

# **Micro-foundations of a collaborative sustainability-oriented innovation capability**

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## **ABSTRACT**

In their quest to advance the sustainability agenda, some firms pursue the development of sustainability-oriented innovations (SOI) in collaboration with both internal and external stakeholders. To be able to develop SOI, these firms must build up a specific collaborative SOI capability. The goal of our study is to understand, from a micro-foundational perspective, how this capability emerges. Based on a process-oriented multiple-case study analysis of two SOI projects in two large incumbent companies in the European manufacturing sector, we present a grounded model of how a collaborative SOI capability emerges. We identified four main interdependent micro-foundations: (1) interactions that trigger innovation projects, i.e., dialogues with downstream members of the supply chain and multi-stakeholder dialogues; (2) individuals' behavior and cognition, i.e., their mental models, behavior, and human and social capital; (3) interactions that lead to the alignment of resources, i.e., inter-firm dialogues that focus on joint innovation and collaboration, and intra-firm dialogues that integrate sustainability across the firm; and (4) structure, i.e. strategy and goal setting, resource allocation, and support of top management.

### **Keywords:**

Micro-foundations of Dynamic Capabilities; Multiple-case Study Analysis; Collaborative Sustainability Oriented Innovation; Inter-Firm Dialogue; Intra-Firm Dialogue

## INTRODUCTION

Currently we are observing a notable increase in dynamism within firms' external environments, triggered by the greater stakeholder demand of products and services with a reduced ecological and social footprint as well as regulatory and political frameworks requiring the disclosure and reduction of adverse effects of companies' operations on specific environmental areas (e.g., the European Taxonomy Directive). This is progressively driving incumbent firms in sectors considered to be particularly polluting – e.g., manufacturing, agriculture, construction and communications – to engage in sustainability-oriented innovation (SOI) to adapt their processes, products, services, and business models, with the aim of not only reducing their environmental impact but also defending their competitive advantage and even securing their existence (see, among others, Huang & Li, 2017; Inigo *et al.*, 2017; Demirel & Kesidou, 2019; Mousavi *et al.*, 2019; Bocken & Geradts, 2020; Ghobakhloo *et al.*, 2021; Santa-Maria *et al.*, 2021). Moreover, and as experience in developing these innovations grows, there is a growing common understanding among practitioners and scholars that effective SOI endeavors require intensive and extensive collaboration with internal and external stakeholders (Pedersen *et al.*, 2022; Stål *et al.*, 2022).

Developing successful collaborative SOI thus presents a managerial challenge and requires firms to build so-called Dynamic Capabilities (DCs) for Sustainability (DCsS). DCsS are among the most dominant theoretical explanations in studying “which capabilities are needed to face the complex and continuously mutating challenges stemming from the internalization of economic, environmental, and social issues as part of business strategy” (Buzzao & Rizzi, 2021, pp. 7–8). More specifically, Adams *et al.* (2016, p. 198), based on the original definition of a DC coined by Teece (2007), have defined an SOI capability as a specific DCsS, conceived “as the dynamic ability to adapt, integrate and reconfigure organizational skills, resources and

functional competencies to respond to contemporary sustainability challenges”. In addition, this ability should allow firms to develop joint innovations in collaboration with a range of internal and external stakeholders, thus constituting a collaborative SOI capability. Therefore, it is important to understand how such a capability emerges and how it can be intentionally developed by focal firms. Moreover, from a practical as well as an academic perspective, there is a great interest in better understanding the underlying mechanisms that enable firms to successfully engage in collaborative SOI and the organizational changes that accompany them (Adams *et al.*, 2016; Amui *et al.*, 2017; Watson *et al.*, 2018).

However, the DC approach has also been considered as inconclusive in a more practice-based sense by some authors (Easterby-Smith *et al.*, 2009; Grant & Verona, 2015; Wenzel *et al.*, 2021), especially as DCs are very often treated as an abstract framework and “less a product of observing the activities and functioning of organizations” (Peteraf & Tsoukas, 2017, p. 165). Hence, some scholars (Felin *et al.*, 2012; Salvato & Vassolo, 2018) have underlined the need to better understand the micro-foundations upon which these capabilities are built in order to be able to conclude how firms can intentionally build them. Micro-foundations of organizational capabilities include “constituent components (i.e., main effects) – individuals, processes, and structure; and interactions within and across components (i.e. interaction effects) – the interactions of individuals, processes, and structures that contribute to the aggregation and emergence” (Felin *et al.*, 2012, p. 1353) of these collective constructs. More specifically, it remains under-investigated how a firm’s collaborative SOI capability is influenced by the cognition, behaviors and interactions of individuals within and across different organizations (both in inter- and in intra-firm dialogues), as well as how this process is supported by a firm’s processes and structures (Adams *et al.*, 2016; Ringvold *et al.*, 2022).

Furthermore, as it has been pointed out by Salvato and Vassolo (2018, pp. 1729-1730), studies on DC are not yet able to adequately address how “the contribution of individual employees become[s] aggregated into a firm-level capacity for systematic asset renewal”. To be able to assess this contribution, these authors propose an element of interpersonal connections among employees within and across firms which they call “productive dialogues”. Following this line of thought, in our study we focus on observing “productive dialogues” as specific forms of interaction that occur during the ideation and implementation of an SOI and aim to decipher its role in making resources more dynamic and innovative.

The goal of our study is thus to understand how a collaborative SOI capability emerges from its constituent components, i.e., the micro-foundations of a DC. In this paper we intend to lay out how a collaborative SOI capability develops in two large incumbent companies in the European manufacturing sector, which are directly affected by political, regulatory, and market-oriented developments pushing for more environmental sustainability. To achieve this aim, two cases of SOI projects deployed in close collaboration with an external partner (joint innovations) are investigated in detail (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), using a process research approach to trace the sustainable innovation paths in the companies over time (Langley, 2007).

The anticipated contributions of this study are as follows. First, it extends the existing literature on micro-foundations for DCsS by investigating how specific forms of interaction, which we call productive dialogues, constitute elements of a capability leading to the ideation and implementation of collaborative SOI. Second, the study enhances our understanding of how different forms of productive dialogues with external and internal stakeholders (intra- and intra-firm dialogues) support the knowledge management required by collaborative SOI. Third,

this research aims to provide empirical evidence of the micro-foundations of a collaborative SOI capability in incumbent companies in the manufacturing sector.

## CONCEPTUAL BACKGROUND

### Dynamic Capabilities for Sustainability

DCs allow companies “to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, 2007, p. 516). They are defined as higher-order organizational capabilities, which serve to modify ordinary capabilities (Collis, 1994; Winter, 2003). According to Buzzao & Rizzi (2021), “the DCs['] view is applied by scholars in the field of sustainability to study which capabilities are needed to face the complex and continuously mutating challenges stemming from the internalization of economic, environmental, and social issues as part of business strategy” (Buzzao & Rizzi, 2021, pp. 7–8). The literature on specific “dynamic capabilities for sustainability” (DCsS), which include DCs leading to diverse sustainability-related outcomes of innovation (e.g., Chen & Chang, 2013; Dangelico, 2016) or those which seek to improve sustainable business practices (e.g., Kabongo & Boiral, 2017; Kähkönen *et al.*, 2018) is burgeoning, as shown by the publication of two comprehensive literature reviews by Amui *et al.* (2017) and Buzzao and Rizzi (2021) in the last five years.

For Singh *et al.* (2021, p. 4), DCsS constitute a firm’s “capacity to create purposefully, extend, or modify its resource base as per the needs of dynamic markets to bring about green innovation in products and processes to stay competitive”. According to Almeida *et al.* (2021), following Bezerra, Maria Clara Da Cunha *et al.* (2020), the term “collaborative capability for sustainability” denotes DCsS which enable a firm to cooperate with other companies and stakeholders to jointly address sustainability challenges. For Zollo *et al.* (2016, p. 232), DCsS are “stable and reliable patterns of behavior specialized in the adaptation of organizational traits

toward inclusive, sustainable, multi-stakeholder, enterprise models”. These conceptualizations define DCsS as the ability to include multiple stakeholders within the firm’s value-creation process.

Accordingly, DCsS are pertinent and relevant for companies pursuing strategic change to meet increasing sustainability-oriented demands, since they enable the recognition of potential opportunities and the identification of new configurations of ordinary capabilities best suited to exploit them, in close collaboration with a range of external and internal stakeholders (Teece, 2007; Silva *et al.*, 2021). Moreover, as Inigo *et al.* (2017) point out, these capabilities permit organizations to shape their market ecosystems and develop new practices and strategies that allow them to capture social and environmental value as well as economic returns by generating and implementing SOIs. SOIs involve “making intentional changes to an organization’s philosophy and values, as well as to its products, processes or practices to serve the specific purpose of creating and realizing social and environmental value in addition to economic returns” (Adams *et al.*, 2016, p. 181). They are also defined as “improved or rather new processes, products, organizational structures or systems innovations which successfully integrate the triad of environmental, social and economic issues in comparison to an existing or prior version” (Klewitz, 2017, p. 476, based on Fichter & Paech, 2003; Hansen *et al.*, 2009). A specific DCsS has been conceived in this regard, which defines an SOI capability “as the dynamic ability to adapt, integrate and reconfigure organizational skills, resources and functional competencies to respond to contemporary sustainability challenges” (Adams *et al.*, 2016, p. 198). In this paper, we aim to understand how a firm’s SOI capability to build joint innovations in collaboration with a range of internal and external stakeholders (i.e., a collaborative SOI capability) can be developed within focal firms.

However, as some authors have pointed out, the current DC approach used in the literature is not particularly useful for understanding how DCs emerge and how these can be intentionally developed (Easterby-Smith *et al.*, 2009; Grant & Verona, 2015; Peteraf & Tsoukas, 2017; Wenzel *et al.*, 2021), especially as it is most often applied as an abstract framework that is not clearly connected to practices and activities by members of an organization. Some scholars (Felin *et al.*, 2012; Salvato & Vassolo, 2018) have therefore underlined the need to better understand the micro-foundations upon which these capabilities are built.

### **Micro-foundations of DCsS**

In this paper, we adopt a micro-foundational view to analyze how a collaborative SOI capability, as a specific DCsS, emerges from the interplay of individual, processual and structural elements in a firm. We adopt the tripartite categorization developed by Felin *et al.* (2012), complemented by Ringvold *et al.* (2022), according to which the micro-foundations of routines and capabilities can be clustered into three core or overarching categories: (1) individuals with their different cognition, mental processes, and emotions, and their social capital and human capital, (2) the processes that shape interactions between individuals, and (3) the structure and design that enables or hinders individual and collective action within an organization. Moreover, the progress of firm-level constructs is strongly influenced by the individual him- or herself, the way the individual interacts and which processes the individual employs to interact, and the aggregation of the micro-foundations.

*The Individual.* Individuals have an influential role to play in determining organizational capabilities and therefore are regarded as a micro-foundation. Individuals' preferences', competencies, and mentality are all determining factors of their behavior within a firm and are as such significant to organizational constructs (Felin *et al.*, 2012). Individuals have diverse intentions, concerns, and principles that influence and guide their decisions. They

also add various characteristics of human capital (competences, expertise, proficiency, and intellectual capabilities) to a business. Differences in these characteristics may have an impact on the routines and abilities generated by organizational members and their relations. In the literature on DCsS, cognitive structures (e.g., mental models) such as attention, perception, and reasoning are used to explain differences in these capabilities (e.g., Gabler *et al.*, 2015; Bocken & Geradts, 2020; Velasco Vizcaíno *et al.*, 2021). Other authors (Fraj *et al.*, 2015; Demirel & Kesidou, 2019) argue that, to build DCsS and thereby integrate sustainability at the strategic and operational level, firms need managerial commitment and proactivity.

*Processes and Interactions.* “In the simplest sense, a process is a sequence of interdependent events” (Felin *et al.*, 2012, p. 1362). Interaction among individuals within an organization is crucial for the implementation of new processes, especially as their interactions can shed light on the dynamics of organizational capabilities and resources. Such exchanges between individuals, as well as processes within an organization can significantly impact its routines and capabilities.

To investigate inter-individual interactions as a micro-foundation, and to better account for the influence of different forms of employee behaviors and interaction on making resources more dynamic, we adopt the approach put forward by Salvato & Vassolo (2018). These authors state that, at the interpersonal level of the firm, the dynamics of organizational change are highly influenced by the quality of relationships and productive dialogues present in the firm and across firms. For this reason, we will look at interactions that are manifested in the form of productive dialogues. A dialogue is conceived as a two-way exchange or communication, and a “form of interpersonal behavior and verbal interaction” (Salvato & Vassolo, 2018, p. 1730). Following scholarship on cognitive science and knowledge creation in organizations (Garrod & Pickering, 2009; Tsoukas, 2009), a productive dialogue is defined as “a form of



joint action in social relationships, in which individuals endeavor to align their understanding of a situation to accomplish a common goal, regardless of whether they agree with every detail” of it (Salvato & Vassolo, 2018, p. 1739). Productive dialogue bridges the gap between individuals and teams as well as between teams and the organization, as it enables the development of shared consensus and facilitates the joining of efforts to attain long-term goals, despite the limitations of the decision-making processes and the uncertain dynamic environment of the organization. Organizations that foster an environment which encourages change and entrepreneurial behavior can reassure employees and prompt them to advance their change proposals (Salvato & Vassolo, 2018). Moreover, when it comes to the implementation of sustainability-related practices, several authors argue that these depend strongly on employees’ loyalty and positive attitudes toward concomitant changes in processes and routines (Cantrell *et al.*, 2015; Fraj *et al.*, 2015; Joshi & Dhar, 2020; Khan *et al.*, 2020; Singh *et al.*, 2021). In this regard, the role of productive dialogue and relational engagement is emphasized, when dealing with change proposals. This form of individual-level integration can contribute significantly to the development of an adequate and consistent firm-level capability for change, as the organization’s employees rely on productive dialogue and participation to foster positive interpersonal relationships.

Individuals interact and influence change processes. They do so within the organizational structure which can either enforce or diminish these change efforts. Therefore, the third relevant micro-foundation that is considered is structure.

*Structure.* Organizational structures set the conditions which both allow and restrict individual and collective action (Felin *et al.*, 2012, p. 1364). Structures also determine the context for organizational interactions. It is important to state that, although structures may restrict individual and collective action, they allow the effective diffusion of information within

and across firms and facilitate the transfer of information and knowledge. This crucial aspect of communication enables coordination and integration, which in turn can facilitate the development of DCsS (Dentoni *et al.*, 2016; Perez-Valls *et al.*, 2016; Shahzad *et al.*, 2020). Similarly, the routines and capabilities of an organization may be influenced by the decision-making structures enforced within the organization, e.g., via resource allocation manifested in the creation of autonomous structural units to develop SOI projects (Bocken & Geradts, 2020). Furthermore, when developing an organizational culture for sustainability, scholars emphasize the importance of setting sustainability goals, measuring them and embedding into the internal communication, e.g. via strategy and goal setting (see, for example, Glavas & Mish, 2015; Fraj *et al.*, 2015; Beske, 2012). Other authors also stress the role of top management, i.e. the structure and involvement of the board of directors, in the successful ideation and implementation of environmental sustainability endeavors (e.g., Villalba-Ríos *et al.*, 2022).

## **METHOD**

### **Research approach**

The main objective of this paper is to illustrate how a collaborative SOI capability emerges from the interplay of (a) the individual cognition and behaviors of members of the firm, (b) the interaction of individuals involved in organizational change processes, with a focus on “productive dialogues”, and (c) structure and design, as well as to extend the theory on micro-foundations for DCsS. To do so, we adopted a qualitative, abductive research method and, by drawing on replication logic (Yin, 2014), conducted a process-oriented multiple case-study. The multiple case-study design is chosen to explore how collaborative SOI capabilities emerge within real-life contexts from the perspective of insiders (Yin, 2014) or “knowledgeable agents” (Gioia *et al.*, 2013, p. 17), and to elaborate on theoretical relationships

between a set of two cases which are more likely to provide transferable results than in individual cases (Eisenhardt, 1989).

In a set of two cases, the unit of analysis are specific SOI projects deployed in close collaboration with an external partner (joint innovations). This approach allows DCs to be explored on different levels and complements existing research which is primarily focused on the organizational level (Schilke *et al.*, 2018).

In line with the aim of systematically and transparently exploring patterns across two cases that could potentially be transferred to other cases, the Gioia methodology is chosen for data coding and analysis (Gioia *et al.*, 2013). The design and implementation of the research approach was informed by the recommendations for case study research by Goffin *et al.* (2019).

### **Case study sample**

Our sample consists of two large, publicly listed incumbents operating in the manufacturing sector and based in Austria. We selected the cases through theoretical sampling (Eisenhardt, 1989) to focus “efforts on theoretically useful cases - i.e., those that replicate or extend theory by filling conceptual categories” (533) and to strengthen their internal validity (Goffin *et al.*, 2019). Accordingly, we only compared those cases that were predicted to share patterns related to their innovation activities or whose resources were made more dynamic and innovative. The comparability of the cases is based on the following criteria:

1. *Size and sector:* First, that both companies are incumbents with more than 500 employees and operate in the manufacturing sector. Due to their size and sector, which counts amongst the largest emitters of greenhouse gases, both companies now have to comply with the EU Taxonomy regulation, a classification system for sustainable activities which is part of an extensive package of policy initiatives that aims at driving

the European economy towards becoming climate neutral by 2050<sup>1</sup>, which was introduced in January 2022.<sup>2</sup> Being directly affected by the EU Taxonomy, the companies can be considered to operate in a dynamic environment.

2. *Sustainability-oriented innovation and collaboration*: Second, that both companies engage in developing and commercializing SOIs (Adams *et al.*, 2016) with a focus on circular technologies with economic as well as environmental value. To do so, they collaborate closely with other companies in their respective industries.
3. *Potential information richness*: Fourth, we compared those cases that allowed the collection of information on the development process and deployment of their SOI.

A maximum variation sampling as defined by Patton (2002) is also employed, since it can yield “high-quality, detailed descriptions of each case, which are useful for documenting uniqueness, and important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity” (235). Accordingly, the selected companies differ in terms of the types of products they manufacture and the driving factors of the innovation project chosen for in-depth investigation (Horbach *et al.*, 2012). In one example, Company A produces fibers for the textile industry. The main stimulus for the chosen project were internal R&D activities, classified as a technology push. Company B produces bricks and clay roof tiles. In this case, the chosen project was stimulated by business development activities classified as market pull. Table 1 gives an overview of both cases.

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<sup>1</sup> [https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities\\_en](https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)

<sup>2</sup> [https://finance.ec.europa.eu/system/files/2021-04/sustainable-finance-taxonomy-faq\\_en.pdf](https://finance.ec.europa.eu/system/files/2021-04/sustainable-finance-taxonomy-faq_en.pdf)

## **Data collection**

To strengthen their internal validity (Goffin *et al.*, 2019), both case studies are based on primary and secondary data (see Table 2), which was collected from June to November 2022 and includes semi-structured interviews as well as archival data.

### *Primary data collection through in-depth interviews with key informants*

The companies' projects were explored by means of semi-structured interviews with key informants including sustainability advisors, project leaders and business development managers. As an entry point, sustainability heads were interviewed since we assumed that they possess an in-depth knowledge on sustainability and innovation within the company as well as a general knowledge of related projects. Then, we followed a snowball system and targeted employees who had been involved in various projects and could give us insights into the different project phases. In company A we conducted five and in company B four in-depth interviews. The interviews lasted between 60 and 90 minutes on average, took place partly in-person and partly through online meetings, and were conducted by the research lead as well as one researcher.

The interview guidelines followed a process-based perspective and was divided into discussion of the initial phase of the project (idea generation), implementation of the project idea, and adaptation of resources for the further project development. Interviews were piloted with two experts in the field of corporate sustainability (Goffin *et al.*, 2019). In addition to the pilot, we continuously refined the questionnaire throughout the study based on feedback from the interviewees. After a narrative-inducing start, interviewees were asked to discuss the company's strategic approach and ability to innovate in terms of sustainability. Following up on this, the interviewees were asked to elaborate on the process of the investigated project with a focus on specific micro-foundations (individuals, interactions, and structure). They were

further questioned on changes which have already occurred due to the project and possible future trajectories. In line with Gioia *et al.* (2013), we considered interviewees as “knowledgeable agents” and asked them about their personal experiences and interpretations. The questionnaire served as a guide of the main themes and a memorandum for follow-up questions rather than a structured list. The interviews were recorded and transcribed verbatim. Further, the transcriptions were coded by the first and second author of the paper.

#### *Secondary data collection through archival-data research*

Data provided by the interviews was complemented and, if necessary, corrected with archival data including, e.g., annual company reports, public interviews, and press releases. For company A 59 sources were included, while for company B there were 268 sources used (see Table 2).

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Insert Table 2 about here  
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Archival data was collected through a systematic search in the database Factiva using eight search strings relevant for the research topic. All data was compiled and analyzed in the software Atlas.ti.

#### **Analytical strategy**

Data coding and analysis were guided by the interpretative methodology proposed by Gioia *et al.* (2013) and informed by the theoretical lens of micro-foundations of DCs (Felin *et al.*, 2012; Ringvold *et al.*, 2022), with a focus on (a) the individual cognition and behaviors of members of the firm, (b) the interaction of individuals involved in organizational change processes, especially relating to productive dialogues, and (c) structure and design. This

allowed us to systematically and transparently explore patterns across the two case companies that could potentially be transferred to other cases (Gioia *et al.*, 2013).

To begin with, the coding team conducted a within-in case analysis to become familiar with the data and assign tentative labels. This was followed by a cross-case analysis that aimed to explore patterns across the two cases. Guided by Gioia *et al.* (2013), we first coded raw data from the transcripts using the informants' terms and categorized them into first-order codes. After having discussed these descriptive first-order codes within the research team, we organized them into more theoretical second-order themes. Lastly, we distilled these more abstract second-order themes into overarching, aggregate dimensions. This final stage was guided by the existing literature on DCs for SOIs and focused on transferable patterns beyond our two cases. These aggregate dimensions represent the building blocks of our grounded model. The coding process was conducted in an iterative way through a continuous dialogue between the codes, the empirical data, and the relevant literature to ensure that the codes represented empirical data and were grounded in existing theory. Figure 1 shows the resulting data structure.

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## **FINDINGS**

In this section, we detail the findings of our inductive and interpretive multiple-case study, which analyzed the process of development of a collaborative SOI capability in two manufacturing incumbents as it emerged from the interplay between three distinct micro-foundations (individual, interactions in the form of dialogues, and structure). We begin our exposition with a brief description of each case before advancing to a cross-case analysis of the process of emergence of an SOI capability. In presenting these findings, we have

coordinated and integrated two data displays – Figure 1, which shows the progressive data structure, and Figure 2, which shows the emergent model – so that the reader can better follow our line of argument.

### **Company A: General description**

Company A is considered a leading organization in terms of sustainability practices within its industry. In line with its sustainability strategy, the company has developed innovative technologies with the aim of moving the whole textile industry towards circularity. To reach its ambitious sustainability targets, it has engaged in active dialogues with various stakeholders, started to closely collaborate with competitors, and driven an industry-wide coalition aiming at systemic change. Within the company, a committee whose members have a variety of functional backgrounds oversees the design and implementation of the sustainability strategy. This committee holds regular routine meetings with the board of directors, in which ideas are discussed and decisions are made. Lastly, the company continuously invests in developing new sustainability technologies and allocates a large share of its resources to this issue.

The innovation project under investigation aims to collaboratively develop processes and technologies for the industrial-scale recycling of post-consumer textile waste of blended fibers. The goal is to tackle the challenge of global textile waste and move the textile industry from a linear to a circular economy. What began life as a master's thesis is now a pioneer project orchestrated through strategic co-operation between two companies in the textile industry. The status of both companies as sustainability leaders in their industry made it



possible for them to build trust due to their successful pre-existing customer-supplier relationship.

### **Company B: General description**

Company B has positioned itself as an organization that strives towards becoming an industry leader in terms of sustainability practices. Having designed and implemented a well-defined sustainability strategy, the company is now continuously working on developing solutions to become climate-neutral and promote a circular economy. To do so, company B is engaging simultaneously in various types of dialogues. Internally, it aims at promoting sustainability as a material and top-priority topic and engage its internal workforce in developing solutions. Externally, it engages with end-customers to better address their requirements and has developed partnerships with other companies in the industry, created innovative products aligned with its vision and strategic approach, and sought to complement and advance its know-how. In terms of governance, a high-ranked manager oversees the design and implementation of the sustainability strategy and reports directly to the company's CEO.

Within the innovation project that was analyzed in this study, company B co-operates with a start-up to distribute low-CO<sub>2</sub> flat roof solutions which are made from plastic waste and can be recycled at the end of the life cycle. What started off with the start-up approaching company B as a potential selling and scaling partner for its innovation has now paved the way for other sustainability initiatives in company B. A top manager with a long tenure and extensive experience in developing the business within company B now oversees the partnership and ensures a good alignment between the companies. Since its beginnings, it has required the incumbent to venture into new market segments and implement crucial internal changes.

## **Cross-case analysis of the process of SOI capability emerging from micro-foundations**

As illustrated in Figure 2, we have identified four micro-foundations from which the collaborative SOI capability emerges: (1) interactions that trigger innovation projects, (2) individuals' behavior and cognition, (3) interactions that lead to the alignment of resources, and (4) structure. In the following section, we will outline how these micro-foundations come to the fore in the development of a SOI capability.

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### **Interactions that trigger innovation projects**

Both company A and company B are confronted with a high environmental dynamism caused by increased European regulations requiring the disclosure and reduction of ecologically harmful effects of their operations, as well as by increased demands on the part of external stakeholders to offer products and services with a reduced ecological footprint. This set of conditions creates potential opportunities (as well as several unwelcome challenges) (Salvato & Vassolo, 2018) that inspire a general – but still highly abstract – imperative for organizational change. More specifically, our emerging model shows that two specific types of dialogues define interactions that trigger a company's decision to engage in a specific SOI: (1) dialogues with downstream members of the supply chain, and (2) multi-stakeholder dialogues. In these dialogues, firm representatives – i.e., sustainability officers – will listen and pick up market and regulatory-related information that is relevant for their companies.

**Dialogues with downstream members of the supply chain.** Both companies were urged through active and direct communication from their immediate customers to comply with environmental requirements. More specifically, these requirements related among other things to a substantial reduction in carbon emissions of their production operations, which arose from

the strategic objective of reducing Scope 3 emissions and related regulations. Consequently, a very concrete material issue was fixed for both firms: “We have to show how we are reducing our footprint” (Company A, Senior Advisor Sustainability). The concretization of this issue led to its prioritization within the company. Additionally, through these dialogues, which did not necessarily take place in a formalized manner, the firms in our study obtained first-hand information on customers’ challenges regarding the new regulatory environment. This allowed them to better understand “what customers need”, leading them to come up with new ideas for new value propositions.

Both companies in our sample are positioned at the beginning of their respective value chains in their sectors. This means that their immediate customers will not be the end-customers. However, in both cases unique connections were created within the sector with (indirect) customers at the end of the value chain, leading to the elaboration of value propositions for these customers. This has proven to be essential in both cases, as the companies made sure that they could leverage market pull for their ideas, as suggestions for eco-innovations were provided directly from firms at the end of the value chain (e.g., brand retailers in the case of the textile company).

**Multi-stakeholder dialogues.** In addition to dialogues with downstream members of the supply chain, the companies in our study regularly engage in multi-stakeholder dialogues which provide them with opportunities to become directly involved in the development of industry-wide frameworks. Specifically, the companies exchange with regulators and industry members on regulations that will concern their own sector and operations, and they are present and active in self-regulatory platforms together with critical NGOs and competitors. These dialogues also allow for the development of a common value perspective, as disclosure requirements are elaborated together with a diverse number of stakeholders (including NGOs

and non-industry actors). During their conversations with external stakeholders concerning the materiality analysis, key sustainability topics are addressed and defined.

This information exchange is received, interpreted, and analyzed by certain individuals, leading to the identification of a specific SOI. These individuals, as we will describe in the following subsection, play a crucial role in creating relationships and further dialogues within and across organizations, generating the required knowledge to further develop these innovations.

### **Individuals' cognition and behavior**

Subsequently, the information exchange produced in these interactions with downstream members of the supply-chain and during multi-stakeholder dialogues is received by one or more individuals within the firm. Three dimensions (aggregate concepts) have been found to determine individuals' role in the later development of an SOI capability: (1) mental models that influence dialogue, (2) behavior towards dialogue, and (3) human and social capital prompting dialogue.

**Mental models that influence dialogue.** As Ringvold *et al.* (2022) point out, mental models refer to individuals' understanding of both specific incentives and the organization of knowledge in larger structures. Being defined by prior personal experience, these models “determine what information deserves attention and affect key cognitive processes, such as perception, information processing, problem-solving, learning, and judgment” (Ringvold *et al.*, 2022, pp. 4–5). In both companies, we have identified at least two key individuals who are guided by specific mental models that aim to stimulate and advance dialogues related to SOIs. In this regard, the mental models which adopted a positive personal stance towards sustainability proved to be a central driving force for both SOI projects investigated in the study. In one example, an individual saw the need to engage in developing a new technology

in response to customer demands for more sustainable products. In another example, which materialized in both companies, an individual considered developing an SOI and committing to sustainability as a “personal mission”.

However, informants in both companies expressed how mental models influencing employees of the company may also pose as a hinderance to dialogue in cases where individuals show resistance towards SOI, often being driven by a technical and conservative approach to innovation. This conservative attitude is shown by individuals’ preference to define rather unambitious objectives that are sure to be met, and by their risk-averse stance when the project rubs shoulders with a completely new market.

**Behavior towards dialogue.** In both cases, individuals were found to be proactive in initiating dialogue with external partners to engage in a collaboration project. This proactive attitude was concretized by their moving the necessary pieces within the company to get an initiative going, actively searching to find the right partners and opportunities to drive the project forward and maintaining a sense of urgency throughout. One of our informants expressed how alarming the situation felt for him by remarking, “If we are not changing, we will be the next Kodak” (Company B, Business Development Manager). In the same way that the once-market leader in analogue imaging had lost its market position by ignoring upcoming technological breakthroughs in digital photography, so this individual was afraid that his company would go out of business if they did not change the way that they approached sustainability. His proactive attitude and behavior towards dialogue helped to move the joint-innovation project forward.

Also, within this dimension, we observed that certain individuals displayed the necessary willingness to challenge rules in order to improve relationship building and dialogue within and outside the firm. In both cases, the projects began during the COVID-19 pandemic,

which prevented both teams from meeting in person and developing in-person social connections. Project leaders had previously considered that these social connections could only be built through personal face-to-face contacts, which they deemed to be fundamental. Thus, during the pandemic they found the courage to overcome formal obstacles (e.g., internal travelling policies) to allow personal meetings, manage accompanying high-risk situations, design contingency plans, and ensure that the dialogue continued between all parties. Additionally, individuals with a positive attitude towards dialogue maintained a high level of engagement and involvement in their teams, which they supported and accompanied along the way.

**Human and Social Capital prompting dialogue.** Some individuals' characteristics and experiences from their professional careers and social connections proved to be of great help in advancing the development of dialogues and relationships. On the one hand, in each project at least one individual with extensive experience in business development for sustainability was involved, whose task it had been to build up and introduce other SOIs in the company. These individuals supported the team by providing their experience in thinking and developing common opportunities together with stakeholders.

On the other hand, the tenure, expertise, and place of the individuals within their companies also influenced how connections and dialogues were initiated with key stakeholders, and consequently how projects were designed and implemented. In both companies, underlying intra- and inter-firm dialogues were supported by individuals with a long tenure in the company (an average of twenty years) and extensive experiences concerning sustainability within the company. This proved to be fundamental in helping to better promote, convince, and attain the buy-in of different stakeholders. Additionally, relevant technical expertise in the sector, as well as connections with relevant market players, helped the

individuals involved to engage in the necessary inter-firm dialogues for joint innovation and collaboration.

### **Interactions that lead to alignment of resources**

The individuals that were identified as crucial to the projects investigated, i.e., the respective project leaders and the sustainability officers, played a vital role in initiating the subsequent dialogues that would lead to essential knowledge management (acquisition, generation, and dissemination) both within and outside the focal firms for deploying the specific SOI projects. Specifically, the companies engaged in two types of dialogue which took place simultaneously. On the one hand, there were inter-firm dialogues for joint innovation and collaborations with external partner firms. On the other hand, there were intra-firm dialogues which integrated sustainability topics across each company and engaged internal stakeholders in the transformation process surrounding the SOI. Both inter-firm and intra-firm dialogues played a fundamental role in aligning the necessary resources for the development of the SOI project.

**Inter-firm dialogues for joint collaboration and innovation.** At the beginning of both projects, a considerable effort was made by the responsible individuals to establish dialogues and exchanges that allowed both teams to achieve alignment with the external partners of both joint-innovation projects by sharing common successes and developing a co-operative mindset. Initial trust built up from past co-operations was found to be key in supporting this process. Of great importance was the explicit acknowledgement of the contribution and retribution of each party in different phases of the project. Additionally, our informants described the importance of gaining inspiration from peers, providing, and receiving positive feedback and encouraging working experience with the external partner.

Furthermore, through these inter-firm dialogues the collaboration partners developed engagement processes. The exchanges were directed at allowing the team members to get a feeling for working together. In both cases, it was observed that a good contract is not of much help if the team members are not personally connected. Moreover, individuals who are responsible for the projects understood that, for a proper collaboration to work well, there needed to be an investment in the process integration.

Lastly, these dialogues helped to establish mindsets and systems for co-evolution. According to Eisenhardt & Martin (2000, p. 17) “coevolving involves the routines by which managers reconnect webs of collaborations among various parts of the firm to generate new and synergistic resource combinations among businesses”. These dialogues followed a knowledge development process in which the partner firms and team members had to learn to proactively exchange information and overcome a certain industry paranoia that prevented open exchange and communication among competitors. Additionally, firms had to learn not to over-impose their own processes and way of doing things and so “kill” the innovation power of the partner.

**Intra-firm dialogues aimed at cross-integrating sustainability.** Another type of dialogue which took place within the firm proved to be effective in the projects investigated for aligning resources. The responsible individuals acknowledged the necessity of engaging and informing all divisions of the company, as in every case the projects could not go on without specific contributions of different functions. Therefore, through these intra-firm dialogues, exchange on relevant sustainability topics was fostered by initiating conversations (directly and indirectly) with employees on specific trends that affect the company. In this way new products or value propositions were presented within the company. Additionally, through these dialogues, firms engaged employees across functions and divisions by creating cross-



functional teams to advance more complex topics, integrating knowledge from different areas, nominating internal ambassadors for sustainability, and designing training programs to increase sustainability literacy.

Finally, these dialogues served to help firms substantiate the customer value perspective of sustainability among all employees, leading them to consider sustainability improvements from a customer perspective also in their day-to-day operations.

## **Structure**

Individuals act and dialogues take place within a corporate structure which contextualizes and influences the actions and dialogues themselves. Structure is determined in how (1) resources are allocated, (2) how the strategy and goals of the firm are set, and (3) how top management supports the process.

**Resource Allocation.** In both companies, three structural elements show that a considerable volume of resources was given to supporting the achievement of sustainability objectives. To begin with, the responsibility for the sustainability strategy is assigned in both cases to a role and team. Specifically, a person (together with a team) oversees the definition and implementation of the sustainability targets of the company. This in turn highlights the relevance of the topic across employees from different departments and divisions. Additionally, for each project a new capacity which ensures oversight over the SOI-process has been created, showing that the human capital management of firms is responsive and flexible when it comes to facilitating the implementation of the sustainability strategy. In this sense, both firms have proven their ability to create ad hoc teams and install coordinating managerial roles (in concrete terms, a head of circularity initiatives and a liaison officer for the specific partnership) to best manage arising SOI opportunities. As a result of this, after engaging in a dialogue, identifying an opportunity, and designing the required strategy to deploy SOIs, companies relocate their

resources (including their human capital) to best implement the strategy and optimize their capacities. New teams and steering committees were thus created and individuals were assigned new roles that solely focus on the SOI project.

Regarding the development of knowledge capital, both firms have allocated capacities to ensure regular scanning of competition and the technological context. This is achieved, among other ways, through briefings on technological innovations elaborated by R&D experts as suggestions that contribute to the business development. The companies acknowledge that competition screening is a vital element within the SOI race.

**Strategy and Goal Setting.** Both firms in our sample define circularity as a pillar of their corporate sustainability strategy and include an articulated ESG strategy in their corporate annual report which all publicly listed companies are liable to produce. Additionally, measurable, and comparable KPIs define the companies' short and long-term sustainability targets. Moreover, concrete budget allocations and incentives support strategic objectives. Both innovation projects are clearly connected to a specific strategic objective: "This project hits all the strategy buttons" (Company B, Business Development Manager).

**Support from top-management.** Our informants in both companies admitted that, for the sustainability agenda to advance within their firms, top-management support has been crucial. On the one hand, the responsibility for sustainability needs to be anchored at top management level. In both companies, the sustainability officer is a member of the senior management (having the role of a Vice President). Additionally, a top-down approach was adopted as buy-in is sought from the highest managerial level, whenever project ideas are agreed to be implemented. On the other hand, top management was actively involved in decision-making on the design and implementation of the sustainability strategy. In the analyzed cases, the board of directors was routinely briefed about the progress towards the

achievement of sustainability targets. In both cases, the decision to engage in a collaborative project had to be concretely supported by the board, as this entailed an array of provisions regarding communication and IP-protection.

## DISCUSSION

The aim of our study was to understand how a firm's collaborative SOI capability, a specific DCsS defined as the ability "to adapt, integrate and reconfigure organizational skills, resources and functional competencies to respond to contemporary sustainability challenges" (Adams *et al.*, 2016, p. 198) in collaboration with internal and external stakeholders, emerges from distinct micro-foundations. Based on two in-depth case studies of product innovation projects in two large incumbent companies in the European manufacturing sector, which were directly affected by political and regulatory developments driving environmental sustainability, we identified four main micro-foundations that are interdependent and from which this SOI capability emerges (Figure 2): (1) interactions that trigger innovation projects, i.e., dialogues with downstream members of the supply chain and multi-stakeholder dialogues; (2) individuals' behavior and cognition, i.e., their mental models, behavior, and human and social capital; (3) interactions that lead to the alignment of resources, i.e., inter-firm dialogues for joint innovation and collaboration, and intra-firm dialogues which integrate sustainability across the firm; and (4) structure, i.e. strategy and goal setting, resource allocation, and support of top management. We have shown in our findings how the process of developing this capability unfolded from the interaction of these micro-foundations.

Our study contributes to the micro-foundational perspective of DCs in a twofold manner. First, we describe how specific forms of interaction, which we call "productive dialogues" (following Salvato & Vassolo, 2018), are constitutive elements of a capability leading to the ideation and implementation of collaborative SOIs. Productive dialogues are the

way that employees within and across organizations “develop the shared consensus and commitment required to achieve ambitious, long-term goals within highly dynamic environments and contested decision-making processes” (Salvato & Vassolo, 2018, p. 1739). Our process research approach allowed us to identify two specific phases in the development of a collaborative SOI, in which productive dialogues play a fundamental role. In an initial phase, two types of dialogues define interactions that trigger a company’s decision to engage in a specific SOI. These are 1) the dialogues with downstream members of the supply chain, and 2) multi-stakeholder dialogues. During these dialogues, firm representatives – i.e., the sustainability officers – will listen to relevant external stakeholders and acquire market- and regulatory-related information that is of relevance to their companies. This information will be received, interpreted, and analyzed by certain individuals in the focal firms, who will play an instrumental role in identifying the required SOI projects. These individuals, acting under the influence of their mental models, human and social capital, as well as behavioral patterns, will thereby become initiators and promoters of relationships and further dialogues within their own companies and across organizations (e.g., with their external partners), in order to acquire, generate and disseminate the necessary knowledge to deploy the specific SOI projects.

In a subsequent phase, productive dialogues are initiated by sustainability officers and project leaders which lead to the necessary alignment of internal and external resources, a fundamental prerequisite that allows a focal company to generate and implement the SOI. In this phase of the process, we have identified two types of dialogues that take place simultaneously: 1) inter-firm dialogues on joint-collaboration and innovation, and 2) intra-firm dialogues which cross-integrate sustainability within the focal company. The first type of dialogues describes conversations directed at achieving alignment between the external collaboration partners, developing engagement processes, and establishing mindsets and

systems for co-evolution. The first two of these categories coincide with Watson *et al.* (2018)'s discussion of the fundamental organization capabilities that enable stakeholder engagement in environmental innovations. The second type of dialogues are directed at fostering exchange on relevant sustainability topics among internal stakeholders, engaging employees across different functions and divisions in joint projects, and substantiating the customer value perspective of sustainability to allow employees to understand how they can contribute to achieving sustainability goals in their day-to-day operations. In summary, our model suggests that four different types of productive dialogues between a focal firm and both internal and external stakeholders are instrumental in the process of making resources more dynamic and leading to the development of a collaborative SOI capability.

As a second contribution to the micro-foundational perspective of DCs, our study underlines the importance of conducting inter- and intra-firm dialogues simultaneously during the phase of resource alignment in order to support the knowledge management required by collaborative SOIs. This result stands in line with the study by Goodman *et al.* (2017), who note that the complexities faced when developing and implementing SOI initiatives often stem from deficiencies in internal knowledge pertaining to the technological and social aspects of organizational sustainability, which can deter the quality of the internal decisions made in this regard. Therefore, engaging multiple internal and external stakeholders through productive dialogues can mitigate the knowledge gaps and provide the organization with access to the needs, know-how, and expectations of various stakeholder groups, which in turn nurtures trust-based exchanges and enhances the organization's internal capability to develop and implement SOIs. Furthermore, stakeholder engagement in sustainability-based activities can be mutually beneficial for the organization and external parties by increasing the knowledge of all parties (Herremans *et al.*, 2016).

Our study also contributes to the growing literature on the role of joint or collaborative SOI projects for effectively addressing sustainability challenges (see, among others, Acebo *et al.*, 2021; Beske, 2012; Dentoni *et al.*, 2016; Inigo *et al.*, 2017; Watson *et al.*, 2018; Almeida *et al.*, 2021). In our multiple-case study, both incumbent firms recur to joint-innovation projects, driven by regulations and pressures from external stakeholders to integrate environmental and social sustainability into their strategy and operations. The acknowledgement that these new environmental conditions make collaboration efforts for innovation necessary to maintain and even enhance a company's competitive advantage was made in many instances during the interviews. Even companies that can be considered market leaders in their sectors know that the required technologies to improve resource efficiency, reduce their carbon footprint and produce an overall improvement of their ecological footprint, cannot be developed by a company on their own. In this regard, Blok *et al.* (2015) contend that stakeholder engagement in sustainability initiatives and responsible innovation can greatly increase an organization's integrative capability as well as its ability to retain and exploit internal knowledge. Scuotto *et al.* (2020) show that organizations can complement their own internal resources by utilizing the tools of connected actors and partners, thereby improving the effectiveness of their own endeavors. Through a qualitative exploratory research on sixteen organizations operating in the minerals industry in Norway, Ghassim & Foss (2021) found that SOI is largely fueled by stakeholder engagement as focal firms resort to stakeholders in order to gain access to the necessary social, market and technological knowledge for the success of the innovation process. Del Giudice *et al.* (2019) stress that stakeholder-related capabilities may even act as a precondition, and not simply a driver, of organizational innovation within an increasingly dynamic and uncertain business environment.

## Research limitations and future research

The present study has some limitations that at the same time encourage the development of relevant further research. First, our study has relied mostly on retrospective data, which could undermine the comprehensiveness and accuracy of the case descriptions. To limit the bias of retrospectivity, we adopted a triangulation approach by collecting interview and archival data simultaneously. However, real-time longitudinal studies which seek to investigate the dynamics of SOI capability development as they unfold would help to further enhance our understanding of this process. Second, the relatively small sample size, whilst allowing for an in depth-analysis of two cases, could be seen to limit the scope of our conclusions. Through our careful sampling procedure, we ensured the transferability of our proposed model to companies with similar make-ups and structural characteristics. Nevertheless, incorporating more cases from companies of a like-minded nature could serve to enhance the analytical validity of the model.

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## APPENDIX

### TABLE 1

#### Description of case companies

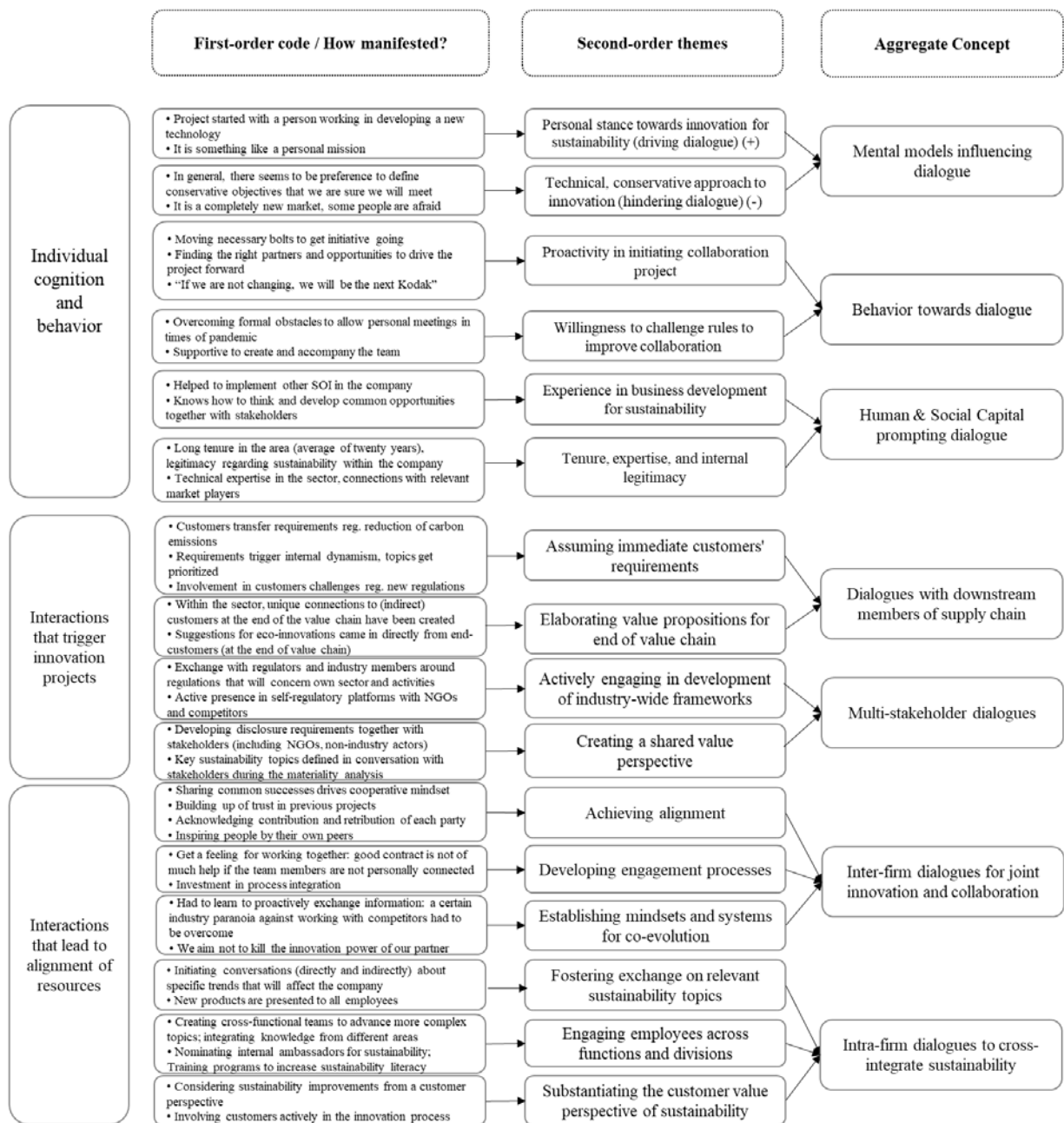
Case	Employees	Revenue in 2021	Brief description of the company and the investigated innovation project
A	~8,000	EUR 2,000 Mio.	Company A is a manufacturer of wood-based fibers and produces plastic polymer products. Incorporated more than 100 years ago, the company is based in Austria and operates internationally across Europe, America and Asia. The innovation project aims to collaboratively develop processes and technologies for the industrial-scale recycling of post-consumer textile waste of blended fibers. The goal is to tackle the challenge of global textile waste and promote a circular economy in the textile industry.
B	~17,000	EUR 4,000 Mio.	Company B is an internationally active producer of building materials such as bricks, clay roof tiles, pipe systems and concrete pavers. It was incorporated more than 150 years ago and is based in Austria. Within the innovation project, company B cooperated with a start-up and has distributed a set of low-CO2 flat roof solutions which are made from waste and can be recycled at the end of their life cycle.

### TABLE 2

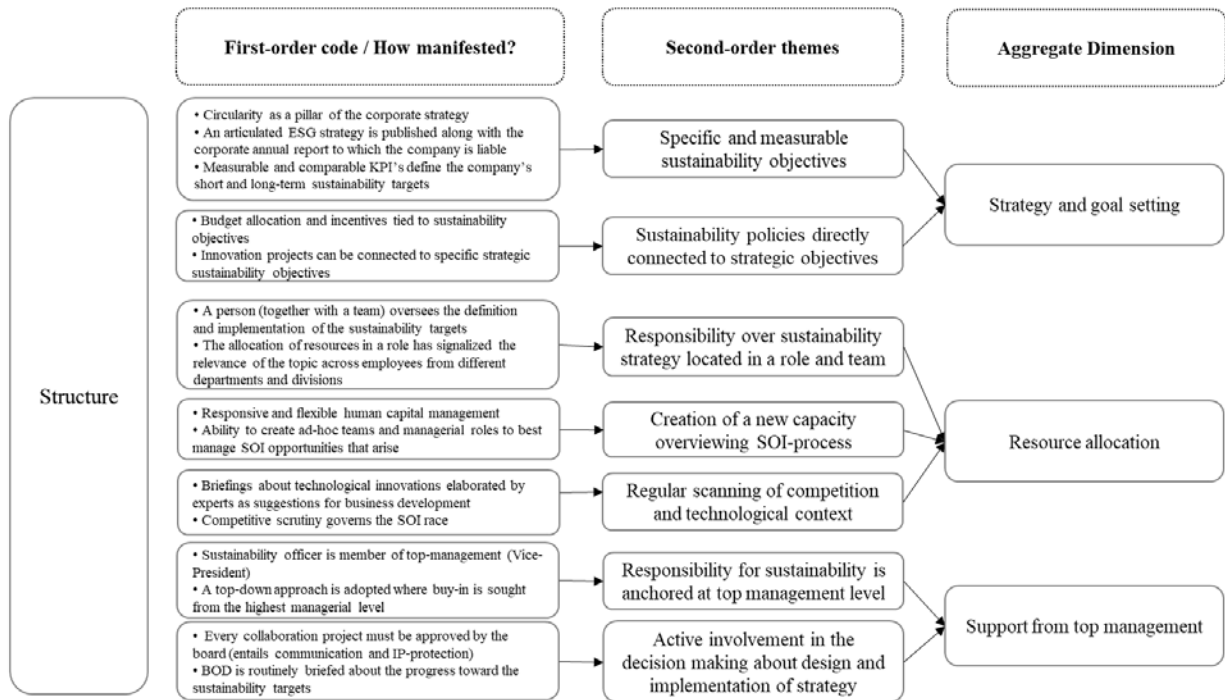
#### Description of data sources

	Primary data		Secondary data
Case	Interviews	Positions interviewed	Archival data (number of files)
<b>A</b>	5 (in total 390 minutes)	Senior Advisor Sustainability; Head of Circular Economy Initiative; VPs Global R&D and Performance, Improvement & Technology; Business Development and Project Manager	Press releases (21), journal and news articles (30), presentation minutes (2), public interviews (4), company annual reports (2)
<b>B</b>	4 (in total 280 minutes)	Senior Vice President, Sustainability & Innovation; Business Development Manager; International Product Manager; Head of International Product Management	Press releases (12), journal and news articles (190), presentation minutes (27), public interviews (4), company annual reports (35)

**FIGURE 1**  
**Data Structure (Part 1)**



## Data Structure (Part 2)



**FIGURE 2**

**Process of collaborative SOI capability emerging from micro-foundations**

