

RESEARCH ARTICLE

How do incumbent firms innovate their business models for the circular economy? Identifying micro-foundations of dynamic capabilities

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Abstract

The circular economy is promoted as a contributor to sustainable development; however, the process of circular business model innovation remains under-explored to date, hindering its implementation. Dynamic capabilities research provides a theoretical perspective to explore how incumbent firms can innovate in rapidly changing environments. An abductive qualitative research is done through an exploratory multiple case study on 10 incumbents that implemented a circular business model innovation. We identify 26 practices, aggregated in 12 micro-foundations of the dynamic capabilities of sensing, seizing, and reconfiguring. By integrating the few empirical studies characterizing dynamic capabilities for sustainability-oriented business model innovation, we offer a comprehensive framework of 33 practices. This study proposes that the most relevant practices for circular business model innovation processes are adopting a lifecycle perspective, employing sustainability-oriented instruments, ideating sustainable value propositions, developing a sustainability strategy and culture, and engaging and coordinating stakeholders in the business ecosystem. We also suggest seven particularly relevant practices for long-term business model transformations (e.g., top management commitment), four for innovations focused on short and medium loops of the circular economy (e.g., early customer engagement), and four for long loops (e.g., business ecosystem coordination). This study corroborates and expands recent research on dynamic capabilities for sustainability-oriented innovation and provides practitioners with a set of 33 skills, processes, procedures, and activities to be prioritized to successfully innovate their business models for the circular economy.

KEYWORDS

best practices, business model innovation, case study, circular economy, dynamic capabilities, micro-foundations, sustainable business model, sustainable development

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1 | INTRODUCTION

Today's business environment is turbulent and in constant change. Technological disruptions of the last 20 years have stimulated a speed and scale of change never seen before, which coupled with megatrends of globalization, environmental concerns, changing demographics and urbanization, are bringing increasing uncertainty to the marketplace (Aagaard & Nielsen, 2021; Lee & Trimi, 2021). Moreover, the recent COVID-19 pandemic is disrupting the markets (Khan, Khan, & Shafiq, 2021; Sarkodie & Owusu, 2020), accelerating the need of companies to adapt and innovate their business models to stay competitive or—in some cases—to survive the crisis (Breier et al., 2021; Ritter & Pedersen, 2020; Seetharaman, 2020). Business model innovation (BMI) is perhaps more than ever a key source of competitive advantage (Mitchell & Coles, 2003; Verma & Bashir, 2017). However, BMI is a complex endeavor for incumbents, as firms need to challenge their existing business architecture, develop new offerings, adapt their value chain structure, establish new revenue models and modify their resource base (Chesbrough, 2010; Koen et al., 2011). Therefore, BMI requires firms to develop a specific set of organizational capabilities. Innovation literature has explored, for instance, the role of organizational learning (Berends et al., 2016; Sosna et al., 2010), absorptive capacity (Miroshnychenko et al., 2021), and relational capabilities (Melander, 2018). However, in recent years, *dynamic capabilities* (DC) theory has been notoriously applied to study the organizational capabilities that firms apply to identify, develop, and implement new business models, particularly in uncertain, volatile and complex environments such as the current one (Mezger, 2014; Schilke et al., 2018; Schoemaker et al., 2018). Literature suggests that the strength of a firm's DC shapes its proficiency at BMI (Teece, 2018), understanding DC as a “firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997, p. 516).

The circular economy (CE) has been endorsed as an effective contributor to long-term sustainable development (Geissdoerfer et al., 2017; Schroeder et al., 2019), as it offers guiding principles to decouple resource consumption and environmental impacts from economic growth, through the retention of value in products and materials for as long as possible (Ellen MacArthur Foundation, 2014; Ghisellini et al., 2016). Furthermore, it has been recently promoted as a viable and necessary strategy for a post-COVID green recovery—to “build back better”—where the development of circular business models (CBMs) plays a key role (Ibn-Mohammed et al., 2021; United Nations Environment Programme [UNEP], 2020; Wuyts et al., 2020). Even though there has been broad interest in the CE in recent years, the business community has been slow in adopting its principles (Bocken et al., 2017; Laukkanen & Patala, 2014; Organisation for Economic Co-operation and Development [OECD], 2019). This might be due to the inherent complexities in innovating business models towards the CE or sustainability (Bocken et al., 2019; Guldman & Huulgaard, 2019), though also due to the lack of understanding—and lack of guidelines—on the process of circular business model innovation (CBMI), particularly for

incumbent firms, and, as the majority of the literature is theoretical, further empirical insights are required (Frishammar & Parida, 2018; Guldman & Huulgaard, 2019; Santa-Maria et al., 2021; Urbinati et al., 2017; Zollo et al., 2013).

In consideration of the challenges of CBMI, and the explanatory potential of the DC perspective, this research sets out to understand *how the CBMI phenomena happens, by empirically exploring what are the micro-foundations of the dynamic capabilities (MofDC) required to successfully innovate the business model towards the CE in incumbent firms*. The MofDC are “the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines which undergird enterprise-level sensing, seizing, and reconfiguring capacities” (Teece, 2007, p. 1319). MofDC often exhibit commonalities across firms, or what can be popularly termed as *best practices* (Eisenhardt & Martin, 2000), thus, in simpler terms, what we set out to do is to identify best practices for CBMI in incumbent firms, and in doing so, better understand how established firms innovate their business models for the CE.

We employ an explorative multiple case study (Eisenhardt, 1989; Yin, 2014) on 10 incumbent firms that have successfully implemented a CBMI to gather insights into what processes and activities firms and managers perform. Relevant is to mention that by data collection dates the COVID-19 pandemic had not fully unraveled, thus we did not directly look for capabilities to recover from the COVID-19 recession, but rather explored how did incumbent firms successfully implemented a CBMI process, an aspect that is today's relevant for the post-COVID recovery.

By employing a DC perspective, we do not only adopt a suitable approach to explore and describe *how* the BMI phenomenon is unraveled (Mezger, 2014), but we also answer calls for further research on DC for the CE (Prieto-Sandoval et al., 2019) and DC for corporate sustainability (Amui et al., 2017). We will also build on and complement recent, though still limited, empirical studies in the intersection of DC and CE (Kabongo & Boiral, 2017; Khan et al., 2020a, 2020b; Khan, Daddi, & Iraldo, 2021), research on DC for sustainable BMI (Best et al., 2021; Bocken & Geradts, 2020; De Silva et al., 2021; Inigo et al., 2017; Mousavi et al., 2019), and DC for service-innovation (Kindström et al., 2013).

After this introduction, key concepts regarding CBMI and DC are presented in a concise literature review section. Later, the methods of the multiple case study and abductive analytical process are exposed, followed by Section 4, where we present 26 best practices for CBMI underpinning 12 MofDC. This section also describes the findings of a complementary cross-case analysis, including a proposal of the most relevant practices and a distinction of those particularly significant for short-loop innovations, long-loop innovations, and long-term transformations. In Section 5, selected literature on DC is contrasted and integrated with our results, offering a comprehensive MofDC framework containing 33 practices, before suggesting a distinction between sustainability-oriented MofDC and conventional ones. To finalize, limitations are acknowledged, future research recommendations are provided, and concluding remarks are provided.

2 | CONCEPTUAL BACKGROUND

The present study lays in the intersection of the emergent field of BMI for the CE—or CBMI—(Santa-Maria et al., 2021) and the increasingly adopted theoretical lens of DC (Schilke et al., 2018; Teece et al., 1997), both of which are briefly presented in this section. DC are one of the most researched topics in the intersection of innovation and the CE (Sehnm et al., 2021), though its exploration at the CBMI level has only recently begun (Bocken & Geradts, 2020).

2.1 | Circular business model innovation

A business model (BM) is a construct that synthesizes what a firm does and for whom (value proposition), how it does it (value creation and delivery system), and why it does it (value capture) (Osterwalder & Pigneur, 2010; Richardson, 2005; Teece, 2010). Relatedly, BMI refers to “designed, novel, and nontrivial changes to the key elements of a firm's BM and/or the architecture linking these elements” (Foss & Saebi, 2016, p. 17). A BMI describes a process of creating an entirely new BM as a start-up, the transformation of a current BM into another, a BM diversification—where the current model stays in place and an additional one is created—or a BM acquisition—where an additional BM is identified and integrated (Geissdoerfer et al., 2020; Geissdoerfer, Vladimirova, et al., 2018). CBMs can be defined as “sustainable business models (SBM)—which are BMs that aim at solutions for sustainable development by creating additional monetary and nonmonetary value by the pro-active management of multiple stakeholders and incorporate a long-term perspective—that are specifically aiming at solutions for the CE [i.e., closing, narrowing, slowing, intensifying, and dematerializing resource loops] through a circular value chain and stakeholder incentive alignment” (Geissdoerfer, Morioka, et al., 2018, p. 713). The conceptualization and implementation of SBMs is understood as the process of sustainable business model innovation (SBMI), and the process of CBMI is a specific type of SBMI (Guldmann & Huulgaard, 2019). Moreover, the CBMI process can be understood as “innovating the BM (i.e., updating the elements of an existing business model, or establishing a new organization and associated business model) to embed, implement, and capitalize on CE practices” (Bocken et al., 2019, p. 3).

Acknowledging there are several classifications of CBM types (Lüdeke-Freund et al., 2019; Rosa et al., 2019), the typology by Lacy et al. (2014, 2015) has been selected for being simple, yet comprehensive, and because it has been cited in several practitioner-oriented publications of wide reach (e.g., OECD, 2019; Sitra, TI Finland, & Accenture, 2018), thus providing a typology easy to communicate to interviewees. It distinguishes between circular supplies, product-as-a-service, product life extension, resource recovery, and sharing platforms. CBM cases can be also characterized according to the *R* value retention strategies (Reike et al., 2018) they implement, differentiating between short loops of refuse (R0), reduce (R1), reuse (R2), and repair (R4); medium loops of refurbish (R5), remanufacture (R5), and repurpose (R6); and long loops of recycle (R7), recover (R8), and remine (R9).

2.2 | Dynamic capabilities

In recent years, the management field has frequently adopted the DC perspective to explain sustained competitive advantage in dynamic markets (Schilke et al., 2018), building on the foundational works of Teece et al. (1997) and of Eisenhardt and Martin (2000). DC theory expands the traditional resource-base-view of the firm (Barney, 1991) into the realm of dynamic environmental contexts, where change and disruption is the norm rather than the exception. DC can be defined as “specific strategic organizational processes that create value for firms within dynamic markets by manipulating resources into new value-creating strategies. (...) DC thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die” (Eisenhardt & Martin, 2000, p. 1107). Following Teece et al. (1997, 2007), DC can be classified into three major categories: (i) sensing capabilities, which allow firms to scan the internal and external environment and identify opportunities and threats; (ii) seizing capabilities, referring to the processes and structures that allow capturing value from these opportunities; and (iii) reconfiguring capabilities, that refer to the continuous strategic alignment and realignment of tangible and intangible resources as markets evolve.

Critics of the DC perspective—which initially was heavily theoretical—argued for a lack of empirical knowledge and the under-specification of the DC construct (Schilke et al., 2018). However, recent years have seen a rise in empiric research on the MofDC, notably the work of Mezger (2014), who explored six BMI cases and identified specific underlying practices. Furthermore, particularly relevant for this research has been the research by Inigo et al. (2017), that identified nine MofDC for both radical and incremental cases of SBMI in eight Spanish firms, and the study by Mousavi et al. (2019), that explored two in-depth cases of high-tech SBMI and described fourteen MofDC. Lastly, and even more closely related to our research, was Prieto-Sandoval et al. (2019) identification of 9 DC for implementing CE, following a focus group with 12 CE experts, and Khan et al. (2020a) detection of 35 practices—grouped on 11 MofDC—after exploring four Italian CBMI cases.

3 | METHODS

To identify *what* are the underlying practices supporting CBMI processes in incumbent firms, thus exploring *how* incumbents pursue CBMI, this qualitative research employed an explorative multiple case study approach (Eisenhardt, 1989; Yin, 2014). By applying grounded theory, the data were analyzed through an abductive logic (Dubois & Gadde, 2002; Timmermans & Tavory, 2012). Case studies allow to obtain rich empirical data and to elaborate hypothesis in under-explored topics, particularly in context-dependent phenomena (Yin, 2014). Grounded theory and the abductive approach direct the researcher back and forth from theory to practice, moving from preliminary analytical frameworks into the fieldwork and back. Empirical data are analyzed and interpreted, and might lead to theory expansion

or change (Dubois & Gadde, 2002). This approach allows the combination of inductive and deductive phases and is well suited to build theory on under-explored topics (Timmermans & Tavory, 2012), such as DC for CBMI.

3.1 | Case selection

Cases were selected through purposive theoretical sampling, which allows to “focus efforts on theoretically useful cases, choosing those that replicate or extend theory by filling conceptual categories” (Eisenhardt, 1989, p. 533). Cases were required to be incumbent firms—understood as companies already established in an industry—that have implemented a CBMI, which in our research could be CBM transformations or CBM diversifications (Geissdoerfer et al., 2020). Our study did not consider cases of start-ups or CBM acquisitions, as these BMI types have different innovation approaches and face different challenges (Cohen & Muñoz, 2017; Hockerts & Wüstenhagen, 2010; Rovanto & Bask, 2020). In addition, to be selected, the innovation had to be substantial (i.e., impacting at least two out of the three BM value dimensions (Richardson, 2005), and replicating Frishammar and Parida (2018) multiple case study sampling approach), and to be already implemented in the market, in order to be able to do a retrospective analysis of how the CBMI process unfolded and what capabilities were required. To increase the validity of findings, and avoid potential biases, a maximum variability within the sample was aimed for (Bryman, 2012), thus case sample aimed to have a mix of CBM types (Lacy et al., 2014), representing a variety of R value retention options (Reike et al., 2018), a mix of industries, company sizes, and at least two countries.

Potential case studies were sought based on desk research and recommendations from the authors' network. Our unit of analysis was the firm; however, we included in our sample three firms that offered two CBMI cases. Finally, 10 firms fulfilling protocol criteria, providing a total of 13 CBMI cases, were selected, contacted and studied. The final sample had five firms from Austria and five from the Netherlands (chosen for practical and budget reasons, to allow in-person interviews); two of small/medium size and eight of large size; two firms with cases of CBM transformation and eight with examples of CBM diversification; four with innovations focused on short and medium loops (R0 to R5) on six on longer loops (R6 to R9); representing five CBM types and nine different manufacturing and service industries (see Table 1 for descriptions).

3.2 | Data collection

Data were collected between May 2019 and January 2020, through 16 in-person semi-structured interviews of an average of 64 min each. This was complemented with on-site observation at facilities, review of publicly available documents (e.g., websites and company reports), and interviewer field notes. The main author carried all interviews, who recorded conversations after obtaining consent from

participants. Obtaining evidence from multiple sources allowed us to apply data triangulation, improving construct validity (Yin, 2014).

To identify the MofDC for CBMI, the interview protocol aimed at broadly exploring the CBMI process, thus questions were informed by a comprehensive CBMI framework recently proposed (Santa-Maria et al., 2021). After clarifying respondents' role and general description of the initiative, the interviewer asked about project antecedents (e.g., drivers and barriers), to then focus on the innovation process distinctive stages and activities. Inquiries were also done on the moderators, context, and outcomes of the process, closing by asking for recommendations to future initiatives.

The interview protocol was designed to be flexible, including several open-ended questions. Question list aimed to serve as a reminder of key topics of conversation rather than a structured interrogatory, thus allowing respondents to naturally focus on distinctive case aspects and to provide *surprising empirical evidence*, an essential aspect in abductive research (Timmermans & Tavory, 2012).

3.3 | Data analysis

Following an abductive logic (Timmermans & Tavory, 2012), and guided by the Gioia pattern-inducing method (Gioia et al., 2013), the data analysis process had five major phases that combined inductive and deductive reasoning, and the application of open coding, axial coding, and theoretical coding. Interviews were transcribed (using verbatim), and together with field notes and collected documents, data were coded to identify prominent themes describing “distinct skills, processes, procedures, organizational structures, decision rules, and disciplines” (Teece, 2007, p. 1319) relevant to the innovation process, that is, the MofDC of CBMI—or *best practices* for CBMI. The coding process was supported with MAXQDA software, and though here it is presented linearly, the process was rather iterative.

First, through open coding (Corbin & Strauss, 2007), initial themes emerged inductively from raw empirical data. After combining closely related codes through an axial coding exercise (Corbin & Strauss, 2007), a first set of 23 distinctive first-order concepts was identified. This step was done without considering previous research on MofDC, to avoid confirmation bias (Gioia et al., 2013).

Secondly, raw data were revisited to deductively identify additional MofDC that have been described in selected literature on MofDC for BMI (Mezger, 2014; Teece, 2007), MofDC for SBMI (Inigo et al., 2017; Mousavi et al., 2019), and MofDC for CBMI (Khan et al., 2020a; Prieto-Sandoval et al., 2019). This step contributed 12 additional and distinctive first-order concepts to the list, totaling 35. The six mentioned papers were selected for being the most relevant contributions in answering our research goal (see Section 2.2), based on the author's judgment, and are later used to contrast the results of this research in the discussion section (see Section 5.2).

As a third step, a cross-case analysis was performed, following a replication logic (Eisenhardt, 1989; Yin, 2014). To increase external validity, we considered for analysis only those first-order concepts that were present in at least 30% of firms, reducing the list to 26. In

TABLE 1 Description of the 10 firms and 13 CBMI cases studied

No.	Fictitious company name	Country	Size	No. of interviews	Total interview time	Position (s) interviewed	Case	CBMI case brief description
1	Recycling Ltd.	AT	Large	1	49 min	Managing Director (of Corporate Spin-off)	A	Creation of an app-based waste disposal platform, connecting construction companies with waste disposal firms, and optimizing logistics and idle capacity.
2	Furniture Ltd.	AT	Large	1	82 min	Country Sustainability Manager	B	Implementation of a take-back, refurbish, and resell service for furniture and appliances.
3	Textiles Ltd.	AT	Large	2	85 min	Senior Manager Sustainability Integration, Head of Product Management	C	Introduction of a textile fiber that incorporates renewable bio-materials and recycled cotton scraps.
4	Packaging Ltd.	AT	Large	1	105 min	VP Group Sustainability	D	Introduction of a fully recyclable flexible packaging product line.
5	Machinery Ltd.	AT	Medium	1	61 min	Head of Product Management	E	Introduction of a machine-as-a-service rental scheme, where the firm retains ownership and charges based on daily fee and hour use.
6	Electronics Ltd.	NL	Large	2	116 min	Senior Director Sustainability, Business partner for Sustainability and Circular economy strategy	F	Introduction of a certified used machine line. The business model includes active take-back, repair, refurbishment, and resell.
7	Carpets Ltd.	NL	Large	1	103 min	Head of Sustainable Development	G	Development of a life extending program for complex medical electronics, financially assisted. Incorporates upgrading, repairing, take-back, refurbishment, and resell.
8	Carpets 2 Ltd.	NL	Large	1	137 min	Director Sustainability	H	Introduction of a solution for medical monitoring systems based on product-as-a-service contracts. Producer retains ownership, client is charged based on consumption. Training, upgrading, and access to latest technology included.
9	Paper Ltd.	NL	Small	1	70 min	Innovation & Business Intelligence Manager	I	25-year journey to become carbon neutral, developing recyclable products with 100% recycled content, with a take-back scheme, focusing on servicing (maintenance & repair)
10							J	Journey to transform linear and carbon intensive production into 90% cradle-to-cradle certified offer.
11							K	Introduction of a locally closed-loop model to recycle a firm's waste to source another product to the same firm. Cradle-to-cradle certified.

TABLE 1 (Continued)

No.	Fictitious company name	Country	Size	No. of interviews	Total interview time	Position (s) interviewed	Case	CBMI case brief description
10	Logistics Ltd.	NL	Large	5	215 min	Director Strategy & Sustainability, Sustainability Intern, Specialist R&D Engineer, R&D Engineer	L	Introduction of an energy-efficient redesigned logistic solution with high recycled content, recyclable, feasible to be remanufactured, and cradle-to-cradle certified.
							M	Introduction of a radical technological innovation, offered through 4 alternative product-as-a-service contracts. Individual machines can be reused in different applications and are designed for easy maintenance, repair, refurbishment, and recycling.

TABLE 1 (Continued)

No.	Value proposition	Value creation and delivery system	Value capture	CBM type (s) (Lacy et al., 2014)	Value retention strategy (ies) (Reike et al., 2018)	CBMI type (Geissdoerfer et al., 2020)
1	Hassle free management of construction waste.	App connects to waste disposal firms in a logistically efficient manner.	Commission percentage of price of the waste removal service.	Sharing platform, resource recovery	R7:Recycle, R1:Reduce	CBM diversification
2	Give old furniture a second life.	Clients returns furniture, it is refurbished and resold.	Sell of reused/refurbished furniture at discounted price.	Product life extension	R4:Refurbish, R2:Reuse, R3:Repair	CBM diversification
3	Circular and bio-sourced textile fibers.	Scrap recovery, mixed with bio-materials to produce textile.	Sell of textile.	Circular supplies	R7:Recycle, R1:Reduce	CBM diversification
4	Certified recyclable flexible packaging.	Production in plant 100% dedicated to recyclable solutions.	Sell of packaging.	Resource recovery	R7:Recycle	CBM diversification
5	Rent of industrial machinery. Buy a certified used industrial machinery.	Production, maintenance, and repair of machinery. Active take-back, structured refurbishing process, and resell.	Fee based on days or hours of use. Sell of refurbished machinery at discounted price.	Product as a service, product life extension Product life extension	R2:Reuse, R3:Repair R4:Refurbish, R3:Repair, R2:Reuse, R1:Reduce	CBM diversification CBM diversification
6	Medical electronics upgrading and life extending program. Access to monitoring services, including upgrading and training.	Upgrading of technology, maintenance, and take-back coordination. Production, provision, and management of equipment.	Leasing and financing contracts. Per-patient fee model.	Product life extension Product as a service, product life extension	R4:Refurbish, R3:Repair, R5:Remanufacture R2:Reuse, R3:Repair, R4:Refurbish	CBM diversification CBM diversification

TABLE 1 (Continued)

No.	Value proposition	Value creation and delivery system	Value capture	CBM type (s) (Lacy et al., 2014)	Value retention strategy (ies) (Reike et al., 2018)	CBMI type (Geissdoerfer et al., 2020)
7	Carbon neutral durable modular carpets.	Production, maintenance and recovery of carpet tiles.	Sell of carpet tiles with 15-year warranty.	Circular supplies, product life extension, resource recovery	R7:Recycle, R1:Reduce, R2:Reuse, R3:Repair	CBM transformation
8	Cradle-to-cradle certified flooring solutions (e.g. carpets).	Production, maintenance and recovery of products.	Product sell contract.	Circular supplies, resource recovery	R7:Recycle, R0:Refuse, R1:Reduce, R2:Reuse	CBM trans-formation
9	Closed-loop cradle-to-cradle certified hygienic paper.	Coordinate the ecosystem to source, produce, and provide the product.	Service and supply contracts.	Circular supplies, resource recovery	R7:Recycle, R1:Reduce, R0:Refuse	CBM diversification
10	Cradle-to-cradle certified conveyor belt.	Production and servicing of product.	Sell of logistic solution.	Circular supplies, product life extension, resource recovery	R7:Recycle, R3:Repair, R4:Refurbish, R5:Remanufacture	CBM diversification
	Access to autonomous transporters that reduce 50% of energy costs.	Production, maintenance, refurbishment, and recycling of product.	4 alternative product-as-a-service contracts.	Circular supplies, product as a service, product life extension, resource recovery	R2:Reuse, R3:Repair, R4:Refurbish, R5:Remanufacture, R7:Recycle	CBM diversification

doing so, we aimed at deleting circumstantial practices that had no substantive support throughout cases and could reduce the transferability of findings.

Fourth, through axial coding, the 26 first-order concepts were clustered into more abstract and theoretical categories that here we present as the 12 identified MofDC of CBMI. Finally, and following a theoretical coding exercise (Walker & Myrick, 2006), the 12 MofDC were aggregated into the three main DC of sensing, seizing, and reconfiguring, guided by Teece's (2007) definitions. Figure 1 presents the data structuration process according to the Gioia method, and Table 2 (in Section 4) details the identification of the specific first-order concepts and MofDC for CBMI per each case. It is relevant to mention that some MofDC could relate to more than one DC, though for communication simplicity, they were allocated to the DC that was more relevant according to our data interpretation (e.g., the use of sustainability-oriented instruments was identified as more critical for seizing, though was also related to seizing and reconfiguring capabilities).

To test the reliability of the data analysis, an investigator triangulation was performed (Eisenhardt, 1989; Yin, 2014). Independent deductive coding of the interviews of four randomly selected firms (out of 10 firms) was done by a second and third researcher. This resulted in a 59.8% of inter-rater agreement on nominal data (Goodwin, 2001; Watkins & Pacheco, 2000), which can be considered as—almost—substantial agreement, taking as a reference that Cohen's kappa strength of agreement level is substantial from 60% onwards (Landis & Koch, 1977).

4 | RESULTS

The data analysis from the multiple case study allowed to identify 26 specific CBMI practices, that is, first-order skills, processes, procedures, and activities that underpinned the DC of sensing, seizing, and reconfiguring in the context of CBMI. These practices were grouped into 12 MofDC and aggregated into the three main DC. They are described in Sections 4.1 to 4.3, and Section 4.4 details the results of the cross-case analysis. The identification of each practice by case can be found in Table 2, and a short description, accompanied by an exemplary quote, can be seen in Tables A1, A2, and A3.

4.1 | Sensing micro-foundations

To learn, sense, filter, shape, and calibrate threats and opportunities that would lead to CBMI, case companies (i) developed external sensitivity, (ii) adopted holistic perspectives, (iii) created knowledge internally, and (iv) were supported by the use of sustainability-oriented instruments.

External sensitivity refers to their capacity to perceive and leverage changes from the external environment. This means *becoming aware of developments of exogenous science and technology* that

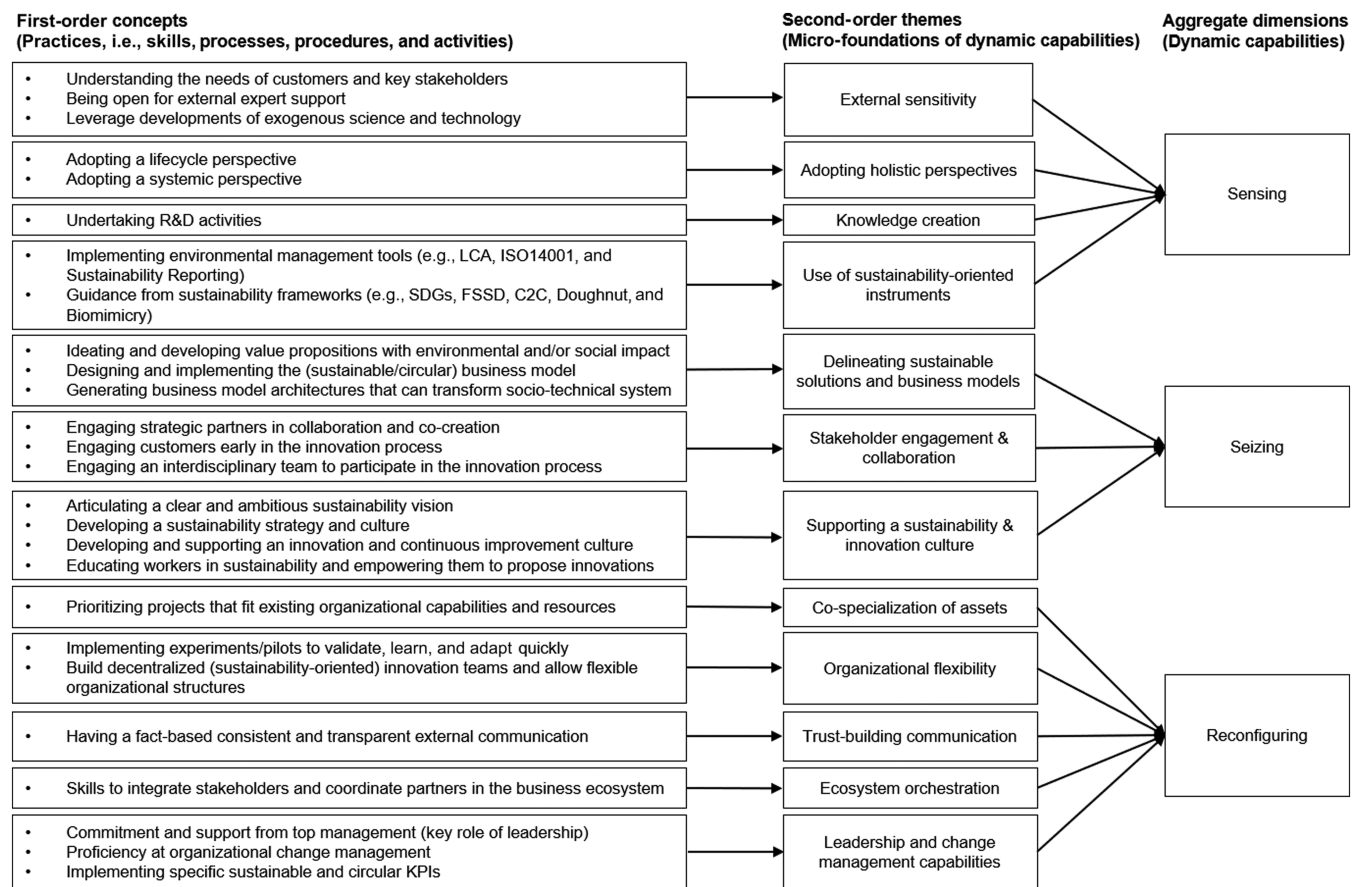


FIGURE 1 Data structuration and analysis process to determine the micro-foundations of the dynamic capabilities for CBMI, following the Gioia method

could be used for business innovation, such as Recycling Ltd. app-based waste disposal sharing platform, which is a result of managers exploration of novel digital technologies. It also implies *identifying key internal and external stakeholders and understanding their current and future needs*, exemplified by the experience of Electronics Ltd, which developed a product-as-a-service model guided by early and ongoing discussion with customers. Finally, it entails acknowledging that sustainability-related challenges are complex to deal with, and *asking for external expert support*, such as in the cases of Logistics Ltd., Paper Ltd. and Carpets Ltd., that had from the start of their innovation processes the support from cradle-to-cradle experts.

Adopting holistic perspectives here refers to two particular viewpoints. First, it considers *embracing a lifecycle perspective*, allowing to identify impacts and (circular) opportunities from the product's cradle to its grave—and back to the cradle. For instance, in Case M of Logistics Ltd., managers realized that to find solutions to end-of-life issues of their product, they needed to redesign the product and add services throughout the lifecycle. Secondly, it contemplates *holding a systems perspective*, looking at the bigger picture and identifying the connections of the BM to the wider environment, which allows identifying unforeseen and impactful opportunities. As the Head of

Sustainable Development from Carpets Ltd. described: “A trade-off is a cue that you haven't zoomed out enough. If you zoom-out, your solution space gets bigger”.

A third sensing micro-foundation was the capacity the create knowledge from the inside of the organization, most commonly done through *research and development (R&D) processes and activities*, a practice identified in all studied companies. Finally, a fourth MofDC was the use of sustainability-oriented instruments, identified through two practices. First, it refers to the *implementation of environmental management tools* to identify, manage, and report sustainability impacts, such as Life Cycle Analyses (LCA), ISO14001, or Sustainability Reporting (Robèrt et al., 2002). In particular, the use of LCAs was mentioned as very relevant for Carpets Ltd., Carpets 2 Ltd., Logistics Ltd., Packaging Ltd., and Textiles Ltd. The second practice was *guiding the firm sustainability strategy and initiatives by an accepted sustainability framework*, such as the Sustainable Development Goals (Griggs, 2013), The Natural Step and Framework for Strategic Sustainable Development (Broman & Robèrt, 2017), Doughnut Economics (Raworth, 2012), the Cradle-to-Cradle initiative (McDonough & Braungart, 2010), or Biomimicry (Benyus, 1998), including here those that were mentioned in interviews with Carpets Ltd., Carpets 2 Ltd., Paper Ltd., and Logistics Ltd.

TABLE 2 Presence of practices and micro-foundations of dynamic capabilities for CBMI by studied firm

Dynamic capability	Micro-foundations of dynamic capabilities	First-order practices (i.e. skills, processes, procedures, and activities)	Firm													% of firms with +	10
			Case	1	2	3	4	5	6	7	8	9	10				
Sensing and shaping opportunities and threats	External sensitivity	Understanding the needs of customers and key stakeholders		+	+		+	+	+	+		+	+		80%	-	
		Being open for external expert support		+					+	+	+	+			50%	+	
		Leverage developments of exogenous science and technology		+			+	+		+					40%		
	Adopting holistic perspectives	Adopting a lifecycle perspective			+	+	+	+	+	+	+	+	+	+	90%	+	
		Adopting a systemic perspective				+	+			+	+	+	+	+	70%		
	Knowledge creation	Undertaking R&D activities		+	+	+	+	+	+	+	+	+	+	+	100%	+	
		Use of sustainability-oriented instruments	Implementing environmental management tools (e.g. LCA, ISO14001, Sustainability Reporting)		+	+	+	+		+	+	+	+	+	90%	+	
			Guidance from sustainability frameworks (e.g. SDGs, FSSD, C2C, Doughnut, Biomimicry)									+	+	+	40%		
	Seizing opportunities	Delineating sustainable solutions and business models	Ideating and developing value propositions with environmental and/or social impact		+	+	+	+	+	+	+	+	+	+	+	100%	+
			Designing and implementing the (sustainable/circular) business model		+	+	+	+	+	+	+	+	+	+	+	100%	-
Generating business model architectures that can transform socio-technical systems					+		+				+	+		+	50%		
Stakeholder engagement & collaboration		Engaging strategic partners in collaboration and co-creation		+		+	+			+	+	+	+	+	80%	-	
		Engaging customers early in the innovation process		+	+	+				+			+	+	60%	-	
		Engaging an interdisciplinary team to participate in the innovation process					+	+	+	+	+				50%		
Supporting a sustainability & innovation culture		Articulating a clear and ambitious sustainability vision		+	+					+	+	+			50%		
		Developing a sustainability strategy and culture		+	+	+	+			+	+	+		+	80%		
		Developing and supporting an innovation and continuous improvement culture		+		+	+	+	+	+	+		+		70%	+	
		Educating workers in sustainability and empowering them to propose innovations						+		+	+	+			40%		
Reconfiguring resources and structures	Co-specialization of assets	Prioritizing projects that fit existing organizational capabilities and resources						+	+			+		30%			
	Organizational flexibility	Implementing experiments/pilots to validate, learn and adapt quickly		+	+					+	+		+	+	60%		
		Build decentralized (sustainability-oriented) innovation teams and allow flexible organizational structures		+									+	+	30%		
	Trust-building communication	Having a fact-based consistent and transparent external communication			+		+			+	+	+		50%			
	Ecosystem orchestration	Skills to integrate stakeholders and coordinate partners in the business ecosystem		+		+	+			+	+	+	+	+	80%		
		Leadership and change management capabilities	Commitment and support from top management (Key role of leadership)		+	+				+	+	+			50%		
		Proficiency at organizational change management						+	+		+	+	+	50%			
		Implementing specific sustainable and circular KPI's			+		+			+	+		+	50%	+		
	Count of practices by case		16	15	12	17	10	20	23	17	16	18		7			

Note: The table includes unsuccessful Case L. “+” indicates the practice was present, “-” indicates the practice was informed as absent, and blank spaces indicate practice could have been present or absent, though not concludable with available data.

[Correction added on 29 March 2022, after first online publication: Table 2 layout has been updated in this version.]

4.2 | Seizing micro-foundations

To take advantage and generate value from the identified opportunities, firms developed certain structures, procedures, designs, and incentives that would lead to CBMI, namely, (i) delineating sustainable solutions and BMs, (ii) engaging and collaborating with stakeholders, and (iii) supporting a sustainability- and innovation-oriented organizational culture.

To clearly define and describe their novel BM and sustainability-oriented solutions, firms engaged in three practices. First, they *integrated environmental and/or social aspects in the core of their value proposition*, building, for example, on CE strategies, though being sure to be also tackling a customer problem or tension, in order to have a market. As the Senior Director of Sustainability of Electronics Ltd. stated: “It is about finding that right balance, between solving a customer pain point and trying to reach our sustainability ambitions. So, any business model that just solves the environmental problem, but does not solve a customer tension, it's not going to go anywhere”. Secondly, all studied firms had the *ability to “think in BMs”*, being able to design them, validate them, and acquiring or transforming specific BM elements. And third, something particularly relevant to those firms that had a more ambitious sustainability strategy was the capacity to *design BMs that could have a direct or indirect impact on the wider system*, beyond the business ecosystem. For example, Packaging Ltd., described how they, along with developing their novel fully recyclable packaging line, engaged in European level projects, initiated industry-wide initiatives and aimed to educate not only their value chain but also the general public.

The second seizing micro-foundation refers to engaging and collaborating with both internal and external stakeholders, where the study distinguished three main practices. First, eight of 10 firms described how they *identified and involved partners that complemented their capabilities early in the innovation process*, even creating specific engagement activities. As the Director of Strategy & Sustainability of Logistics Ltd. mentioned: “Circularity is something you must do within an ecosystem, with other companies. So we created Partner Days to start this conversation”. Secondly, most of the successful CBMI initiatives *engaged potential users to co-develop solutions*, exemplified by the experience of Logistics Ltd., which acknowledged that one of the key differences in the success of case M versus case L was the early involvement of customers in the innovation process. And third, a practice that was found in half of the cases was the *constitution of a multidisciplinary cross-functional team to work on the innovation process*, complementing traditionally involved technical, customer, and/or finance-oriented perspectives with a sustainability perspective.

The third identified seizing micro-foundation was the development and support of a both sustainability-oriented and innovation-oriented organizational culture, operationalized in four related practices. First, *articulating a clear and ambitious vision* of the role of the firm in a sustainable future, providing a “north star” to guide and inspire the organization and the innovation initiatives. As the Head of Sustainable Development from Carpets Ltd. mentioned: “Without a vision of the future you mainly see costs and threats, not new

opportunities and returns”. Second, and related to the first practice, was the *creation of a bespoke sustainability strategy*, aligned or embedded in the corporate strategy, also supporting the development of a sustainability-oriented culture. Third, the establishment of an *innovation and continuous improvement culture*, promoting and celebrating both disruptive innovation and continuous improvement. And fourth, identified as a central element to achieving the previous practices, was the *training and education of workers on sustainability topics*, and their empowerment to propose bottom-up innovations. Interesting examples of the mentioned practices were the sustainability ambassadors program of Carpets Ltd., which encouraged workers to propose and implement sustainability innovations on different levels of commitment and reward, and the various training toolkits of Packaging Ltd., each with different level of complexity, aimed at collaborators with different levels of sustainability knowledge, besides having educational programs for value chain partners and end-users of their products.

4.3 | Reconfiguring micro-foundations

Focusing on the continuous alignment and realignment of specific tangible and intangible assets required to implement the CBMI, five reconfiguring micro-foundations were identified: (i) co-specialization of assets, (ii) organizational flexibility, (iii) trust-building communication, (iv) ecosystem orchestration, and (v) leadership and change management capabilities.

The co-specialization of assets refers to *prioritizing projects that fit existing organizational capabilities* and developing or acquiring resources and competencies that are value enhancing. This can be exemplified by the comment of the Senior Director of Sustainability from Electronics Ltd: “Whatever you do, it must meet with what you do well as an organization. There are hundreds of ways to make money in a circular economy, but there are maybe only ten that fit with what you do well as an organization”.

Organizational flexibility is here referred to as the firm's capacity to quickly adapt to changes, specifically to changes in the BM, and it was identified through two practices. First, in six out of 10 firms, it was noted that companies implemented *experiments, prototypes, or pilots to validate assumptions*, decrease uncertainty and risk, and quickly and cheaply learn and adapt, before scaling up their ideas. As the Senior Director of Sustainability from Electronics Ltd argued: “Start small, pilot, and fail quickly. [...] The change towards circular business models is so messy and so disruptive that is also impossible to detail everything into a business model”. And secondly, three firms were successful in providing needed flexibility by arranging *decentralized (sustainability-oriented) innovation teams* and facilitating loosely coupled organizational structures, to support the development of a corporate start-up (Case M) or corporate spin-offs (Cases A and K).

Trust-building communication denotes the relevance of *having fact-based consistent and transparent external communication*, particularly once the implementation phase of the innovation starts, as this

creates the necessary trust and engagement of stakeholders. This can be clarified by the words of the Director for Sustainability of Carpets 2 Ltd.: “The consistency and knowledge that we were pushing into the market created trust [...]. It's also to invite others, inclusiveness, to help you solve your issue”. This was suggested as especially relevant for novel sustainability innovations, where there is a risk of greenwashing or misleading consumer behavior towards unexpected impacts.

Ecosystem orchestration capabilities were found relevant in eight of the 10 studied firms and refer to the skills to *identify, manage, and coordinate the strategic partners of the business ecosystem*. This required setting up the right incentives, managing communications and aligning responsibilities. This aspect was exemplified in Paper Ltd. Innovation case, which required the coordination of four specific value chain actors to locally turn a client's waste into a product for the same client, dealing with conflicting interests and unequal power relations.

Finally, the fifth reconfiguring micro-foundation refers to leadership and change management capabilities, described here through three practices. First, it was found that the *commitment and support from top management* was crucial in the success of the innovation process, as they could accelerate (or block) the process and provide the needed resources. As the Director for Sustainability of Carpets 2 Ltd. clearly stated: “The only person you need is the CEO, if the CEO is on board, you are there!”. Secondly, it was inferred through the interview analysis the relevance of *being proficient at organization change management*, dealing with the preparation, management, and reinforcement of the planned change required for the CBMI. And lastly, it was identified in half of the cases the importance of *implementing specific key performance indicators (KPIs)* oriented at managing the sustainability and/or circularity performance of the initiative.

4.4 | Cross-case analysis

Performing a cross-case analysis allowed us to develop several propositions. First, we suggest which of the 26 practices are more relevant for a successful BMI process; secondly, we propose which ones are more important for innovations oriented at the short and medium loops of the CE and which ones are more relevant for the longer loops; then, we distinguish practices that are particularly significant for long-term BM transformations; and finally, we provide some insights related to ecosystem collaboration and learnings from a specific case of BMI failure. These findings should be considered as propositions to be tested in more robust future research.

Out of the 26 identified practices, three were present in all cases, namely, (i) undertaking R&D activities, (ii) ideating and developing value propositions with environmental and/or social impact, and (iii) designing and implementing the (sustainable/circular) BM. This is not surprising, as a selection requirement for cases was to have implemented a CBMI, and R&D is a standardized activity in innovative firms. However, practices that were present in at least 80% of cases do provide some more interesting insights on critical capabilities to be

developed for a successful CBMI process: (i) understanding needs of customers and key stakeholders, (ii) adopting a lifecycle perspective, (iii) implementing environmental management tools (e.g., LCA), (iv) engaging strategic partners in collaboration and co-creation, (v) developing a sustainability strategy and culture, and (vi) developing skills to integrate stakeholders and coordinate partners in the business ecosystem. This does not imply that other practices are not relevant, only that the previously mentioned capabilities are suggested as critical for any type of (C)BMI in incumbent firms.

The cross-case analysis allowed to also distinguish practices that were more present in firms focusing on short and medium loops (R0 to R5) of the CE versus those focusing on longer loops (R6 to R9) (Reike et al., 2018), beyond those that are relevant for both types (see the previous paragraph). Firms working on short and medium loops tended to engage more with customers early in the innovation process and to understand the needs of key stakeholders and were also keener on doing experiments to validate their assumptions and to promote an innovation culture. Firms focusing on longer loops particularly cared more about engaging with strategic partners and effectively coordinating the business ecosystem, and they were also more open for external expert support and placed particular relevance on a fact-based external communication. These findings are aligned with conventional CE strategies descriptions (e.g., Reike et al., 2018), as shorter loops like reuse and repair are by definition closer to the user, and longer loops such as recycle and recovery regularly depended on collaboration with other firms. An additional set of insights comes from comparing the commonalities of the only two firms from the sample that performed an ambitious BM transformation (i.e., Carpets Ltd. and Carpets 2 Ltd.) with the cases of BM diversification. Both had in common that they articulated a clear and ambitious sustainability vision, counted with full support from the CEO, guided their transformation journey by a sustainability framework, received support from external experts, trained and empowered their workers in sustainability topics, were proficient at organizational change management, and had a fact-based consistent communication. These practices were present only in three or less of the firms with BM diversification cases, suggesting that these aspects are particularly relevant when aiming at long-term sustainability-oriented transformations. These findings are aligned with the particularities of long-term corporate sustainability management (e.g., Baumgartner, 2014; Witjes et al., 2017).

Another interesting insight is that in only three of the studied CBMI cases (i.e., B, E, and F) strategic partner engagement and ecosystem orchestration were not present; however, this is a practice commonly portrayed as a key element of a CBM (Antikainen & Valkokari, 2016). Arguably, this was because these firms decided to develop needed capabilities in-house rather than partnering up and because they designed their BMs in a way customer were the ones taking-back the product. In the words of Hansen and Revellio (2020), they opted for a *make* strategy, rather than an *ally*, *buy*, or *laissez-faire* strategy.

Finally, the two CBMI cases of Logistics Ltd. offered a unique opportunity for insights, as the firm implemented in Case M what they learned from the unsuccessful market entry of Case L. Both cases

were a tech-push with circular elements; however, Case M distinguished from Case L particularly in four aspects: They cared to understand the needs of customers and stakeholders, engaged customers—and strategic partners—early in the innovation process, and most importantly, they embedded the new technology in a robust BM offer (i.e., four alternative product-as-a-service contracts). In contrast, Case L did not consider customers opinions until being market-ready and did not have a BM design behind it, which emphasize the relevance of the mentioned practices.

5 | DISCUSSION

This section is divided into four parts, first, it is discussed whether the MofDC identified in the present study are being supported by previous literature, contrasting with selected BMI, CBMI, and SBMI literature focused on MofDC. Secondly, by integrating complementary MofDC described in previous literature, we propose a comprehensive framework (see Table 3). Later, we explore whether the mentioned MofDC are specific for sustainable/circular innovation processes or valid for any type of innovation process (see Table 3). The section is closed by the identification of study limitations and recommendations for future research.

5.1 | Literature support

As mentioned in Section 2, CBMI can be considered as a subset of SBMI, which can be considered a subset of BMI literature (Santa-Maria et al., 2021). Considering MofDC has been empirically and theoretically explored in the three fields, the findings of this research are here contrasted with the results of six selected papers, two from BMI literature (Mezger, 2014; Teece, 2007), two from SBMI research (Inigo et al., 2017; Mousavi et al., 2019), and two from the CBMI sub-field (Khan et al., 2020a; Prieto-Sandoval et al., 2019). Documents were selected, based on the authors' judgment, for being the most comprehensive identifications of specific MofDC in their respective fields, thus, the most relevant contributions in answering our research goal.

As can be seen in Table 3, 22 of the 26 identified first-order practices that underpin DC have been described in at least one of the six selected papers; however, the study with more overlap identified 14 of the 26, and the one with less, only 5, therefore our study could be distinguished as the more comprehensive one in this regard. Selected papers were either theoretical or explorative, thus the present research contributes first, in supporting their findings through empirical replication, and second, in providing four practices not described before in the selected DC papers, that is, (i) being open for external support, (ii) guidance from sustainability frameworks, (iii) trust-building communication, and (iv) the implementation of specific sustainable/circular KPIs. Complementary, it should also be highlighted that the present study described six practices that were previously identified by only one DC paper, that is, (i) adopting a

systemic perspective, (ii) implementing environmental management tools (e.g., LCA), (iii) ideating and developing value propositions with environmental and/or social impact, (iv) generating BM architectures that can transform socio-technical systems, (v) engaging customers early in the innovation process, and (vi) educating workers in sustainability topics and empowering them to propose innovations.

5.2 | Literature integration into a comprehensive framework

Following the review of the six selected MofDC papers, we identified seven practices that have not been described in the present research, though described by at least two of the selected papers. This could be explained by the explorative nature of our method, the flexible interview protocol, and our analysis criteria, that is, the specific practices were not inquired in the interview protocol, the interviewee did not mention them, or they were present in less than 30% of our cases, which does not mean they are not potentially relevant. We consider that these seven practices complement our findings and should be considered for further research. We propose they allow us to “complete the circle” of MofDC and to offer an updated comprehensive framework of MofDC for CBMI (see Table 3). Regarding sensing micro-foundations, previous research has proposed three practices that complement our identified MofDC of external sensitivity, namely, (i) recognizing alternative BM configurations on competitors and across the industry, (ii) identifying social and environmental opportunities and threats, and (iii) anticipating and responding to changes in regulation. It has also been described how (iv) employing accumulated experience, know-how, and intellectual property is a practice of the MofDC of internal knowledge creation, complementary to R&D activities. Concerning reconfiguring micro-foundations, a relevant practice complementing organizational flexibility is to (v) embrace open innovation, understanding it as a mode of innovation in which companies, rather than relying only on internal ideas, look outside their boundaries, leveraging on internal and external sources of ideas (Zott et al., 2011). Lastly, two complementary reconfiguring micro-foundations described in previous studies are related to first, governance aspects, namely (vi) achieving incentive alignment, minimizing agency issues, and managing collective decision making; and second, about knowledge management aspects, specifically on (vii) organizational learning, knowledge transfer, know-how integration, and intellectual property management (see Table 3 for references of the seven complementary practices).

5.3 | Sustainability-oriented specific micro-foundations

In the following, we offer a proposal of whether the identified 33 MofDC (i.e., 26 identified in this study plus the 7 complementary practices) are specific for sustainable/circular innovation processes or valid for any type of innovation process. This proposal is based on our

TABLE 3 Comprehensive framework of practices and micro-foundations of dynamic capabilities for sustainability-oriented BMI

Dynamic capability	Micro-foundations of dynamic capabilities	First-order practices (i.e., skills, processes, procedures, and activities)	Teece, 2007	Mezger, 2014	Inigo et al., 2017	Mousavi et al., 2019	Prieto-Sandoval et al., 2019	Khan et al., 2020a	Present research	Specific to SBMI/ CBMI
Sensing and shaping opportunities and threats	External sensitivity	Understanding the needs of customers and key stakeholders	+		+	+	+	+	+	
		Being open for external expert support							+	(+)
		Leverage developments of exogenous science and technology	+	+	+			+	+	
		Recognizing alternative business model configurations on competitors and across industry		+		+		+		+
		Identifying social and environmental opportunities and threats			+			+		
		Anticipating and responding to changes in regulation			+				+	(+)
	Adopting holistic perspectives	Adopting a lifecycle perspective				+			+	+
		Adopting a systemic perspective				+			+	+
	Knowledge creation	Undertaking R&D activities	+				+	+	+	+
		Employing accumulated experience, know-how, and intellectual property	+				+			
Use of sustainability-oriented instruments	Implementing environmental management tools (e.g., LCA, ISO14001, and Sustainability Reporting)							+		+
	Guidance from sustainability frameworks (e.g., SDGs, FSSD, C2C, Doughnut, and Biomimicry)								+	+
Seizing opportunities	Delineating sustainable solutions and business models	Ideating and developing value propositions with environmental and/or social impact			+			+	+	+

TABLE 3 (Continued)

Dynamic capability	Micro-foundations of dynamic capabilities	First-order practices (i.e., skills, processes, procedures, and activities)	Teece, 2007	Mezger, 2014	Inigo et al., 2017	Mousavi et al., 2019	Prieto-Sandoval et al., 2019	Khan et al., 2020a	Present research	Specific to SBMI/CBMI
		Designing and implementing the (sustainable/circular) business model	+	+	+	+	+	+	+	+
		Generating business model architectures that can transform socio-technical systems		+					+	+
	Stakeholder engagement & collaboration	Engaging strategic partners in collaboration and co-creation	+		+	+		+	+	(+)
		Engaging customers early in the innovation process			+				+	
		Engaging an interdisciplinary team to participate in the innovation process			+	+		+	+	(+)
	Supporting a sustainability & innovation culture	Articulating a clear and ambitious sustainability vision			+	+		+	+	+
		Developing a sustainability strategy and culture					+	+	+	+
		Developing and supporting an innovation and continuous improvement culture				+		+	+	+
		Educating workers in sustainability and empowering them to propose innovations					+		+	+
Reconfiguring resources and structures	Co-specialization of assets	Prioritizing strategic fit of resources and capabilities	+	+				+	+	
	Organizational flexibility	Implementing experiments/pilots to validate, learn, and adapt quickly	+	+		+		+	+	(+)

(Continues)

TABLE 3 (Continued)

Dynamic capability	Micro-foundations of dynamic capabilities	First-order practices (i.e., skills, processes, procedures, and activities)	Teece, 2007	Mezger, 2014	Inigo et al., 2017	Mousavi et al., 2019	Prieto-Sandoval et al., 2019	Khan et al., 2020a	Present research	Specific to SBMI/CBMI
		Build decentralized (sustainability-oriented) innovation teams and allow flexible organizational structures			+	+		+	+	+
		Embracing open innovation	+			+			+	(+)
	Trust-building communication	Having a fact-based consistent and transparent external communication								
	Ecosystem orchestration	Skills to integrate stakeholders and coordinate partners in the business ecosystem	+	+	+	+		+	+	(+)
	Leadership and change management	Commitment and support from top management (key role of leadership)	+				+		+	
		Proficiency at organizational change management	+		+				+	
		Implementing specific sustainable and circular KPIs							+	+
	Governance	Achieving incentive alignment, minimizing agency issues, and managing collective decision making	+							
	Knowledge management	Organizational learning, knowledge transfer, know-how integration, and intellectual property management	+	+	+	+	+	+		
Count	14	33	13	7	14	17	7	18	26	19

Note: Teece foundational study is complemented with five key papers and the present research. The last column indicates which practices are specific to SBMI/CBMI, that is, “+”, and which ones are relevant for SBMI/CBMI, though not specific, that is, “(+)”.

analysis of the generated data and review of the literature and can be considered as a base for future research. Here, we propose which practices are *specific* for CBMI or SBMI processes, which ones seem to be particularly *relevant* for CBMI or SBMI—though not exclusive—and which ones are *not specific* to sustainability-oriented innovation, thus relevant for any type of BMI processes (see the last column of Table 3 for individual classifications).

We propose that out of the 26 practices identified by this research, there are 11 *specific* and 6 *relevant* for CBMI/SBMI. Out of these 17, if we consider only the practices that were more prevalent throughout cases (i.e., present in at least 80% of cases), we conclude and propose that the most important MofDC—or “best practices”—for a successful CBMI process are (i) adopting a lifecycle perspective, (ii) implementing environmental management tools (e.g., LCA), (iii) ideating and developing value propositions with environmental and/or social impact, (iv) developing a sustainability strategy and culture, (v) engaging strategic partners in collaboration and co-creation, and (vi) integrating stakeholders and coordinating partners in the business ecosystem.

Regarding the seven complementary MofDC practices, we suggest that (i) identifying social and environmental opportunities and threats is a *specific* capability for CBMI/SBMI and (ii) anticipating and responding to changes in regulation is a *relevant*, though not specific capability.

5.4 | Limitations and future research

The present study is subject to certain methodological limitations. First, the most relevant data originate from interviews of an average of only 1.5 interviewees per company, thus implying risk in the validity of statements and partiality of perspectives. This was attempted to be solved through data triangulation; however, we recommend future research to obtain data not only from multiple sources but particularly from different organizational perspectives, beyond the sustainability departments. Second, due to the exploratory nature of research, and the abductive approach, the presence of each MofDC practice was not able to be assessed in every case. Therefore, it is relevant to consider that in Table 2, the spaces in blank indicate practices that were either not present or not able to be identified, though possibly existing. This aspect poses a limitation on the internal validity of the cross-case analysis propositions. Third, findings from a qualitative case study as the present should be considered as propositions, as they are derived from a limited number of cases, thus limiting external validity (i.e., generalizability). Despite being an exploratory study, the research design considered these aspects and aimed for maximum variability within a sample defined by specific requirements.

Future research is encouraged to test the findings of this research in larger scale quantitative studies, to further generalize conclusions. Methodologies from previous research aiming to quantify DC could be considered (Khan, Khan, & Shafiq, 2021; Kiefer et al., 2019; Kump et al., 2018), for example, it could be studied the effectiveness of the MofDC in the BMI process and their implications on the performance

of the organization (i.e., economic, environmental, or social). Larger samples offer the additional opportunity to add complementary control variables of research interest, for example, industry, company size, country, specific CBM types or R value retention strategies, firm *linear* background or sustainability strategy (Guldmann & Huulgaard, 2019), or if it is B2B or B2C. Our study focused on the technical cycle of the CE and on cases of BM diversification or BM transformation, thus future research could expand into the biological cycle of the CE, and on cases of start-ups or BM acquisitions. Finally, we also invite future research to test our proposal of sustainability-oriented specific practices by contrasting them with regular not sustainability-oriented innovation cases.

6 | CONCLUSIONS

Understanding how incumbent firms can successfully innovate their BMs towards the CE is now more relevant than ever. Companies are operating in a particularly dynamic marketplace, characterized by a wave of megatrends in globalization, digitalization, ecological concerns and changing demographics—among others—, and more recently disrupted by the COVID-19 crisis. World leaders are calling to “build back better”, and the CE is being promoted as a recovery strategy (Ibn-Mohammed et al., 2021; UNEP, 2020; Wuys et al., 2020). The DC perspective provides a theoretical lens to explore those capabilities that allow firms to adapt and thrive in rapidly changing and uncertain environments, such as the current one (Eisenhardt & Martin, 2000; Teece et al., 1997). Through a multiple case study on 10 incumbent firms that successfully implemented a CBMI, we identified 26 best practices, underpinning 12 MofDC of sensing, seizing, and reconfiguring (see Table 2). Furthermore, we distinguished four practices not described in previous MofDC research—such as trust-building communication and the use of specific sustainable/circular KPIs—six practices mentioned in only one previous study (see Section 4.1), and by integrating our study to extant literature, we proposed a comprehensive framework of 33 best practices underpinning 14 MofDC for sustainability-oriented BMI (see Table 3). Through an additional step of cross-case analysis, we were able to propose three relevant collections of insights: First, we propose that the most important MofDC for a successful CBMI process are (i) adopting a lifecycle perspective, (ii) implementing environmental management tools (e.g., LCA), (iii) ideating and developing value propositions with environmental and/or social impact, (iv) developing a sustainability strategy and culture, (v) engaging strategic partners in collaboration and co-creation, and (vi) skills to integrate stakeholders and coordinate partners in the business ecosystem. Secondly, we identified four practices particularly relevant innovation processes focused on short and medium loops of the CE (R0 to R5), such as the early understanding and engagement of customers; and four for innovations centered on long loops (R6 to R9), such as engaging with strategic partners and coordinating the business ecosystem. And third, we distinguished seven practices that are particularly relevant for long-term sustainability-oriented BM transformations (in contrast with BM

diversifications), such as an ambitious vision, guidance from sustainability frameworks, and top management support (see Section 4.4).

This research has contributed to theory by providing empirical evidence on CBMI processes (Santa-Maria et al., 2021) and the specificities of the DC construct (Schilke et al., 2018); and, by describing sustainability-oriented specific MofDC, it has answered calls for further research on the intersection of DC and CE (Prieto-Sandoval et al., 2019) and DC and corporate sustainability (Amui et al., 2017). By proposing a comprehensive framework of MofDC for sustainability-oriented BMI that combines previous research with our findings, this study complemented and validated the scant empirical research on the intersection of DC and CBMI, and DC and SBMI. Furthermore, this research contributed to the integration of traditional innovation and management research (e.g., DC and BMI) with the emerging SBMI and CBMI literature.

This study contributes to practice providing a set of 33 specific practices (i.e., skills, processes, procedures, and activities) recommended for incumbents to innovate their BMs towards the CE, in order to remain competitive in the current dynamic and uncertain marketplace, and to support the transition to a sustainable circular economy. Of particular relevance for practice is first, that we propose which six practices should be a priority for firms engaged in CBMI processes. Second, that we distinguish critical capabilities that should be developed depending on the firm strategic intention and time horizon, that is, practices that seem to be critical when aiming at shorter loops of the CE, in contrast to others relevant for longer loops of the CE. And third, that we identify seven practices relevant when aiming at long-term sustainability-oriented BM transformations.

Finally, we consider we have contributed to policy by identifying and highlighting those business practices that should be stimulated to promote a sustainability-oriented transition of the market. Policy can create the conditions for these practices to flourish. For example, developing legal frameworks that promote—and government initiatives that apply—sustainability-oriented tools (e.g., LCA and ISO14001) and sustainability frameworks (e.g., SDGs, C2C, and Doughnut). Environmentally oriented regulations, such as extended-producer-responsibility, eco-label standards, and carbon taxing, can spur sustainable innovations in firms and stimulate industry-wide collaborations. Policy could also improve the standards in transparent and rigorous sustainability accounting and use of sustainability KPIs, provide financial support to sustainable R&D and business experimentation, and could enhance knowledge transfer between societal actors.

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APPENDIX A

TABLE A1 Description and exemplary quotes of the identified micro-foundations of sensing capability

Micro-foundations of sensing	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
External sensitivity	Understanding the needs of customers and key stakeholders	Recognizing key internal and external stakeholders, identifying their current and future needs. Early customer research and engagement allows to develop valuable propositions and manage tensions.	“Understand the voice of the customer is essential to build up a successful strategy and later a proposition. By voice of the customer I refer to all the internal and external stakeholders.” (Business partner for Sustainability and Circular Economy, Electronics Ltd.)
	Being open for external expert support	To acknowledge sustainability-related challenges are complex to deal with, and ask for or receive support from external experts.	“That started with asking for help: how can we work in an ecosystem where we no longer plunder and degrade the earth, but add value? Many environmental experts, economists, knowledge institutions and also our chain partners responded, including the founders of the circular economy, cradle to cradle, The Natural Step and biomimicry.” (Head of Sustainable Development, Carpets Ltd.)
	Leverage developments of exogenous science and technology	Being aware of science and technology developments and how they can be used for business innovation.	“Going back to the roots of [Case A], the idea was by the managing directors of [Recycling Ltd.]. They were former technology managers, from big technology IT companies, they were not in the waste management business at all. And got some new ideas, fresh air and fresh wind for the company, and they said: What new technologies can we handle and what can we do? ... and they had a look at different business models in different business areas in the company.” (Managing Director, Recycling Ltd.)

(Continues)

TABLE A1 (Continued)

Micro-foundations of sensing	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
Adopting holistic perspectives	Adopting a lifecycle perspective	Adopting a lifecycle perspective to identify impacts and opportunities. Assuming responsibilities and recognizing circular opportunities from the cradle to the grave (and back to the cradle).	“The view on the total lifecycle, (...) that's where [case M] has been innovating in a very different way than the company has been used to.” (Director Strategy & Sustainability, Logistics Ltd.)
	Adopting a systemic perspective	Adopting a systemic perspective, understanding how the components of the business and the wider system are interconnected. Zooming-out to avoid unforeseen trade-offs or challenges.	“You must also look at it from a systems perspective, this is not only about closing loops technically, but also about looking at the effect of closing those loops. (...) A trade-off is a cue that you have not zoomed out enough. If you zoom-out; your solution space gets bigger”. (Head of Sustainable Development, Carpets Ltd.)
Knowledge creation	Undertaking R&D activities	Undertaking Research and Development (R&D) processes to create new products and services or improve existing ones.	“So we started to really move on and the good thing is that we already had from R&D a stage-gate process in developing projects, and a very structured process for implementation, where we have milestones, timelines, report every month ... so, a very clear structured guidance”. (Head of Product Management, Textiles Ltd.)
Use of sustainability-oriented instruments	Implementing environmental management tools (e.g., LCA, ISO14000, and Sustainability Reporting)	Using environmental management tools to identify, manage, and report the firm sustainability impacts. Such as life cycle analysis, environmental management systems or any type of Sustainability Reporting.	“Corporate and Product Sustainability is combined very well together, because we have a very comprehensive lifecycle assessment approach. So, we are weighting all our raw materials against LCA criteria. We know for all our products the environmental footprint, not only the carbon footprint, but also assessing all different impact categories, like eutrophication, acidification, photochemical, and all others. And we also assess our own raw materials.” (VP Group Sustainability, Packaging Ltd.)
	Guidance from sustainability frameworks (e.g., SDGs, FSSD, C2C, Doughnut, and Biomimicry)	Guiding the firm sustainability strategies and initiatives by an accepted sustainability framework, such as the Sustainable Development Goals (SDGs), The Natural Step and Framework for Strategic Sustainable Development (FSSD), Doughnut Economics, the Cradle-to-Cradle initiative, Biomimicry, and others.	“[...] and then together with the people of the Natural Step, you might have heard of Karl Henrik Robert and the FSSD. OK, so how can we work within the Planetary Boundaries? Which is nowadays the thinking behind the Doughnut [...].” (Head of Sustainable Development, Carpets Ltd.)

**TABLE A2** Description and exemplary quotes of the identified micro-foundations of seizing capability

Micro-foundations of seizing	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
Delineating sustainable solutions and business models	Ideating and developing value propositions with environmental and/or social impact	Integrating environmental and social aspects in the core of the value proposition, building, for example, on CE strategies, though being sure to be also tackling a customer problem or tension, in order to have a market.	“It’s about finding that right balance, between solving a customer pain point and trying to reach our sustainability ambitions. So, any business model that just solves the environmental problem, but does not solve a customer tension, it’s not going to go anywhere. [...] the CE is better for us as a company and it’s better for the environment, but it’s not necessarily better for the customer. It needs to be a sort of triple win.” (Senior Director Sustainability, Electronics Ltd.)
	Designing and implementing the (sustainable/circular) business model	Having the ability to “think in business models”, to design them, validate them, acquire or transform specific business model elements, and implement the planned ideas.	“[...] the innovation in the business model is much more important. What the customers want is that they can advertise that they treat their own waste and that it’s coming back as the same or different product. At that time, we thought, if somebody delivers us coffee cups we could make hygiene paper and deliver it back. It’s easy said, but difficult to realize.” (Innovation & Business Intelligence Manager, Paper Ltd.)
	Generating business model architectures that can transform socio-technical systems	Designing business models that can have a direct or indirect systemic impact, beyond the business ecosystem.	“and we pushed on the European level on the flexible packaging Europe committee [...], we installed this value chain wide project. Not only were we approached by the Ellen MacArthur Foundation [...]. Responsible sourcing, aluminium stewardship initiatives, talking to indigenous people, and all other things, all this started by us.” (VP Group Sustainability, Packaging Ltd.)
Stakeholder engagement & collaboration	Engaging strategic partners in collaboration and co-creation	Identifying and involving partners that complement the capabilities and resources early in the innovation process, engaging in collaboration and co-creation.	“[...] you cannot do it by yourself, even though we are a large company. Circularity is something you must do within an ecosystem, with other companies. So, we created Partner Days to start this conversation with the most important suppliers. We also needed them to think more circular, so, we did product design with parties from the whole circle around the table”. (Director Strategy & Sustainability, Logistics Ltd)

(Continues)

TABLE A2 (Continued)

Micro-foundations of seizing	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
	Engaging customers early in the innovation process	Involving potential users early to co-develop solutions, identify their needs, validate assumptions, and test innovations.	“If you want to compare, what we really did differently with [Case M] is that we have been involving customers early in the process, very early. With [Case L] we developed the product in-house, and then we took it into the market. With [Case M] we have been from early phase talking with customers, like Lean Start-up approach.” (Director Strategy & Sustainability, Logistics Ltd)
	Engaging an interdisciplinary team to participate in the innovation process	Developing circular and sustainable business models within a multidisciplinary team that incorporates the technical, financial, sales/consumer, and sustainability perspectives.	“As soon as we start a project, at a very early stage, in R&D, we involve sustainability, [...] we do not want to develop new things that are from a sustainability point of view worse than we did before. It should always be an improvement”. (Senior Manager Sustainability Integration, Textile Ltd.)
Supporting a sustainability & innovation culture	Articulating a clear and ambitious sustainability vision	Developing a clear and ambitious vision of the role of the firm in a sustainable future, a “north star” to guide and inspire the organization throughout the innovation process.	“Without a vision of the future, you mainly see costs and threats, not new opportunities and returns [...]. You should trigger yourself and be more ambitious. Once you know what you should do, you start to get into a zoom-in mode, but if you do not know what to do, all solutions are open.” (Head of Sustainable Development, Carpets Ltd.)
	Developing a sustainability strategy and culture	Creating a specific sustainability strategy, aligned or embedded with the corporate strategy. Generating and promoting a sustainability-oriented organizational culture.	“That does not work with a traditional business strategy that, when it comes out, also tries to take sustainability into account: sustainability is, therefore our business strategy.” (Head of Sustainable Development, Carpets Ltd.)
	Developing and supporting an innovation and continuous improvement culture	Installing an innovative organizational culture that promotes and celebrates both disruptive innovation and continuous improvement.	“As we are in the spirit of being kind of an innovation leader in the industry, also the organization has the structure that allows this spirit. We allow some crazy things. And we also have the equipment, a small testing unit and so on.” (Head of Product Management, Textiles Ltd.)

TABLE A2 (Continued)

Micro-foundations of seizing	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
	Educating workers in sustainability and empowering them to propose innovations	Training and building collaborators capacities on sustainability topics, encouraging, and promoting to propose innovations.	“Empower people, also internally, create opportunities to internal entrepreneurs [...]. We have this program [...], that has been creating Ambassadors, that are also sharing, with suppliers and customers. Whatever role you have at [Carpets Ltd.] you are our eyes and ears to the outside world.” (Head of Sustainable Development, Carpets Ltd.)

TABLE A3 Description and exemplary quotes of the identified micro-foundations of reconfiguring capability

Micro-foundations of reconfiguring	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
Co-specialization of assets	Prioritizing strategic fit of resources and capabilities	Prioritizing projects that fit existing organizational capabilities and developing or acquiring resources and competencies that are value enhancing.	“That's an important learning. Whatever you do, it must meet with what you do well as an organization. There are hundreds of ways to make money in a circular economy, but there are maybe only ten that fit with what you do well as an organization.” (Senior Director Sustainability, Electronics Ltd.)
Organizational flexibility	Implementing experiments/pilots to validate, learn, and adapt quickly	Identifying your model assumptions and testing them early, to decrease uncertainty and risk. Doing experiments, prototypes or pilots, learning and adapting projects accordingly.	“I think very important is the lean kind-off start-up mentality. We would advise any other organization: Start small, pilot, and fail quick. We do a lot of small pilots. The change towards circular business models is so messy and so disruptive that is also impossible to detail everything into a business model”. (Senior Director Sustainability, Electronics Ltd.)
	Build decentralized (sustainability-oriented) innovation teams and allow flexible organizational structures	Promote intrapreneurship and facilitate the organizational structure alternatives to implementing the novel (circular) BM, for example, corporate start-up or spin-off. Provide needed flexibility and develop organizational ambidexterity.	“At the beginning they were looked as a start-up, being located elsewhere, on the campus but in a different building. They had the resources of a big company, but they were on their own, having innovative ideas.” (Sustainability Intern, Logistics Ltd.)

(Continues)

TABLE A3 (Continued)

Micro-foundations of reconfiguring	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
Trust-building communication	Having a fact-based consistent and transparent external communication	Ensuring consistent and transparent external communication once innovation implementation starts, as this creates necessary trust and engagement of stakeholders.	“Keep your external communication consistent and try to avoid pitfalls. Be factual as much as you can. And be honest. If it does not work, it does not work. [...] The consistency and knowledge that we were pushing into the market created trust [...]. It's also to invite others, inclusiveness, to help you solve your issue. That does not necessarily mean you have to throw your secrets on the streets, but you have to create an understanding and awareness in your customer base, and also in society, of how big your challenge actually is.” (Director Sustainability, Carpets 2 Ltd.)
Ecosystem orchestration	Skills to integrate stakeholders and coordinate partners in the business ecosystem	Building up the capacities to identify, manage, and coordinate the strategic partners of the business ecosystem. Setting up the right incentives, managing communication and responsibilities.	“We found out that making things circular always needs four companies, to make a complete circle. This is the bank, that produces coffee cups, these coffee cups have to be collected by a waste management company. It has to be cleaned, separated, bundled. We only convert the bundles of five to eight hundred kilos of these products. And then they have to be brought to us. We then can use this to make hygiene paper. This hygiene paper has to be distributed by a distributor to this end customer.” (Innovation & Business Intelligence Manager, Paper Ltd.)
Leadership and change management capabilities	Commitment and support from top management (key role of leadership)	Top management commitment is crucial for the success of the innovation process. If they are not the initiators of the initiative, engaging them early can accelerate the process and provide needed resources.	“By continuously challenging the system, with a strong CEO push, it pushed the whole Cradle-to-Cradle mindset through the company. [...] The only person you need is the CEO, if the CEO is on board, you are there!” (Director Sustainability, Carpets 2 Ltd.)
	Proficiency at organizational change management	Effective implementation of the planned change. Preparing, managing, and reinforcing the change, focusing on the “people side” of change.	“[...] Some people [within the firm] were irritated, because it is a change, and it is very complex to understand. So, we set educational platforms where we had lessons to educate them. But some old foxes are not so interested in this, but they cannot keep going like these, they are facing internal pressures.” (VP Group Sustainability, Packaging Ltd.)

TABLE A3 (Continued)

Micro-foundations of reconfiguring	First-order practices (i.e., skills, processes, procedures, and activities)	Practice description	Exemplary quote
	Implementing specific sustainable and circular KPI's	Designing, communicating, and monitoring specific key performance indicators (KPIs) oriented at managing the sustainability/circularity performance.	“The circular revenues are about existing strategies. A financial measure of our circular activities, but this does not say yet that we have a clear strategy. What would make sense is to have a circular strategy by business, [...] but for them is easier that we start with very concrete pieces of work, that's why we have Circular Projects KPIs, and no Circular strategy implementation KPI.” (Business partner for Sustainability, Electronics Ltd.)