sensing and seizing are associated with scanning opportunities and threats and exploiting these opportunities through new products and services, the reconfiguring aspect considers changes in organizational recourses. This next part delves deeper into the reconfiguring aspect of the organization and sheds light upon the microfoundations visible in it. By analyzing the interviews thoroughly, this research uncovered four distinctive themes. These four are talent acquisition and task restructuring, investing in new infrastructure, enabling an agile and collaborative mindset, and building a learning organization.

4.3.1 Talent acquisition and task restructuring

The first theme that arose from the interview transcripts is that of talent acquisition and task restructuring. Talent acquisition and task restructuring are linked to reconfiguring organizational recourses, as recruiting and task restructuring renew resources through employees. This next part will analyze the different microfoundations that are showcased in recruiting and task restructuring.

To orchestrate open innovation and specifically an innovation ecosystem, the organization took part in a routine for recruiting new resources. Interviewee 2 discusses that the case organization recruited around 70 new employees, or recourses, to enable open

innovation in the innovation ecosystem. Khan et al., (2020) study also recognize the task of recruiting as a microfoundation in dynamic capabilities. However, they argue it belongs in the seizing part, whilst in this study recruiting is a part of the reconfiguring part, as it is linked to resource base changes.

> *"Last year, for example, around 70 new resources were hired to take this forward alone. » (Interviewee 2)*

> *"Yes, new people have been recruited, yes, not many, but they have been recruited specifically for this, so that we can simply operate." (Interviewee 3)*

In addition to recruiting new resources who work on the innovation ecosystem, the case organization also recruited new employees in areas with little knowledge. This, for example, occurred when they recruited people for 3D printing.

The subsequent finding relates to task restructuring because when the organization decided to implement an open innovation paradigm for its ecosystem, it orchestrated a specific unit. The people's tasks were changed when they became a part of this unit, and their new task was to help product development with the shift towards the new work method, as Interviewee 1 describes. Thus, it can be argued that by changing the support staff's tasks they could help the product development team to utilize open innovation.

> *"Yeah, but there have also been changes in job roles to align with this […] Our task is to support product development in this rather new way of working." (Interviewee 1)*

In addition to recruiting new resources for operating the ecosystem and supporting product development through task restructuring, the case organization has recruited and utilized open innovation specialists to plan the open innovation principles for the case organization.

> *"There is such a starting level and around it there have been, let's say, such experts in their field on the innovation side of how this open open innovation of ours*

actually works and through that, more people have been hired for it." (Interveiwee 2).

4.3.2 Infrastructure and strategies for collaborative innovation

Additional resource reconfiguring occurred in the organization to facilitate open innovation and ecosystem orchestration. This is showcased in the underlying theme of new infrastructure investment and creating a playbook for co-creation. The case organization built new facilities where co-innovation and thus co-creation could take place. Interviewee 2 emphasizes that co-innovation relies also on the actual physical place where it can take place, and thus, the organization wanted to invest in new facilities.

"It has changed in the sense that, first of all, those spaces exist, and because it often depends on the physical space as well, where it can be found." (Interviewee 2).

Furthermore, the organization also showcases a new work method, as they wanted to create a public playbook, showcasing how the case organization orchestrates its business to potential partners, competitors, and ongoing partners. Additionally, this public playbook can be viewed as a new practice for partner management, as it provides the foundation for co-working with partners that the case organization values. While the creation of a public playbook was discussed in more detail in the seizing section, it is also emphasized here as this has an effect on the resources the organization can utilize.

Another finding that drives innovation in the organization is the work method of utilizing facilitators in innovation work. In the interview transcript, Interviewee 2 acknowledges the benefits of utilizing facilitators for innovation work, as they can help achieve better results. Furthermore, facilitators, as Interviewee 2 describes, allow them to get more out of people, even information that they did know they had.

"[…] can we find an innovation sprint facilitator? In that case, we have a few facilitators at the partner campus, who are then able to get the best result from this innovation team […] It hasn't happened before, so it's completely new, because it's a wonderful kind of psychology, that with a certain tool and methods, you can get

something out that he himself didn't know he was capable of producing." (Interviewee 2)

In conclusion, for open innovation and ecosystem work to be able to occur in the organization and between its partners, the case organization invested in new physical facilities. The case organization also stressed the new work methods of the public playbook it utilizes to lead its partners and the importance of facilitators who are valued in innovation work.

4.3.3 Enabling a collaborative and agile mindset

A theme that rose throughout the interviews was enabling an agile and collaborative mindset. This is not only in line with the previous findings of this study but also showcases a broader mindset change that took place for open innovation and collaboration to work.

A significant cognitive change that has occurred in the organization through its transformation process to implementing an open innovation paradigm is that of knowledge sharing. In the case organization, experts' work was before associated with being the owner of the information, and information was kept to the people themselves. However, through the transformation processes the underlying cognition of expert work changed. The new cognition emphasizes knowledge sharing by sharing and teaching others, as Interviewee 3 highlights. Furthermore, the aspect of communicating more is also stressed in the transformation.

"That is, the fact that I am an expert does not mean that I keep things to myself, but that I share and teach, that is, the thinking of the entire learning organization […] Let's share information and teach others and get involved. Let's communicate more, all these things are related to the open innovation way of thinking and visualizing and drawing things." (Interviewee 3).

Another finding associated with collaboration is the mindset push toward employees about the need for collaboration in the organization. Interviewee 2 illustrates that rarely

a single person is the one that provides novelty value in the field the organization is in, which emphasizes the need for collaboration. Furthermore, a mindset of collaboration between employees is encouraged in the organization because the environment in which the organization operated has become ever more complicated and collaboration is key for new solutions, as Interviewee 3 describes.

> *"It's rare for a single person to come up with something new, especially in this field." (Interviewee 2)*

> *"[…] that we should share and be present and see each other much more often either online or face to face and so on let's discuss them because this environment has become so complicated that we need to do things together much more than being able to solve those problems alone." (Interviewee 3).*

Another aspect of collaboration is that of cross-functional collaboration, which began when open innovation was implemented in the organization. Cross-functional collaboration, in this case organization, means that both account managers and research and development employees are involved in discussions with customers. This showcases a mindset that there is a benefit for cross-functional collaboration so that customer needs are better understood.

> *"[…] but to a greater extent R&D as an organization is also involved in customer discussions." (Interviewee 2).*

A cognition associated with the theme of an agile mindset in the organization is deviating from long-term plans to shorter-term plans and more agile planning. The case organization had a cognition towards making long and detailed preliminary investigations and plans before moving forward with innovations. However, as Interviewees 1 and 3 discuss, the case organization changed its approach to a shorter and more agile way of moving forward. This new cognition emphasizes starting with available information and moving forward as long as possible. This allows for skipping unnecessary work in plans.

> *"So, in a more exaggerated sense, yes, in the past, we conducted thorough and lengthy preliminary investigations, and there's nothing inherently wrong with that,*

but even if you conduct preliminary investigations, there will still inevitably be unknown unknowns." (Interviewee 1)

"Well, maybe, yeah, exactly what I described in a certain way, sometimes it might be worth just starting with the available information and seeing how far you can go and how quickly, and then realizing, "Oh, we don't need this, we need more." Instead of starting by examining every single detail and then coming to the table and saying, "Okay, what do we have here?" Because in that approach, it could be that you're doing partially unnecessary work or unnecessary work specifically for that particular matter. Or let's put it this way, it's something that, when done differently, wouldn't have needed to be done at all." (Interviewee 1)

"[…] perhaps the biggest change for us, I see it as the fact that we used to make really long developments." (Interviewee 3)

Adding to the previous finding, the case organization also emphasizes a more agile mindset about innovation through learning and allowing to fail. There is a dilemma in the case organization associated with innovation and failure. Interviewee 4 illustrates that to be able to innovate, there is a possibility for failure. Before failing could be associated with one's legacy, which means that the risk tolerance in innovating is low as people do not want to be associated with their failings. Thus, a cognition towards more risk tolerance and innovations is needed for innovation growth.

"To be honest, I think the best way to do it is to, kind of. There needs to be some level of leeway from the top. Meaning, you're not penalized for the failures, it's really more for the learnings. But do you have a clear action points based on those learnings? I think previously sometimes people have failed. But no one has really grasped on why. So I think that's with that legacy in mind, it comes to a little bit. Well, let's not do that again. We're gonna be losing a lot of money. Gonna have a lot of people leaving or to turn over and you know all these type of things and the negative sentiment kicks in as well. So it's kind of. We need to be um better at learning to fail fast. But not also kind of a. How do I say taking that with you as I see your legacy within the company sometimes that gets attached to you or your name. Although you know, I don't think anyone should be necessarily penalized for something that's going right if it was outside of their, you know, control, but. I think that comes with a little bit though going back to my initial point I was making the risk tolerance is quite low at the moment. And that's a bit challenging when you think about innovations." (Interviewee 4).

The last agile mindset enhancing attribute is the work method of conceptualizing ideas and gaining confirmation. This type of method works to build a concept that is then sold to different stakeholders. By doing this, the organization can understand if the conceptualization of the idea is valuable and necessary before starting to manufacture it. This showcases a more agile mindset, as rather than innovating and manufacturing and then seeing for demand for the solution, the case organization works to see if the idea has demand before manufacturing it.

> *"That it's definitely the same when also in that open innovation, that we make the idea, we look at the concept level and that's how we sell the concept before we start manufacturing, that if no one is interested in the concept, then stop it." (Interviewee 3)*

In summary, the case organization has changed its approach toward collaboration and agility throughout the implementation of open innovation. The case organization encourages collaboration between functions, as well as being able to tackle the evermore challenging environment. Furthermore, there is evidence that throughout the transformation process the organization has embarked on, the work of experts has changed. The main change in cognition is from upholding information to sharing and teaching others. In addition to collaboration, an agile mindset is also encouraged in the organization. This was showcased in how the organization utilizes shorter rather than long plans. Furthermore, it is also visible in conceptualizing ideas and seeking confirmation for demand rather than selling a finished solution and then reviewing demand.

4.3.4 Building a learning organization

The last finding of the reconfiguring section is associated with building an organization that learns and unlearns from previous knowledge. Building a learning organization is seen through learning from mistakes, benchmarking to others, continuous improvement mindset, and sensemaking of each ecosystem event.

Modifying the case organization's structure for open innovation is essential to reconfiguring and building a learning organization. Modifying organizational structures is associated with reconfiguring because it transforms structures and resources. On the other hand, modifying organizational structures for implementing open innovation is also associated with building a learning organization because, while the organization first built a centralized open innovation function, it did not provide results. Thus, the learning organization aspect is showcased as the organization modifies its structures for more tangible results.

> *"We're not trying to create a large centralized organization because it would be too costly to sustain and it would eventually collapse under its own weight…Yeah. This is something we had before, around 5 or 6 years ago, or maybe 7. There was this centralized open innovation organization that did really cool things. Amazing things that generated a lot of buzz and raised expectations. But in the end, there was no bottom line impact [...]"(Interviewee 1.)*

The other side of the coin, but an essential part of building a learning organization, is unlearning from previous knowledge. As the case organization in question evolved its capabilities from a closed innovation organization to an open innovation organization, it had different things to unlearn. Unlearning can be seen as a process. Two main points were brought up in the interviews that are closely linked to unlearning. The first point is that of unlearning from being silent and keeping all information inside the organization. This is shown by Interviewee 2, who emphasizes that it is in the employees' DNA and, thus, in their cognition that research and development is a secretive job. On the other hand, another essential part of unlearning in a broader aspect is moving away from owning all IPRs.

> *"[…]it's sometimes a bit challenging when you deviate from our DNA, that everything is IPR protected and such, and then you have to open that it's like a path in itself…People have it in their DNA that this is a secret job." (Interviewee 2)*

> *"[…] it's sometimes a bit challenging when you deviate from our DNA, that everything is IPR protected and such, and then you have to open that it's like a path in itself, […]" (Interviewee 2.)*

There has been a visible mindset change in the case organization after implementing the open innovation paradigm. After open innovation was first implemented into the organization, the organization created a centralized open innovation function that innovated. However, the case organization came to the realization after a while that while a radical approach to open innovation was valued and there were new ideas, the implementation and their impact took too long. After this realization, the case organization changed its mindset towards a more results-driven mindset. This new mindset emphasized tangibles and results regularly. Furthermore, both Interviewees 1 and 3 discuss how the organization is not a charity and that the organization is a profit-seeking company; thus, results are needed. Thus, there became a mindset in the organization that results are needed to justify the spent money.

> *"There was this centralized open innovation organization that did really cool things. Amazing things that generated a lot of buzz and raised expectations. But in the end, there was no bottom line impact. Or, well, there might be some impact someday, but let's just say that the time horizon is too long... After all, we're a profit-seeking company, like any legitimate business. So, the investments we make must yield results. If it's a general, overall good investment, then it should be smaller. If we're doing something bigger, there should already be visible returns. Otherwise, it becomes PowerPoint theater." (Interviewee 1).*

> *“We need to change everything. Radical, radical, radical. And then opened up tons of like experiment or innovation centers around the world. Hired a bunch of ex consultants. Bunch of kind of people in place related to innovation… we have spent so much money, time and resourcing in doing these changes, but realized it didn't yield anything quite spectacular. It was just like, yeah, we learned a lot, but we're not a charity. We don't spend hundreds of millions of dollars just to learn. So we just don't have the, the we're not Google, we're not Microsoft, you know, and most companies don't have the capacity to do that. So I think that comes with that mentality a little bit.” (Interviewee 4)*

In addition to moving towards a more results-driven mindset, the organization has also built a continuous improvement mindset. Interviewee 3 stresses that people have a positive attitude towards learning new things. Furthermore, a continuous improvement mindset is also demonstrated by Interviewee 3 when they discussed about small

innovations occurring every day. Another interesting finding of a continuously improving mindset is visible in the case organization's annual report. The organization utilizes coaching and mentoring to create a culture of openness.

> *"[…] we really have such a positive attitude towards everyone's new learning […] continuous improvement and it is really strong, that is, every day, in principle, small innovations should take place." (Interviewee 3)*

> *"In 2022, the focus was on the development of coaching and mentoring guidance, which promotes the development of a culture of openness that values growth and development, and which is also consciously invested in. Coaching and mentoring management brings many advantages to the organization." (Annual report of case organization, 2022)*

A noteworthy finding contributing to building a learning organization is benchmarking to others. Through each ecosystem event, the organization partakes in, it benchmarks its activities to others. This ongoing routine benchmarking can be seen as both a routine, as it occurs often, and a cognition, as this demonstrates a desire to develop.

> *"[…] that when you see how things are done elsewhere, it gives you a lot of food for thought and the ability to change, at least at the supervisor level. That if others are running like that and we're still in the starting blocks, it makes you think." (interviewee 3)*

This theme's last finding is closely associated with sensemaking, which can be seen as a routine in the organization. The organization makes sense of each ecosystem event in a way that they can improve their knowledge of ecosystem orchestration. Interviewee 3 places emphasis on decision-making culture and commitment. Decision-making culture, as discussed earlier, is different in an ecosystem environment, as it is more about win-win solutions and collective decision-making. On the other hand, commitment is another aspect that is valued in an ecosystem because the ecosystem partners are in an interconnected network with a shared common goal, and each partner's commitment influences the common goal. Thus, sensemaking in the case organization can be seen through learning from each ecosystem event.

"Yes, every ecosystem event like this teaches a lot about the decision-making culture and how we commit to those things and move forward together." (Interviewee 3)

4.4 Summary of the findings and revised framework

This part of the study summarizes the eleven discovered novelty value microfoundations within sensing, seizing, and reconfiguring of dynamic capabilities, and it also answers the research question of this study. As displayed in the figure below (see Figure 6), a revised framework, which was first introduced in the literature review, showcases the capability transition that has taken place. This framework interprets the transformation and evolving of capabilities, which are visible when the organization transitioned from a closed innovation paradigm towards an open innovation paradigm occurring in an innovation ecosystem. Furthermore, it showcases the dynamic capabilities.

One significant shift that has occurred in the case organization is specifically the cognition underlining the Intellectual Property Right (IPR) capability, where the case organization displayed a strong shift away from owning all IPR rights. The case organization has altered its mindset towards IPR ownership towards more of IPR orchestration capability. This new capability means that the case organization uses others' IPRs instead of owning all of them themselves. Thus, the new capability could be described as IPR portfolio orchestration capability. This mindset is strongly in line with previous findings of open innovation (e.g., Chesbrough, 2003b), where IPRs are not always owned, but rather used.

The second capability, innovation capability, has evolved to become an agile innovation capability. The case organization's innovation capability meant that they made extensive and detailed examinations before they began to innovate. Furthermore, they typically were slow to shoot down ideas as these examinations took a long time. Additionally, they failed slowly. However, through open innovation, the case organization was able to evolve the innovation capability into an agile innovation capability. This meant that rather than doing long and extensive preliminary examinations, they would instead start to move forward and stop when they had a problem. Additionally, through open

innovation, failing fast was encouraged as communication helped share information and determine if something works. Furthermore, the interviewees emphasized that open innovation had intersections with agility, especially innovation sprints and service design. This meant that rather than using waterfall projects, innovations sprints, linked to agile project management were used. Also, service design was emphasized to understand the customer gaps.

The case organization also altered its customer management capability into a customer engagement capability. This meant that rather than telling customers what they want and thinking that the case organization knows best, they wanted to shift their mindset into pursuing open dialogue with their customers. In addition, to open dialogue, one significant change in the case organizations work when transitioning from closed to more open innovation was the publication of a roadmap to showcase future possibilities of products. The idea behind the publication of a roadmap and updating it on a semi-annual basis is that if they share more information, then the customer might also share more information. Furthermore, this roadmap might help the customer realize what possible upgrades they could implement to tackle difficulties such as the green transition.

One significant change in capabilities is that the organization altered its supply chain management capability. This capability meant that they managed their buyer-supplier relationship. However, open innovation and specifically open innovation occurring in an innovation ecosystem meant that the organization had to alter its capabilities, and thus, a new capability, ecosystem orchestration capability, was made. This new capability meant that the organization started to seek win-win outcomes with ecosystem partners, as this is an essential part of ecosystem orchestration. Furthermore, this new capability included seeking new ecosystem partners to join the ecosystem. Lastly, this capability also meant that they had to share information and communicate more openly in the ecosystem.

The fourth capability that was altered was its expert work capability. This expert work capability meant that experts built their information but also kept this information to themselves. However, through a transformation process that occurred in the organization, one essential part of expert work changed, and the new mindset was that experts should share information by teaching others. Additionally, unlearning from older knowledge played a key role. These new altered things changed the capability from expert work to a learning organization capability.

Another change that occurred in the case organization was that information upholding became an information-sharing capability. In closed innovation, the organization had a strong mindset that nothing should be shared before non-disclosure agreements were signed by all parties so that secretive information would not be shared. However, signing NDAs could take a long time, and as this was the only way to move forward with innovations it resulted in a slow beginning of the actual innovation process. There was a mindset change through open innovation, which changed the approach to knowing what to share before NDAs are signed to start the innovation processes more quickly. This resulted in information sharing capability being created.

Venturing capability was completely new through open innovation; thus, it is not visible in the left column. Building a venturing capability meant that the case organization proactively sought for new ventures and technologies, but what was more open about this was publicly sharing what types of ventures and technologies the organization is seeking.

This is showcased as they have a distinctive internet page where they have gathered the different ventures and technologies they seek.

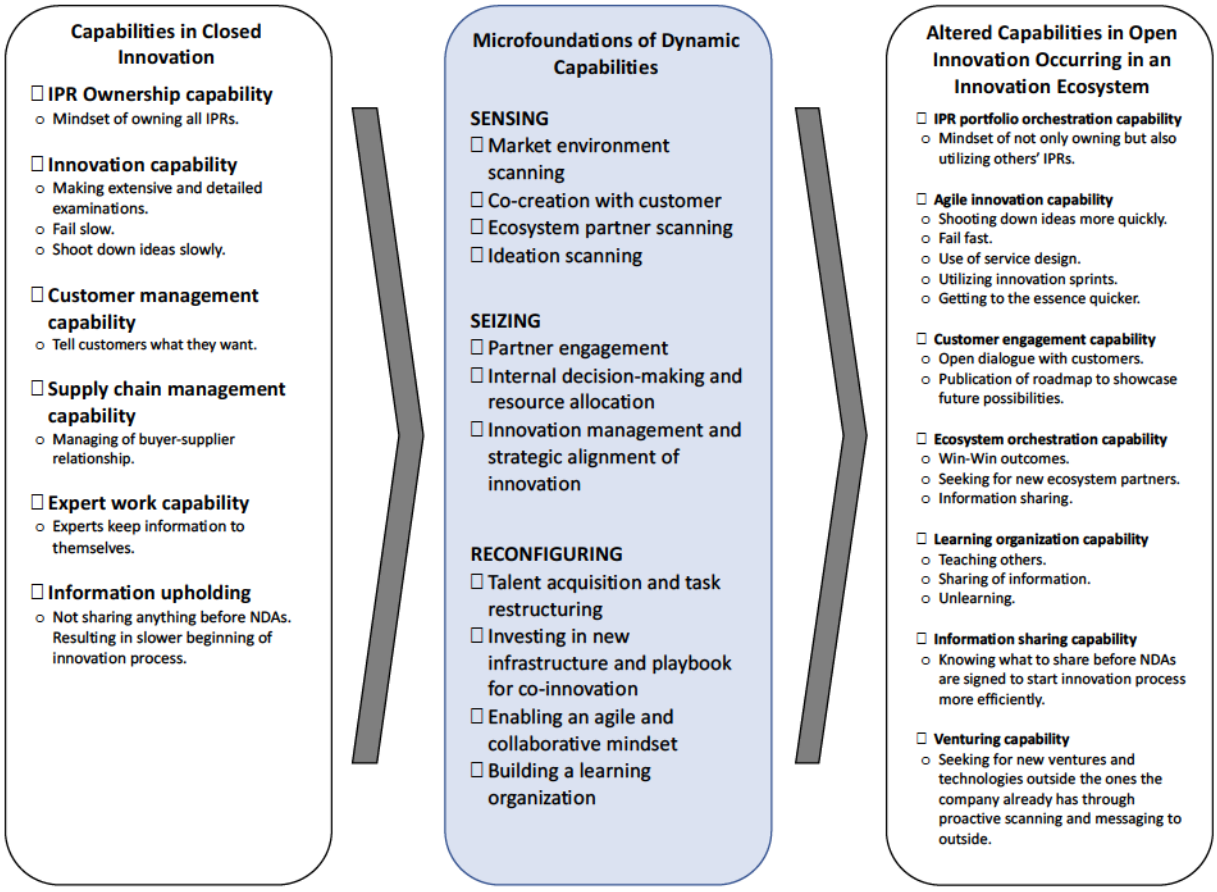


Figure 7. Revised framework.

5 Discussion

5.1 Theoretical implications

The purpose of this study was to scrutinize how a manufacturer's capabilities and managers' mindsets evolve when transitioning from closed innovation to orchestrating an open innovation ecosystem. In the 21st century, organizations have begun to opt for open innovation over closed innovation for numerous reasons (Chesbrough, 2003b). The shift towards open innovation has employed organizations to seek multiple approaches to open innovation, such as crowdsourcing, coopetition, and ecosystems (e.g., Adner, 2006; Adner, 2017). The ecosystem theory, explicitly innovation ecosystems, was considered in this study as the case organization orchestrates an innovation ecosystem. The term innovation ecosystem is complex as it has multiple meanings; however, by examining the theory, notions such as interconnection, co-creation of value, and interdependency arose. Ecosystems build on the idea that ecosystems can create more value than one single organization could create by themselves (Adner, 2006). Another interesting aspect of innovation ecosystems is their timing compared to another mainstream ecosystem term, business ecosystem. Innovation ecosystems come before business ecosystems as innovation ecosystems concentrate on innovation creation, while business ecosystems concentrate more on commercializing these innovations.

For organizations to produce innovations, they need to leverage their capabilities and renew their capabilities (Jantunen et al., 2012). Renewing capabilities can happen through the leveraging of dynamic capabilities (Danneels, 2011). Dynamic capabilities can be perceived through the triad of sensing, seizing, and reconfiguring (Teece et al., 1997). Dynamic capability theory and, specifically, Teece's division were considered in this study. The literature review of this study figures that the dynamic capability theory is complex and fragmented, with numerous different understandings of what dynamic capabilities are and what they are used for. One essential stream of research that has gained interest from scholars is the microfoundational study of dynamic capabilities (see Teece, 2007; Felin et al., 2012). Microfoundational study provides insights into the micro-

level of dynamic capabilities. This study also employed a microfoundational viewpoint into studying dynamic capabilities, as it provides novelty value insights into managers' mindset changes and how these affect the manufacturer's capabilities. Furthermore, this microfoundational approach was used to fill the gap presented by Helfat and Raubitschek (2018), who argue that there is a lack of knowledge about capabilities that are needed in orchestrating an ecosystem, as well as Linde et al. (2021), who argue that there still exists a gap in the dynamic capabilities and routines that are needed for innovation in an ecosystem.

While there is a small amount of empirical research on microfoundations in dynamic capabilities, only two empirical studies have studied microfoundations of dynamic capabilities in an ecosystem context (see Linde et al., 2021; Lütjen et al., 2019). In this study, numerous novelty value microfoundations for sensing, seizing, and reconfiguring became apparent, which contributes to microfoundational research of dynamic capabilities and specifically in the phenomenon of this study. Furthermore, the findings from this study builds onto earlier research as well as challenges it.

Market environment scanning is a theme that arose and resembles that of Teece's (2007) study. Market environment scanning included different roles that include the job of scanning, understanding regulation, utilizing business intelligence for scouting, and one finding that employs an ecosystem and open innovation perspective is using research vendors for scanning. Using research vendors for scanning means that other partners are listened to and their knowledge is utilized. The market environment scanning, specifically the finding of influencing EU projects, challenges Mousvavi and Bossink's (2017) study. Their institutional dialogue finding is associated with this study's finding as both are about influencing high-level decision-makers. However, they argue their finding to be a seizing activity, while this study sees it as more of a proactive sensing activity, as they try to influence EU-level projects already in their creation phase. Thus, it challenges that this type of influencing should be a sensing activity.

The second theme of sensing is co-creation with customers, which portrays open innovation, as open dialogue was used with customers. Furthermore, the publication of a roadmap mirrors a routine and a mindset toward sharing knowledge. The third theme, ecosystem partner scanning, contributes to sensing of ecosystem partners theory. This study differs from Linde et al.'s (2021) approach, where they seek partners to achieve the value proposition. This study found that partners are sought on a need-based approach, and a mindset towards understating what value-added specific partners could add was also valued. Another noteworthy finding was using an innovation metric for scanning new potential partners showcasing a routine. Lastly, ideation scanning, which was not seen in previous studies, is also a finding that encompasses open innovation and distinctive processes for seeking ideas and storing them. These findings provide novelty-valued contributions to the microfoundational perspective of dynamic capability theory, specifically in the context of an innovation ecosystem.

The second part, seizing, also encompasses numerous novelty value findings. This study builds on Schilke et al.'s (2018) argument that microfoundational research in dynamic capabilities can provide new insights into heuristic research by discussing decision-making in the ecosystem and internally. This study found that collective decision-making and making win-win decisions describe decision-making and heuristics in an ecosystem, thus broadening the perspective of previous heuristics and decision-making research. On the other hand, this study also found that internal decision-making heuristics and cognitions, which include a cognition towards thinking about how value-add can be either that an innovation works or that it can be shot down. Furthermore, internal decision-making heuristics are showcased in how the case organization makes decisions based on facts and distinct frameworks. These internal decision-making findings contribute specifically to the seizing part of dynamic capabilities and decision-making heuristic theory and build onto Sull and Eisenhardt's (2015) simple rules, as decisions should be made for value-add of ideas or shooting down ideas more quickly. Additionally, these findings strengthen Teece's (2007) study. This strengthens Teece's (2007) findings associated with internal

unbiased decision-making by providing practical processes, open discussion, and a clear ladder for the organization to utilize as a way to avoid unbiased decisions.

Moreover, partner engagement includes a finding that is strongly associated to Chesbrough's (2003b) open innovation concept. This finding concerns intellectual property rights and the mindset towards not owning all IPRs, but rather utilizing others' IPRs. Furthermore, the publication of a playbook for open innovation and ecosystem showcases the rules the case organization has and communicates these to the outside. The third theme that arose is innovation management and strategic alignment of innovation. Innovation management included a process for quarterly reviewing of projects and a mindset towards prioritizing must-win projects. On the other hand, open innovation is showcased in how the case organization utilizes different agile tools as open innovation. This finding contributes into strengthening and showcasing the bridge between the two theories.

The third part, reconfiguring, is related to renewing the organization's resources. The first finding is talent acquisition and task restructuring, which resembles a routine, in that new resources are hired, and roles are changed for orchestration to be possible in the ecosystem. Moreover, investments into new infrastructure were made in the case organization. This investment allowed the creation of a physical place for co-creation, which resembles the organizational restructuring finding made by Kahn et al. (2020) and the creation of new resources finding by Danneels (2010). This study's findings further build onto and challenge Danneels's (2010) study. This study argues that assessing external resources can happen in addition to alliances and acquisitions through ecosystem partners. Furthermore, Danneels's leveraging of customer understandings was also found in this case organization when the case organization evolved from having a mindset towards knowing what customers want to open dialogue with customers as a way to understand what customers want. On the other hand, this study questions Danneels's (2010) need for the release of resources as no people were released rather, new people were hired, and roles were altered.

Additionally, changing experts' mindsets toward information sharing and teaching resembles that of open innovation. Furthermore, the case organization wanted to build its organization to become a learning organization. This was seen, for example, in how organizational structures were renewed to implement open innovation. For open innovation to become beneficial, the organization changed its mindset towards a results-driven mindset.

This study's main theoretical contribution is the empirical framework presented in Figure 7. The empirical framework showcases how microfoundations aid the manufacturing organization in achieving dynamic capabilities when the organization transitions from close innovation to open innovation, which occurs in an innovation ecosystem. These microfoundations that are discussed above allow for the evolution of new capabilities. The organization's altered capabilities are IPR portfolio orchestration, agile innovation, customer engagement, ecosystem orchestration, learning organization, information sharing, and venturing capability. The IPR portfolio orchestration capability finding contributes to open innovation theory as this sort of not owning but utilizing mindset can be seen as a new capability. Additionally, the agile innovation capability that this study discovered is linked to open innovation, as it provides more agile tools that can be utilized for innovating. This finding contributes to strengthening the connection between agile innovation and open innovation. The ecosystem orchestration capability contributes to this topic of ecosystem management. On the other hand, this study builds on the decision-making aspect, specifically heuristics in ecosystems, as this study found that decisions should have a win-win outcome.

As argued in the research gap section, a significant gap exists between dynamic capability and innovation ecosystem theory. This study contributes to building the bridge between dynamic capability and innovation ecosystem literature as this study discusses how microfoundations aid the manufacturing organization in achieving dynamic capability when the organization transitions from a closed innovation process towards an open

innovation ecosystem. Additionally, employing a microfoundational perspective in this study contributes to the upcoming microfoundation way of thinking. This further provides insights into the managerial level instead of the firm level, which has been emphasized before (e.g., Teece, 2007).

5.2 Managerial implications

Organizations might consider choosing an open innovation paradigm instead of a closed one. Furthermore, this open innovation can occur in the innovation ecosystem it orchestrates. For open innovation in an innovation ecosystem to succeed, managers must change their mindsets, which allows the organization to evolve its capabilities. This study provides insights into the essential managers' mindset that has changed from a closed to an open innovation occurring in an innovation ecosystem.

One essential part of open innovation is associated with intellectual property rights. This study showcases that when implementing open innovation, managers have to be able to shift their mindset from owning all IPRs towards utilizing partners' IPRs. Furthermore, open innovation also provides managers with different agile tools they can use in innovation. One finding discusses how utilizing these tools can aid with innovation time.

Another critical aspect of open innovation is communication, specifically open communication. A mindset towards open communication will allow for broader value-add in the innovation process. It will allow not only to exchange ideas but also to shoot down ideas more quickly. The mindset towards open communication is moreover stressed in dialogue with customers. It is not enough to have a one-way dialogue with customers, which involves the organization telling them what they want. Rather, open dialogue is needed to exchange ideas and understand customer needs more broadly. Furthermore, publishing a roadmap for future solutions showcases a proactive stance towards open dialogue and understanding how to fulfill customer needs.

Moreover, managers should encourage experts to transition from upholding information to sharing and teaching others. This not only means that a new mindset should be learned but also means that the experts should unlearn previous knowledge. In addition to sharing information inside the organization, when an organization moves towards open innovation and innovation ecosystems, it must shift its mindset towards NDAs. As one of the interviewees emphasized, not sharing secretive information with others is in the DNA of many. This means no information is exchanged before NDAs are signed by all counterparts. However, information should be shared in open innovation, meaning managers should learn to communicate without an NDA.

Lastly, moving towards ecosystem management means moving away from traditional supply chain management. This change means that mindset must be changed also. The orchestrator must realize that decisions are made collectively with other ecosystem partners. Furthermore, a mindset toward win-win decisions must be learned, as each partner depends on each other in the ecosystem and strives for a common goal. Thus, without everyone winning in an ecosystem, there would be no partners. In conclusion, managers must alter their mindsets so that open innovation in an innovation ecosystem can succeed.

5.3 Limitations

This study employed a single-case study design, providing rich novelty value insights into managers' mindset and capability changes that occurred in the investigated case organization. However, the single-case study design is also this study's primary limitation. A single-case study's main limitation is associated with the generalization of findings. As this study employs a single-case design, the findings of this study cannot be generalized and applied in a broader setting. Furthermore, in this study, five employees of the organization were interviewed. While this provided a rich understanding of the evolving of managers' mindsets and the organization's capabilities, interviewing more employees throughout the organization and the ecosystem it orchestrates could have provided a broader perspective.

5.4 Suggestions for future research

Organizations are ever more seeking to implement an open innovation paradigm and orchestrate an ecosystem, there exist opportunities for future research. While this study considered a case organization and its ecosystem, which is in the evolving stage, it would be worthwhile to study an ecosystem that is in the mature phase. This could provide new perspectives and valuable insights if there are changes in managers' cognitions and capabilities when the ecosystem transitions from an evolving to a mature ecosystem. Moreover, this study studied one single case organization and its ecosystem. Studying a multiple case study can broaden the perspective, and studying different ecosystems could help in comparing differences in different organizations and their orchestrated ecosystems. This would provide information about whether there are different managers' mindset changes and capability changes that have occurred in the organization.

The case organization in this study is a stock-listed company. While this provides adequate insights into how mindsets and capabilities have evolved in the organization, studying or comparing a city's, non-profit's, or a family company's ecosystem to a stock-listed organization's ecosystem could also provide knowledge of the capabilities and managers' mindsets and how they differ. Lastly, this study's case organization orchestrated the ecosystem. However, future studies could analyze how a case organization that only contributes to an ecosystem needs to evolve its capabilities and managers' mindsets.

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Appendices

Appendix 1. Interview template (in English)

Before moving into the interview, I want to tell you that these interviews will be anonymized, however, it is worth noting that there is no NDA signed, so if there is anything that falls under that, I hope you do not bring it up.

Fill in after the interview:

Name: X

Duration of employment at the case organization: 0-3, 4-7, 8-11, 12-15, 15+

Age range: 20-29, 30-39, 40-49, 50-59, 60-65+

Role/Title:

Is it okay for you that I record this interview?

Introductory question:

1. What path did you take to get to your current position at the case organization? What are your areas of responsibility and how have your tasks changed in the company?

Since I am investigating how the case organization's capabilities have changed, I'd love to hear from you about how you did things before open innovation and how you do things today.

Sensing

2. What processes do you use nowadays to analyze changes in market segments, customer needs or opportunities that exist in the market?

   a. How has the case organization previously identified opportunities and threats in the market and how does the case organization do it nowadays when you make more use of more open innovation?
   b. How do you choose where to focus your market research?
   c. How often do you review changes in the business environment (e.g. competition, customers, network)? Are there different time spans in different units and how do you reconcile them?
   d. In practice, how do you make sure that you have a strong understanding of the customer and an understanding of the customer's needs?

3. How and where do you look for new partners in your ecosystem?
   a. How do you assess who will participate in the ecosystem?
   b. Can you estimate how big a share of new ideas comes from those participating in the ecosystem? Has this changed in the last 5-10 years?

4. Who have you involved before in identifying new opportunities, market research or forecasting the future? (e.g. customers, suppliers, consultants?) and what about nowadays?
   a. Do you use the knowledge of your partners and their abilities to analyze market developments? How much has their role changed in e.g. 10 years?
   b. How do you share information with each other through a process?

5. How have you looked at external innovations and developments in technology or science before and how now?
   a. Do all companies in the ecosystem examine external innovations and developments in technology or science that are important to them?

Seizing

6. How do you proceed when a new potential idea has been discovered, either through you or the ecosystem?
    a. How previously did you proceed when a new potential innovation was discovered?

7. Describe your decision-making process for a new idea/innovation?
    a. Who or who were involved in the decision-making process before and who now?
    b. Who makes the final decision on which innovations to invest in?
    c. Did you have and do you currently have a specific decision-making process?
    d. How do you make sure that this particular one is the best solution?

8. How did you previously avoid illusions or biases in decision-making and how do you try to avoid them nowadays?

9. How do you ensure that all employees and members of the ecosystem are committed to driving new innovation?
    a. How do you get an employee to drive the organization's new innovation?
    b. How do you get the ecosystem to focus on new innovations?

Reconfiguring

10. What new ability did you have to develop through open innovation? What have you had to give up or unlearn as a result of open innovation?

11. How do you promote open innovation in your organization and ecosystem?
    a. What are the key strategies and methods for promoting open innovation in the organization?

   b. How can external stakeholders be effectively involved and encouraged to participate in open innovation projects?

12. How do you keep your ecosystem up to date and how do you continuously get others to participate in this ecosystem?

13. As a result of the ecosystem, has decision-making been distributed to different organizations?
    a. Does the company with the most information make the decision?
    b. Does the case organization make all the final decisions?

14. What changes have you made to your resource base because you have moved to more open innovation and network-like innovation?
    a. Have people been dismissed or transferred to other positions?
    b. Have new people been recruited?
    c. Has the product development department been modified?

Other:

- Is there anything else you'd like to tell us that hasn't been covered yet?

Appendix 2. Secondary data.

Reports:
Annual report 2022
Annual report 2021
Annual report 2020
Annual report 2019
Annual report 2018
Annual report 2017
Annual report 2016
Annual report 2015
Annual report 2014
Annual report 2013
Capital Market Days 2021
Capital Market Days 2019
Capital Market Days 2018
Capital Market Days 2016

Other:
Playbook (Public)
Newsletter Article, 2023