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Research paper

The role of interactions in business network transitions toward circular business models☆

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ABSTRACT

Circular economy (CE) is getting increased attention from industrial actors as a response to sustainability concerns. In the industrial business network, CE enables firms to transition from linear to circular business models (CBM), requiring structural change and interactions that unfold during the process. The nature and role of these interactions during and for the transition to CBM is underexplored. Using a process-oriented case study approach, we examine a single in-depth case of a firm shifting its business from linear to circular, showing how interactions can trigger, support or hinder the transition, developing throughout this process at different firm, buyer-supplier relationship and network levels. This study advances CBM research by combining the industrial marketing and purchasing (IMP) conceptualizations with multi-level perspective (MLP) on sustainability transitions, situating micro-level interaction processes within the *meso* and macro context of CE transitions. The study shows that existing interactions generate the triggers that initiate circular transitions, and as the transition unfolds, new interactions emerge and cascade across firm, dyadic, and network levels. A multi-level framework explains how the nature of interactions develops from latent interactions to triggers and then cascade to shape the transition. For managers, circular transitions require ongoing, iterative engagement and trust-building with internal teams, suppliers, and customers, to create the underlying environment for circular practices.

1. Introduction

Business networks are evolving as society is moving toward becoming more sustainable. One important development is the shift from linear to circular business models (CBMs), where firms redesign activities to circulate products and resources. CBM refer to configurations of activities and relationships through which firms enable the circulation, reuse, and extended life cycles of products and resources, enacted through inter-organizational coordination and formalized collaboration across supply chains rather than isolated firm-level actions. Several studies point to the importance of business network interactions in the transitions from linear to CBMs (Geissdoerfer et al., 2018; Vellesalu et al., 2025), particularly in enabling resource sharing, innovation, and coordination among firms (Kanda et al., 2021; Aarikka-Stenroos et al., 2022; Franzò & Urbinati, 2023). These interactions span intra-firm dynamics, dyadic coordination, and network-level initiatives, each with distinct but interconnected challenges (Huemer & Flygansvær, 2025; Keränen et al., 2023; Sairanen et al., 2024). A multi-level approach is therefore necessary to understand how CBM transitions unfold and how actors coordinate across boundaries.

While the importance of interactions in circular transitions has been acknowledged, much of this work conceptualize interactions as reactive responses to external pressures, such as regulatory changes or supply chain disruptions (Bocken et al., 2018; Geissdoerfer et al., 2018; Jäger-Roschko & Petersen, 2022; Ranta et al., 2020; Schurr et al., 2008). Some studies (including Schurr et al., 2008; Halinen et al., 2012; Hasche et al., 2025; Vellesalu et al., 2025) have emphasized that interactions can also be proactive, generative, and iterative. In this study, we build on this latter stream of research and argue that interactions play an iterative and generative role during the transition process. Some of these interactions are latent, embedded in existing relationships as background practices, tensions, or visions and shape the conditions that eventually give rise to new triggers. However, the dynamic role of interactions in transitions to CBMs, particularly how they change over time and across relational levels, remains underexplored.

Therefore, this study aims to examine how interactions not only respond to but also generate and support (/hinder) transitions toward CBMs in industrial business networks. We follow the industrial

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marketing and purchasing (IMP) approach to interactions. In this stream of literature interactions encompass actor bonds (relational and organizational ties), resource ties (linkages of technical, financial, and knowledge assets), and activity links (coordination of operational and strategic tasks) (Håkansson & Snehota, 1995). CBMs require more frequent and complex interactions than traditional linear business models (Geissdoerfer et al., 2018), and often involve new actors, new resource exchanges, and new collaboration structures (Bankel & Govik, 2024).

To further situate our multi-level approach, we draw on the Multi-Level Perspective (MLP) from sustainability transitions literature (Geels, 2002), which conceptualizes transitions as unfolding across niche (micro), regime (*meso*), and landscape (macro) levels. MLP highlights how macro level pressures such as regulatory shifts, market disruptions, and societal expectations, can destabilize established industry practices and open windows for innovation. However, while MLP provides a valuable framework for understanding how transitions unfold, it tends to emphasize structural dynamics and macro-level pressures (Daniel, 2022; Geels, 2011), it often underrepresents the day-to-day processes through which change is enacted within and between organizations. What is often missing in this perspective is attention to the relational and interactional mechanisms through which transitions take place in practice including how actors negotiate, adapt, and co-create new practices. Our study complements this view by focusing on the involvement of interactions, within and across intra-firm, dyadic, and network levels, that shape and are shaped by the transition to CBMs.

Against this background, in this study, we aim to elaborate on how interactions within and across multiple levels of business networks (namely intra-firm, dyadic, and network) are involved in and developed throughout the transition from linear to CBMs. Such transitions have been identified as particularly interesting to study from an industrial network perspective (Bizzi & Langley, 2012). More specifically, we look at triggers (i.e., critical events or shifts that punctuate ongoing processes (Halinen et al., 2012; Schurr et al., 2008)), and examine how these triggers activate, shape, or hinder interactions across intra-firm, dyadic, and network levels over time. Triggers can take multiple forms such as external shocks, gradual developments, internal strategic decisions, or dyadic operational problems, but share the defining feature of punctuating ongoing interaction processes and activating change across levels.

The paper takes a process-oriented case study approach, longitudinally investigating a single in-depth case, where a firm transitioned one of its transactions with a given customer from a linear to a CBM under conditions of global disruption and resource scarcity. This provided an opportunity to closely observe and analytically trace the interactions between business network actors from the focal firm's perspective in the context of our study.

The findings of this paper contribute to our understanding of the dynamic role of interactions in shaping circular economy (CE) transitions in industrial settings. This study contributes to the emerging literature on industrial marketing and CE, which point to how interactions influence and shape transitions to circularity (e.g., Huemer & Flygansvær, 2025; Vellesalu et al., 2025). Our study provides a processual, multi-level perspective on how interactions change and shape transitions to highlight their dynamic and generative nature. The study shows how interactions on different levels, namely firms, dyads, and networks, engage in iterative cycles of learning, adaptation, and process standardization. The paper contributes to the ongoing discussion on how business-to-business (B2B) relationships change, as firms embrace CBMs (Aarikka-Stenroos et al., 2022; Sairanen et al., 2024). By integrating insights from MLP with an interactional lens grounded in industrial marketing, we aim to contribute to a more nuanced understanding of how circular transitions develop through cross-level interrelations. MLP frames the context and pressures for transition, while IMP reveals the micro-level processes and relationships that drive and shape those transitions in practice. Conceptually, we extend IMP scholarship by showing how triggers originate within existing interaction processes rather than arriving only from outside the network and contribute to CE literature by explaining the relational mechanisms through which circular transitions unfold across firm, dyadic, and network levels. These triggers set off cascading interactions across levels that shape how CBMs emerge in practice.

The paper is structured as follows. First, the theoretical background is presented, and the methodology is explained followed by the case description. Thereafter, the case analysis is presented, followed by discussions and conclusions.

2. Theoretical background

2.1. Interactions in business networks

In business networks, interactions are defined as the processes through which actors in networks engage with each other, exchange resources, and adapt to one another's needs and expectations which are characterized by mutual dependence, trust, and adaptation (Håkansson, 1982). Interactions are influenced by past experiences as well as the broader network context (Ford et al., 2011). Interactions evolve in response to critical events within business relationships, as shifts in resource ties, activity links, or actor bonds can either strengthen or weaken relationships over time driven by endogenous as well as exogenous factors (Schurr et al., 2008).

Business actors cannot achieve sustainability in isolation; rather, they must interact in multi-actor networks, including suppliers, customers, policymakers, NGOs, and industry alliances (Ryan et al., 2012; Harrison et al., 2023; Vellesalu et al., 2025). Harrison et al. (2023) argue that business networks undergoing structural transformation to become sustainable need to be further investigated as still many challenges are not fully understood. Following the definition adopted in our study, a CBM it is understood as the configuration of interdependent activities and relationships that organize how value is created and captured through circular practices (Aarikka-Stenroos et al., 2022). Empirically, this comprises product life-cycle activities such as reuse, refurbishment, and reverse logistics, as well as the contractual, organizational, and relational arrangements through which these activities are coordinated by actors across firm, dyadic, and network levels. From this perspective, business models are brought into being through interactions and transformed through ongoing interactions among actors.

Interactions in CBMs involve both internal restructuring and external coordination with actors requiring firms to integrate with multiple supply chains and adapt resource exchanges to facilitate e.g. circular product development (Vellesalu et al., 2025), and reuse and recycling (Huemer & Flygansvær, 2025). Firms act as central actors in CE implementation, but their ability to adopt circular practices often hinges on network-level interactions (Rizos et al., 2016), such as industrial symbiosis networks that facilitate resource sharing (Lieder & Rashid, 2016). Business actors interact in networks to develop industry norms, which has implications not only within the particular industry, but throughout the society (Aarikka-Stenroos et al., 2022). In order to demonstrate the multi-level interactions in CE, Vellesalu et al. (2025) show how actors at the micro, *meso* and macro levels interact in business networks, thereby enabling a network's transition to CE. Interactions in business networks are important for managing supply chain disruptions that result in resource scarcity, which could be triggered by shocks or impactful events (Tunisini et al., 2023). Episodes are interaction sequences activated by a trigger (Håkansson, 1982; Medlin, 2004; Schurr et al., 2008), unfolding as supporting and hindering interactions across firm, dyadic, and network levels.

2.2. Multi-level perspective on sustainability transitions

The MLP framework captures the dynamic patterns in socio-technical transitions (Geels, 2002). It encompasses three different levels: niches, regimes and landscapes. The niche level is the micro level,

where innovations are developed, often by a group of actors that go against the mainstream market (Geels & Schot, 2007). The regime is the *meso* level, consisting of incremental processes, where technology, user practices, symbolic meaning of technology, infrastructure, industry structure, and policy and techno-scientific knowledge co-evolve and are interlinked (Geels, 2002). At the meso/regime the dominant practices, rules, and institutions structure the industry. The landscape forms the macro level, where changes in the landscape may push regimes to change, which opens for niche innovations. At the macro/landscape level, the broader societal, political, and environmental factors shape and pressure regimes and niches. These levels interact with one another, and landscape pressures (e.g., regulatory shifts, societal demands) can destabilize regimes, enabling niche innovations to scale, while successful niche innovations can, over time, reshape regime structures and influence landscape narratives.

The MLP framework is useful to address sustainability challenges and sustainability transitions as it provides an analytical lens for interactions on three levels: niche, regime and landscape (Geels et al., 2017). It has been applied in several empirical contexts, such as e.g. energy (Geels et al., 2016; Osunmuyiwa et al., 2018) and mobility (Berggren et al., 2015; Köhler et al., 2020). The sustainability transition goes beyond adopting the new innovation, it includes investments in new infrastructure, development of new markets, new preferences and user practices (Geels et al., 2017).

Triggers in MLP are typically framed as pressures or disruptions originating at the landscape level, such as regulatory shifts, societal demands, or technological breakthroughs, that destabilize existing regimes and create windows of opportunity for niche innovations (Geels, 2010, 2011). Triggers are not always external shocks though and can also be gradual changes that accumulate over time and reach a tipping point, what we mark as a beginning of a transition process in our study. These triggers are not isolated; they often move across levels, initiating changes in dominant practices, actor configurations, and institutional arrangements (Kang et al., 2023). For instance, a regulatory push at the landscape level may compel regime actors to adapt, which in turn enables niche-level experimentation to scale (Ahmadov et al., 2025). Here feedback loops are important, where changes initiated at one level, such as successful niche innovations, can reshape regime structures or influence landscape narratives over time (Geels & Schot, 2007).

While MLP traditionally focuses on structural pressures across niche, regime, and landscape levels, emerging work argues for a more interactional understanding of how transitions unfold (Colovic et al., 2025). Ahmadov et al. (2025) argue that a comprehensive understanding of circular transitions requires examining how actors and mechanisms interact across micro, *meso*, and macro levels, and how these interactions shape the trajectory of change. By integrating MLP with an interactional lens from industrial marketing, this study seeks to investigate how cross-level interactions actively shape and are shaped by transition processes within firms, dyads, and networks, offering a more granular view of how CBMs emerges and evolves in practice.

2.3. Interactions in transitions

The IMP framework can help us understand the role of interactions in the transition to CE better. In transition studies (like the MLP), researchers often focus on macro-level structures (e.g., policy, culture, industry norms) and meso-level regimes (e.g., dominant practices, institutions). These studies sometimes lack detail on how change happens in practice, the day-to-day interactions, through which actors negotiate and adapt. Taking an IMP-based interaction lens allows us to capture the fine-grained, relational processes, the actual interactions, that drive change. These are often underexplored in transition theory. While transition theory (e.g., MLP) provides a valuable macro-structural view of sustainability transitions, our approach complements it by focusing on the evolving interactions that shape and are shaped by these transitions across levels.

The MLP's levels (niche, regime, landscape) are conceptualized differently from IMP's levels (firm, dyadic, network). While MLP provides a structural, systemic view of transitions, IMP offers a relational, interactional lens focusing on how actors negotiate and adapt within and across levels. We combine these perspectives to show how interactions (at the IMP levels) drive and shape transitions across system levels (adapted from MLP). The IMP levels are not isomorphic with MLP's niche, regime, and landscape only. But also, they offer complementary analytical lenses. By integrating MLP's macro-structural perspective with IMP's micro-level interactional lens, this study provides a more nuanced understanding of how circular transitions are driven by cross-level interactions. Feedback loops refer to interaction outcomes that feed back into the system across levels, either reinforcing emerging routines or generating new triggers (Geels & Schot, 2007; Halinen et al., 2012). Our analysis highlights bidirectional feedback loops where not only do landscape and regime pressures shape firm and network interactions, but iterative interactions within business networks also feed back to influence regime and landscape dynamics. Thus, our main contribution lies in demonstrating how interactional mechanisms across IMP levels actively shape and are shaped by systemic transitions conceptualized in MLP.

By treating these perspectives as complementary lenses, we show how cross-level interactions (within firms, between partners, and across networks) actively contribute to the unfolding of CBM transitions (see Table 1). Our primary contribution is to the IMP literature on interactions in business networks, through our understanding of triggers and the identification of interaction cascades across firm, dyadic, and network levels. MLP situates these interactions within the broader dynamics of sustainability transitions, providing context for where and why pressures arise. This approach enables us to capture not only how pressures (or triggers) initiate change, but also how iterative, bidirectional interactions reinforce, redirect, or even generate new transition dynamics over time, emphasizing the relational mechanisms through which system-level pressures and triggers play out in practice.

3. Methodology

3.1. Research design

The study takes a qualitative case study approach by conducting a single longitudinal case study. Case studies are particularly suitable for examining contemporary phenomena within their real-life contexts

Table 1
Complementarity between IMP and MLP perspectives on circular transitions.

	IMP contribution	MLP contribution	Complementarity between IMP and MLP
Triggers	Triggers emerging from existing interactions across levels: firm (CEO's vision for reuse), dyadic (contract renegotiation with customer), network (chip shortage response)	Landscape/ regime-level pressures (e.g., regulatory shifts, resource scarcity, industry norms) that destabilize existing practices and open windows for change	Explains why the same external pressure activates change at some levels and not others, depending on existing relational readiness
Interactions	Cascading interactions across firm (internal routines, new roles), dyadic (incentive agreements, return contracts), and network (supplier collaboration, industry standardization)	Change as movement and feedback loops across niche-regime-landscape levels over time	Shows how systemic pressures are translated into concrete, level-spanning interaction cascades, and how these cascades feed back into broader practices

(Halinen & Törnroos, 2005). Capturing the context is central to our aim of understanding how the firm adapted its business model. With the interaction lens as a starting point, we aim to study how interactions can trigger, facilitate, or hinder the transition toward CBMs. A significant advantage of using a single case study is its ability to thoroughly examine a phenomenon at a deeper level compared to other research methods (Voss et al., 2002). The goal is to highlight a significant case, emphasizing a nuanced understanding. In longitudinal studies, the process involves observing, tracking themes and trends, identifying patterns, and then either confirming or disconfirming these patterns, allowing the study to progress (Pettigrew, 1990).

To thoroughly understand the dynamic and evolving nature of interactions during a transition from linear to CBMs, we adopt a *process-as-evolution* approach (Grimm et al., 2024). This methodology focuses on analysing interactions over time by documenting temporal sequences of interactions and episodes (Medlin, 2004) that drive these changes. This approach emphasizes the interconnectedness of activities, providing a comprehensive understanding of how the firm navigates and transforms its interactions and business model over time. Process research, therefore, empirically examines evolving phenomena and incorporates temporal progressions of activities as key elements of explanation and understanding (Langley et al., 2013).

Given the longitudinal nature of this study, we focus on sequences of intensive data collection using various techniques spread over three years. This case study design allows for the collection of rich and detailed data on the firm's motivations, expectations, challenges, and nuances in changing its business model (Eisenhardt, 2021), allowing time for events to unfold. The longitudinal approach also enables us to follow the firm's reorganization over time. This method is informed by Pettigrew (1990)'s longitudinal study framework and the principles of process studies (Langley, 1999; Langley et al., 2013). Process studies focus on evolving phenomena and data collection involves iterative processes of observation and verification, allowing for a comprehensive examination of the firm's adaptations over time. Process research has been useful in business network research (Chou & Zolkiewski, 2012; Makkonen et al., 2012).

The case in our study is TEMP's CBM implemented for one specific product line (temperature loggers) within one focal customer relationship. Accordingly, the analysis focuses on the activities and interactions through which this product line is produced, delivered, used, returned, refurbished, and redeployed in collaboration with the focal customer and selected upstream and downstream partners. Other product lines, customers, and related activities fall outside the scope of this study. Before the transition, TEMP operated a linear business model in which loggers were produced, shipped, used once, and invoiced per unit delivered. After the transition, the model shifted to a circular configuration based on return, refurbishment, and redeployment of devices, with revised contractual arrangements defining responsibilities, incentives, and payment logic with the focal customer. These changes formalized the CBM in practice.

TEMP was initially a five-person company in 1992 that grew driven by a niche focus on the pharmaceutical industry to 47 by the end of 2024. It has always been a company that primarily operates in the field of temperature and data monitoring solutions, particularly for the logistics and supply chain industry. TEMP provides monitoring devices, often referred to as "loggers", that track and record various data points, with a strong emphasis on temperature monitoring. The data logger contains a sensor to receive the information and a computer chip to store it. These loggers are used to monitor the environmental conditions of shipments, ensuring that products requiring specific temperature or environmental conditions, such as pharmaceuticals, remain within the required ranges during transport. TEMP provides software and IT devices to the life science industry.

The pandemic significantly impacted businesses that provide automated parcel tracking for items like vaccines and other goods that need temperature-controlled supply chains (Singh et al., 2020). The "chip shortage" issue, stemming from prolonged interruptions during the pandemic, brought about a domino effect across various sectors (Marinova & Bitri, 2021). This includes companies such as TEMP, which initially operated under a traditional, linear supply chain, and while not directly in the semiconductor industry, rely on electronic devices and their associated components but found itself at an opportunity within this paradigm.

The chip shortage impact on TEMP becomes particularly significant when considering their essential role during the pandemic. At a time when the world was grappling with the pandemic and the urgent need for vaccine distribution, TEMP was one of the companies which was instrumental in providing temperature control solutions. These businesses have come under a lot of pressure to make sure that vaccinations are carried out and maintained at the proper temperature to preserve their efficacy due to the increased demand for vaccines worldwide (Khan Amin & Ali, 2022). The CEO introduced its CBM to reuse the existing products and hence reduce dependence on the supply of electronics, as a response to the chip shortage crisis of 2019. This transition was supported by a fundamental change of the firm's interactions at multiple levels. Hence, TEMP has developed a system for collecting and re-using its products on the industrial market.

We used purposeful sampling, which is crucial for process studies as it influences the inferences drawn and the potential for transferability (Grimm et al., 2024). The case in our study, TEMP, was selected because it could be examined over a defined time horizon, spanning before the transition (baseline) prior to 2021, during the transition (implementation) during 2021–2022 when circular activities were introduced, and a after transition (consolidation) from 2023 to 2025 during which these activities became embedded. Within the defined product-customer scope, TEMP's transition represents a complete reconfiguration of the business model in line with our CBM definition, while remaining partial at the firm level across other products and customers.

TEMP's transition from a linear to a CBM with a specific customer, under conditions of global disruption and resource scarcity, provided a rare opportunity to closely observe how interactions evolve within the firm, with buyers and suppliers, and across the wider network in real-time. This made TEMP particularly suitable for studying the interactional mechanisms that shape circular transitions, offering insights that would be difficult to capture in more partial or incremental cases. The process was understood as it unfolded during the research process and building on real-time data. This case is valuable for our study because it underwent its transition from a linear to a CBM for one of its key customers. The customer is a large leading pharmaceutical company with multiple geographical locations that use TEMP's product. The conditions surrounding this case made it an ideal fit for studying how interactions trigger circularity and what interactions for circular transition were taking place at different levels over time within a change that is still new to industrial marketing research.

3.2. Data collection

Data was collected between 2021 and 2025 with waves of data collection and time in between. Varying data collection techniques including interviews, site visits, presentation/discussion sessions, and secondary data sources were used to gather sufficient data, with the aim of covering a full range of relevant views in the specific setting of the study (see Table 2 for the details). The firm introduced the shift to CE in the Spring of 2021 with the triggers identified in our study, and by the end of data collection in this paper, had managed to enter routine activities related to the CE with its key customer.

The semi-structured interviews were conducted with key stakeholders at TEMP. Participants were purposively selected through a snowball technique based on their roles and expertise relevant to the research objectives. An interview guide was developed to include topics such as the background of the individual and company, the circular transition, developing partnerships, interaction with other actors,

Table 2
TEMP firm description and sources of data.

	Data source	Duration /amount	Date
1	Interview with CEO	60 min	May 2021
2	Roundtable discussions (on flexibility of responses to Covid-19)	3 h online	December 2021
3	Presentation by CEO	45 min in person	March 2022
4	Presentation by head of design	30 min in person	Sept 2022
5	Site visit 1	40 min	Sept 2022
6	Interview with head of design	60 min online	Oct 2022
7	Site visit 2	60 min	May 2023
8	Interview with CEO	65 min online	June 2023
9	Published report on "A sustainability analysis of the electronic components" with TEMP	1 report (61 pages)	July 2023
10	Interview with COO	50 min online	July 2023
11	Interview with the Head of Supply Chain & Trade Compliance	45 min online	August 2023
12	Interview with the Head of Supply Chain & Trade Compliance	45 min online	September 2023
13	Interview with the key account manager	55 min online	September 2023
14	Published case study of TEMP and a customer	1 report (7 pages)	September 2023
15	Interview with the chief revenue officer	45 min online	March 2024
16	Interview with the global sourcing manager of one of TEMP's key customers	60 min online	May 2024
17	Interview with the global sourcing manager of one of TEMP's key customers	50 min online	February 2025

regulatory issues, and challenges. These interviews are carefully designed to extract comprehensive insights into TEMP's journey toward a CBM, covering aspects such as the triggers that initiated change and the interactions leading to those triggers.

Two site visits to TEMP's headquarters in Stockholm were undertaken at different points in time to gain firsthand observations of the operational aspects related to its CE practices. This includes witnessing processes such as the calibration of temperature loggers, recycling procedures, and refurbishment activities. The site visits supplements interview data by providing contextual information and enhancing researchers' understanding of TEMP's organizational infrastructure and logistical challenges associated with a CBM. A 3 h online, roundtable discussion was carried out with the head of design, COO and the CEO of TEMP, 2 CEOs from similar SMEs engaged with circularity initiatives, and 6 scholars focusing on production systems. The discussion was structured around the reasons and motivations behind the shift to the CBM, the flexibility in response to Covid-19, and its challenges. The session was recorded and transcribed. The presentation instances were carried out in a discussion format, with the presenter introducing the main thoughts and ideas followed by discussions and questions from at least two of the authors presents. Furthermore, secondary data sources such as internal reports, documents, and presentations provided by TEMP are analysed to supplement primary data collection. The document analysis provided the researchers with insights into TEMP's organizational structure, historical context, policies, and industry dynamics, enriching the understanding of TEMP's circular transition.

3.3. Data analysis

Data analysis was conducted using an inductive coding approach, whereby collected data, including interview transcripts, observational notes, and documents, were systematically analysed to identify key themes, patterns, and categories. Following the suggestions in process research work (Langley, 1999) we combined different strategies for analysing process data. Visual mapping strategy was used to illustrate precedence, progression, and parallel processes. The data was closely examined to identify recurring themes and ideas related to TEMP's circular transition. Codes were iteratively refined and organized into a coding framework to facilitate data interpretation. To provide transparency in how we studied the interactions, extensive tables and illustrative quotes in the Appendix and analysis section (Table 3) were provided to show a clear audit trail from raw data to the framework (Fig. 5) presented in the Discussion.

The analysis and coding was guided by an analytical framework inspired by prior research on multiple levels in the work of Melander and Arvidsson (2021). While the interview guide was interaction focused and not explicitly structured around these levels, the analytical framework applied during data analysis and coding was explicitly level informed. Interactions were first identified inductively from the empirical material. In a subsequent step, each interaction was coded to a primary level based on where it predominantly unfolded. In the first round, the Appendix was structured with illustrative quotes showing initial (the first) and subsequent interactions across firm, dyadic, and network levels. The purpose of this round was to identify a turning point by tracing the first interaction associated with a trigger and the interactional responses that followed. Visual mapping was used an intermediate analytical step to understand how triggers and interactions were connected within and across levels. The visual mapping helped identify recurring patterns of interaction cascades and informed the abstraction of three empirically grounded interaction cascades. Fig. 3 summarizes the main triggers over time identified in the data, while Fig. 4 illustrates how these triggers activated interaction cascades across firm, dyadic, and network levels.

In the second round, these interaction sequences were further structured in Table 3. Here, we identified links between subsequent interactions and organized them into sequences of cascading interactions beginning with the initial interaction following a trigger. While all the subsequent interactions were part of the process, only interactions that could be linked back to a connected episode were coded as cascading interactions. In this step, three distinct cascades of interactions for structuring Table 3 were specified, where a trigger set off an episode of supporting and hindering interactions.

These cascades correspond to the interactional patterns illustrated in Fig. 4 and are detailed empirically in Table 3. These cascades are examples of interaction sequences that could be clearly traced in the data and not the only or definitive turning points. This structuring of interactions also allowed the identification of feedback loops in each episode, where the outcomes of interactions either reinforced emerging routines or redirected efforts toward new adjustments, shaping the overall process of TEMP's circular transition.

This iterative process allowed us to abstract the findings into the framework presented in Fig. 5 inspired by prior theory, drawing on the MLP for its temporal and multi-level orientation, and on the IMP tradition for its focus on interaction processes. Through this iterative visual mapping and coding (Langley, 1999), we abstracted recurring patterns into three empirically grounded interaction cascades (Table 3, Fig. 4) and developed a framework of interactional dynamics during CBM transitions (Fig. 5). This is consistent with our process-as-evolution approach (Grimm et al., 2024), which treats the temporal unfolding of interactions as material for analytical abstraction rather than only as a sequence of events reported.

Fig. 1 provides an overview of the longitudinal structure of the study and the temporal progression of the analysis. The time arrow at the top of the figure indicates the progression of the case over time, distinguishing the periods pre (baseline), during (implementation), and after the transition (consolidation). For each period, the figure highlights the core concepts that guided the analysis and shows how these relate to the tables and figures, and analytical techniques used in the study, while recognizing that the boundaries between periods are

Table 3
Triggers and cascading interaction sequences across levels.

Latent Interactions (leading to a trigger)	Trigger	Cascading interactions within episodes (supporting/hindering)			Feedback loops
		First cascade	**Second cascade**	**Third cascade**	
Due to the environmental concerns, stakeholders at different levels raise the need for regulatory action *(R12, R13)*	External regulatory and industry pressure created by policies, push the firm to act *(Q8, Q9)*	[Supporting] **Network level** Industry-wide collaboration, communication, and standardization occur (e.g., in response to regional environmental policies) *(Q29, Q30)*	[Supporting] **Firm level** (e.g., customer in the case study), internal processes shift, making them more open to the new business model *(Q14, Q15)*	[Supporting] **Dyadic level** New contracts and agreements are installed including new financial incentives, and liabilities *(Q20, Q43)*	Interactions at the different levels feed back into the policies, refining the existing ones and creating new ones
Top management engages internal teams to address cost and sustainability concerns with single-use loggers *(Q1, Q3, D2)*	Top-down strategic push for changing to a CBM *(Q1, Q3)*	[Supporting] **Firm level** Internal routines and CBM implementation with active monitoring and enforcing product returns *(Q14, Q17, R18)*	[Supporting] **Dyadic level** Coordination extended to contracts, incentivizing and improving control over returns *(Q20, Q22, Q23)*	[Hindering] **Firm level** Internal discussions target refurbishment improvements to scale circular operations, but also face system gaps *(Q19, Q40)*	Interactions across firm and dyadic levels generate insights that contributed to refining internal routines and effort to scale CBM
Engagement with the customer to introduce a CBM, limited interactions with upstream and downstream partners prior to the crisis *(S7, Q10, Q11)* Power asymmetries & geopolitical prioritization *(Q10, Q11, D36)*	Getting excluded (or not prioritized) from global allocation of scarce chips *(D36),* forced new interactions between suppliers and customer to adapt and secure continued operations *(Q10, Q11)*	[Supporting] **Dyadic level** Suppliers and their suppliers were engaged to prioritize components, using support from end customers to secure critical deliveries *(Q29, Q30, Q31)* [Hindering] **Network level** TEMP & Swedish customers lacked political leverage *(D36)*	[Supporting] **Network level** Collaboration with the customer led to mutual commitment to longer-term return flows, and leveraging customer support and supplier ties to gain priority allocations *(Q31, Q32, Q33, D34)*	[Supporting] **Firm level** Reverse logistics and inventory forecasting for reused devices are managed *(Q41, Q48, Q50)*	Cross-level interaction, between the firm, customer, and suppliers influenced reverse logistics and product design for refurbishment
Lack of accountability and motivation within specific customer functions hindered consistent returns *(Q6, D21)*	Use of incentives and contractual agreements to motivate consistent returns from the customer *(Q6, Q20)*	[Supporting] **Dyadic level** Incentive-based agreements were introduced to align return behavior *(Q20, Q22, Q24)*	[Hindering] **Firm level** Internal systems were built to monitor & manage returns but hindered by miscommunication within customer organizations across departments *(Q19, Q26, Q42)*	[Hindering] **Network level** Operational practices were standardized and shared across logistics partners but face return complexity *(Q47, Q55, Q56)*	Network and dyadic contractual agreements and firm capabilities come together and reshape product design and refurbishment practices

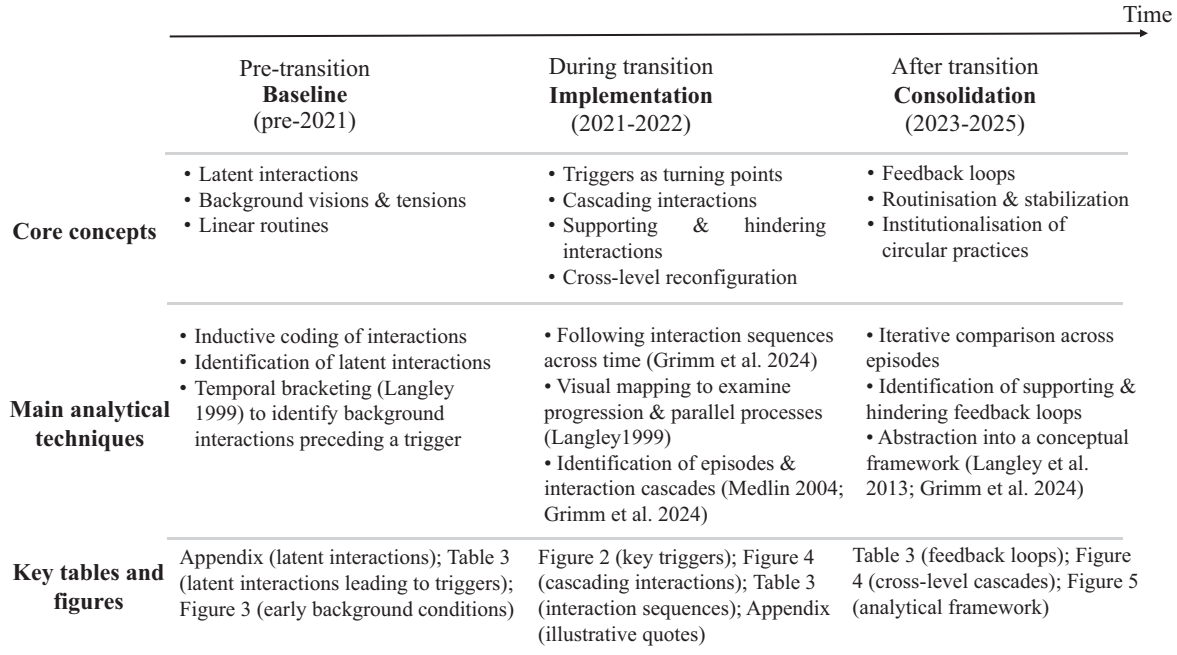

Fig. 1. Longitudinal structure of the case and analytical approach.

analytical rather than discrete.

4. Case description

During 2020 and following the Covid-19 induced disruptions, the demand for electronic components needed to manufacture products such as home office and at home entertainment equipment increased in the consumer industry. At the same time, the car industry's demand for electronic components decreased as their demand dropped. In the beginning (early 2020), the drop in demand was sufficient to satisfy global demands; however, when the Covid-19 crisis started to normalize, the demand from the car industry returned, and the demand from the consumer sector continued to be on higher levels. The mix of the requirements made the insufficient global capacity to supply the electronic components evident. This situation impacted TEMP's business and resulted in chronic shortages of electronic components in late 2020.

In this global shortage situation, political influence became evident. Big firms were able to rely on governments to push to prioritize their demands. Governments were able to influence who would be supplied first, which constrained TEMP as Sweden was a non-prioritized country and TEMP a smaller enterprise. As the CEO put it, *"we didn't get any priority. They [the USA] prioritized their own. We had no voice, and no one saw us" (D36) (See Appendix for the examples)*. The company needed to take quick, tactical actions in response to urgent challenges but also saw value not just in "fixing" the problem temporarily, but in working closely with suppliers and customers to develop solutions. TEMP representatives directly engaged with suppliers to advocate for the prioritization of their component volumes during the crisis by leveraging their strong relationships with large pharmaceutical customers. This approach aimed to secure a steady supply chain in the short term (early 2021) (Q*30, Q31)*.

TEMP communicated openly with their suppliers, even helping them secure critical resources by providing urgent letters from major customers to prioritize orders. Understanding the challenges faced by suppliers and offering support helped showcase TEMP's commitment to the suppliers' success in addition to their own. This act was not merely transactional but relational, signalling to suppliers that TEMP was invested in their mutual long-term success rather than treating them as just vendors. TEMP acknowledged the importance of fostering long-term relationships beyond the immediate crisis and the need to develop stronger relationships with these suppliers, potentially through collaborative problem-solving and creative solutions. As the CEO later explained, *"through a very close collaboration with the manufacturer, as we call front-loading, we could ensure regardless of what happened in the market situation, we still had our volumes" (Q29)*.

Faced with a critical component shortage, TEMP was forced to find alternative solutions to survive. The CEO had been collecting and storing defected, rejected, and returned products in his offices for years prior to 2020, hoping to develop a CBM. *"I kept a bunch of the loggers in my office in the corner just in case…. At one point I was forced to throw half of the stuff out …" (D2)*. The customers who did not want to share their stored data had refused the idea. The shortages, and the lack of alternative solutions,

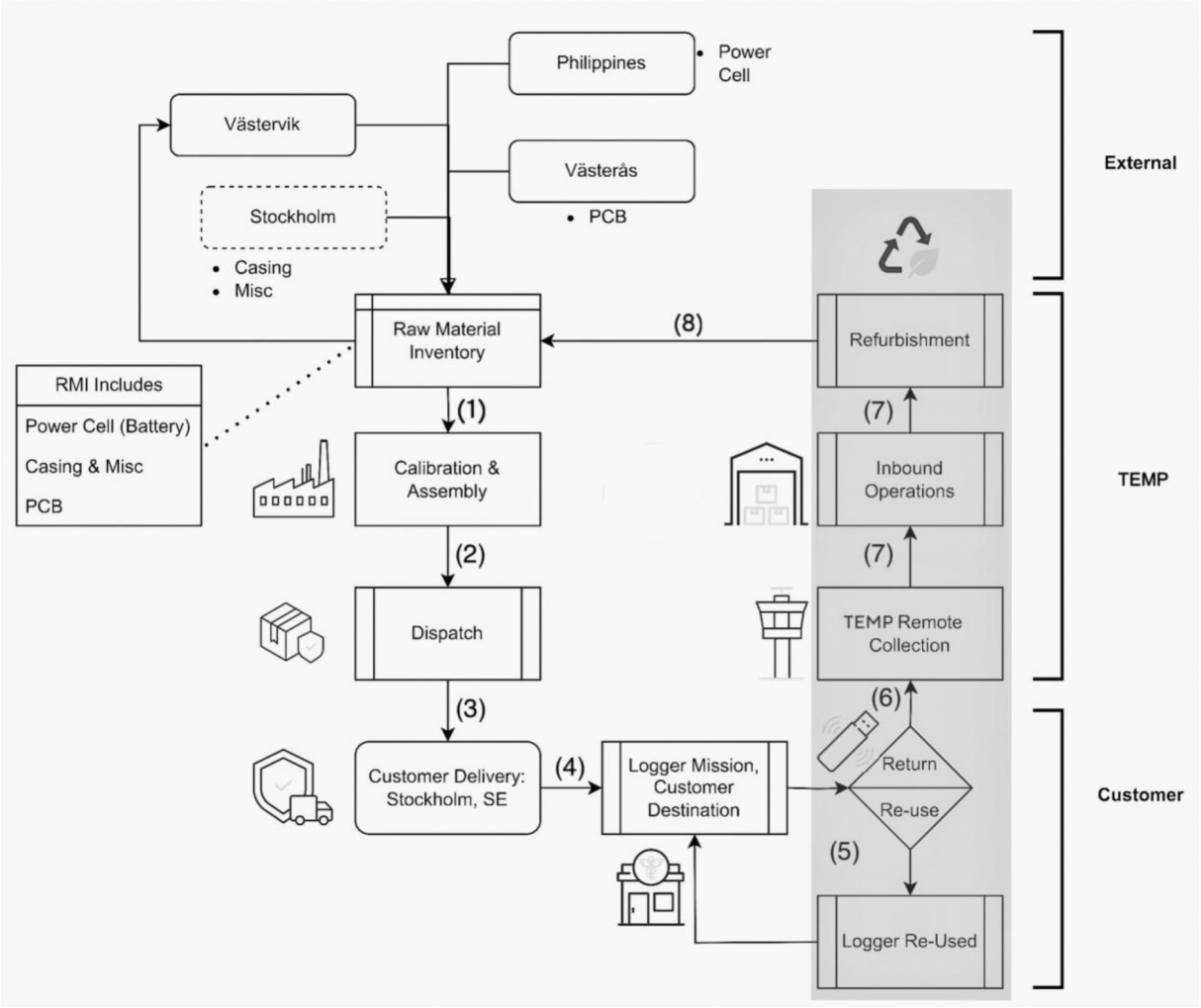

Fig. 2. TEMP's supply chain configuration following the implementation of circular activities.

made the customers come on board in mid 2021 which enabled a CBM.

Fig. 2 illustrates an example shipment and use of TEMP loggers in the focal product-customer setting. The figure supports the longitudinal analysis by visualizing the process elements that become introduced during the transition and stabilized after it. Steps highlighted in the shaded area represent circular activities and reverse flows that were absent before the transition and were implemented following the triggers in 2021. It shows the movement of a shipment case originating from Stockholm, SE to Memphis, KY, US, tracing the lifecycle of TEMP loggers employed in temperature monitoring missions from production to reuse that was introduced in 2021 and as it looked in the end of 2024. Following is a breakdown of the stages depicted in the figure:

#1: Calibration & Assembly: The ordered devices are manufactured in a make-to-order production line. Once completed, the order is forwarded to Dispatch for customer delivery.

#2: Customer Reception: The customer receives a set of 1000 loggers, each designated for specific temperature monitoring missions worldwide.

#3: Mission Launch: Using TEMP Software, the customer launches a device on a mission, selecting the mode of transportation. The device records temperature data throughout its journey, in this case, via air transport.

#4: Data Upload: Upon reaching the destination, the device is stopped, and its data is automatically uploaded to the TEMP Cloud. The destination may choose to reconfigure the device for another mission or hold onto it.

#5: Device Reuse or Return: If the logger is not reused, the destination stores it until a threshold of downloaded devices is reached (in this case, 200 devices). TEMP's Reverse Logistics Control Tower then arranges for the return of the devices.

#6: Collection: The devices, along with others accumulated at the location, are collected for return.

#7: Inbound Operations: Upon receipt, the devices undergo inbound operations, where they are refurbished. The refurbishment process involves dismantling and sorting the components, followed by quality control to verify component integrity and reusability.

#8: Component Reuse: Components that pass quality control are moved to the Return Material Inventory (RMI) and used in the next production run of TEMP loggers.

Through close interactions with component manufacturers open communication and a deep understanding of mutual needs strengthened these supplier relationships over time. This approach, built on close interactions with suppliers and customers, allowed TEMP's customer to avoid impulsive reactions such as production cutbacks and instead opt for, and trust in, the solutions provided, directly engaging with TEMP to assess the situation *(Q29, Q30, Q31)*.

TEMP's new business model relies on rescuing the company amid times of component shortages and allowing them to deliver solutions to their customer because of market flexibility. This innovative model utilizes alternative technologies such as advanced tracking software, and machine learning for logistics optimization, and ensures product lifecycle management. During the transition, TEMP also analysed the environmental effects of selling refurbished products in 2021 and adopted refurbished procedures both to ensure its sustainability and as an add-on selling point to its partners *"The results clearly indicate that the refurbishment, recalibration, and reuse approach had significantly lower impacts, compared to a single mission approach" (R18)*.

TEMP's external focus in 2024 was based on refining vendor selection and product design processes to enable contingency planning. Internally, efforts were directed toward enhancing the expertise of product owners, empowering them to assume long-term accountability for supplier relationships, a task presently overseen by the CEO. TEMP eventually intends to increase global redundancy through the establishment of different capacity locations in order to leverage regional infrastructure, national and international goals, and legal and regulatory frameworks.

5. Analysis

TEMP's circular transition was the result of many interactions that slowly built up, sometimes in the background, and then came together in more visible turning points. To capture this, we describe how latent interactions led into active triggers that acted as a turning point toward a CBM. In our case, triggers were seen as events that punctuate ongoing processes (Medlin, 2004) marking the moments when change becomes active interaction in the transition to a CBM. Each trigger set off an episode of interactions, cascading as supporting and hindering across different levels. Also, the feedback loops that either reinforced new routines or redirected the firm and its partners across levels. Table 3 brings together the latent interactions, the triggers they lead to, and the cascades of supporting and hindering interactions which move between levels. The table also includes the feedback loops, not only within levels but between them, as outcomes in one level feed into new adjustments elsewhere in the transition.

TEMP's shift toward a CBM was not a straightforward process but rather a series of cascading interactions across multiple organizational levels. The appendix provides quotes from interviews, roundtable discussions, documents, and observations, triggers and interactions organized by firm, dyadic, and network levels, and further separated into supporting and hindering interactions (see Appendix). At the firm level, TEMP's CEO initiated and legitimized a CBM by problematizing the unsustainability and financial inefficiencies of single-use loggers. His vision provided a foundation that later became crucial when external crises forced TEMP to reconsider the linear supply chain.

Once the shift began, **firm-level** routines had to adapt. Systems for forecasting and managing returns were introduced, but they also faced some difficulties. The COO explained, *"Some loggers disappear and they don't find them, and some throw them away because the information hasn't funnelled through all the way" (Q19)*. These challenges showed that while the vision and intent were strong, implementing circular practices required new forms of information sharing and coordination across internal functions. Over time, the company invested in strengthening its internal organization. New roles such as a logistics manager were created to handle the bidirectional flows of products, with the CEO acknowledging, *"we needed to strengthen that organization in order to drive that direction more efficiently" (Q40)*. Here, we observed that on the firm level, the circular transition was both supported by some interactions such as persistence and new structuring and hindered by other interactions such as fragmented routines and undeveloped established practices for reverse flows.

The move to a CBM could not succeed through internal effort alone. **Dyadically**, the relationships between TEMP and its customer were extremely important in enabling a CBM. It relied on the acceptance and adaptation of TEMP's customer. In some cases, incentives and penalties were introduced to encourage the return of devices. The customer gradually came to accept these terms, recognizing that access to products depended on participation in the CBM. These interactions gradually progressed from enforcement-based to more cooperative relationships *(Q20)*. This acceptance was not free of tensions. Negotiations with the customer usually revolved around the question of responsibility. As the CEO explained during the round table discussions, *"…but who should take the risks and the costs of e.g., the extra logistics. We need new contracts" (D27)*. The discussions showed how the process of becoming circular, while attractive in principle, created practical uncertainties in sharing costs and risks and faced hindering interactions as well.

In addition to contractual arrangements, customers actively shaped the transition by influencing TEMP's refurbishment and design practices. For instance, customer's need for flexible inventory management led TEMP to develop a control tower approach *(Q17),* while sustainability reporting requirements pushed the firm to adapt its service offerings *(Q24)*. Moreover, balancing customer demand with return flows shaped decisions about how many devices were refurbished versus produced new *(Q33)*. Such pressures meant that TEMP's CBM was not simply

rolled out to customers but co-developed with them, requiring iterative adjustments in both product refurbishment and service design.

There were also communication problems, as the customer with complex operations sometimes struggled to distinguish which devices could be reused and which to keep in circulation. The Head of Supply Chain of TEMP described, *"Our customer has a high employee turnover so we must communicate very clearly what devices they can still use, and which should be returned. Making it clear which products to return is always going to be a work in progress" (Q23)*. At the same time, the customer engaged and supported positively and even saw value in the system. The customer noted how the model improved their own efficiency: *"it means we don't have to send any products directly to them … if the inventory isn't moving, then they request the return back to Sweden and redeploy them somewhere else" (Q17)*. These dyadic interactions show the duality of support and hindrance. For instance, new contracts and shared incentives supported participation, but questions of accountability and communication continued to complicate and hinder the daily functioning of circular business network.

Beyond the customer, TEMP's transition was also shaped by interactions in the wider **network**. One of the most decisive external triggers was the global semiconductor shortage during the Covid-19 pandemic, which forced TEMP to reconsider its dependence on new components. The key account manager described, *"We went together with our supplier to their supplier of components and showed them a couple of letters from all our big customers. Where they said that it is really mission critical to get the components. If we don't then we can't ship medicine and, in the pandemic, it's devastating if we can't ship the vaccines for example, or other medicines. With that, we got prioritized." (Q31)*. These interactions supported TEMP's ability to secure components and demonstrated the importance of relational capital in times of crisis. At the same time, however, TEMP faced clear disadvantages as a small Swedish company without political leverage *(D36)*. These asymmetries highlighted the fragility of TEMP's position in global allocation systems and exposed vulnerabilities that circular practices alone could not resolve.

The regulatory environment of the pharmaceutical industry further complicated TEMP's efforts. Attempts to automate returns and scale refurbishment processes were slowed down by compliance requirements and industry standards. A document from TEMP observed that *"automating manual processes in heavily controlled industries, such as pharmaceutical manufacturing and logistics, is complex … often involves several stakeholders" (C37)*. These situations created hindrances at the network level. There were also supporting interactions. Circularity agreements became standardized in contracts with the major pharma customer, embedding return requirements into long-term relationships *(Q32)*. These agreements showed how network level practices had become institutionalized over time.

5.1. Latent interactions leading to triggers

Some of the most important triggers in the study can be better understood if we look back at the conditions that came in the pre-transition. In our analysis, we distinguish between latent interactions, practices, tensions, or visions that persist in the background of relationships but do not yet initiate visible change, from the moments when these interactions led to active triggers. They create a kind of potential that remains dormant until circumstances shift. They may turn into turning points or triggers when external events or the alignment with other latent interactions makes them visible or actionable and then, they set off new cascades of interactions. The CEO's persistence, for example, keeping boxes of old loggers in his office *(D16, D2),* was a latent interaction, a vision of circularity sitting in the background of the firm's daily operations. The chip shortage reconnected past practice (stored loggers) with the present crisis and pushed the network toward a new future turning this vision into a strategic internal push (reuse/circularity). What stands out is that this vision had been ongoing for years, long before 2020, but only gained relevance in mid-2020 when the shortage created the conditions for reuse to become viable.

Sustainability goals are another example of the move from latent interactions to trigger. For years, such goals can sit in the background and still require a particular alignment and reinforcement to become real triggers for a firm to transition to CBMs. The trigger came in 2021, when reports quantified the environmental footprint of electronics *(R12, R13)* and industry and regulatory pushes tied sustainability ambitions to concrete requirements *(Q8)* and saw CBMs as one of the solutions for becoming carbon neutral *(Q9, Q46)*. From that moment, what had long been background expectations became an active trigger, demanding new processes and agreements.

During the transition and implementation, at the dyadic level, when TEMP sought to formalize returns through contracts, the inefficiencies surfaced as a trigger for change. Attempts to motivate and incentivize the customer to test a CBM had persisted in the background during 2020–2021, until they led to active triggers at the end of 2021 when new contracts and penalties exposed the costs of inconsistent returns *(Q6, D21)*. Fig. 3 illustrates the four key triggers between 2020 and 2025, showing the approximate period when the triggers shifted from being latent interactions in the background to visible causes of turning points as triggers. Fig. 3 thus presents the triggers in the dimensions time and space (firm, dyad and network), similar to the work by Abrahamsen et al. (2012). Some of these triggers appeared suddenly, such as the chip shortage, others developed more gradually like the case of sustainability goals that gained force once linked to regulatory and industry pushes.

5.2. Cascading interactions across levels

Once these triggers were activated, often through the way actors interacted around external and internal events, the resulting interactions did not stay put at the existing level, but they cascaded across levels in the same episode. For example, regulatory requirements led the firm to start working with industry partners *(Q29, Q30)*. This, in turn, changed company processes *(Q14, Q15)* and influenced contracts with the customer *(Q20, Q43)*. When TEMP's CEO decided to introduce the CBM *(Q1, Q3),* a similar process occurred. The decision brought new routines in the company, affected dyadic negotiations and incentives *(Q17, R18)*, and revealed issues with refurbishment practices *(Q19, Q40)*. These examples show that interactions cascade in different levels instead of staying within one or in other words, how levels interact and not just what happens inside one level. An interaction at one level (e.g., a firm-level routine) generates new circumstances or requirements, such as rules, expectations, dependencies, incentives or challenges, that influence the dyadic or network level.

5.3. Feedback loops

After the transition, and as the process moved into consolidation, interactions became more routinized and formalized, though they continued to generate feedback loops that shaped further adjustments across levels. The outcome of each interaction feeds back into the system and influences the next round of interactions, sometimes reinforcing (supporting), sometimes creating tension (hindering further progress) and both could happen inside the same episode. So, the feedback loop is about how interactions evolve and move across levels and the supporting or hindering interactions indicate whether the effect of that loop supports or blocks circular transition. Each round of feedback loop doesn't end the process; it sets off another cascade of interactions. Because the feedback loops channel the outcome of each interaction into the system and shapes what comes next. Each interaction creates fresh outcome (e.g., accountability gaps, communication issues) which act as new triggers. The new triggers created start cascading again, moving across levels and repeating the cascade.

For analytical clarity, we structured each episode into three cascades, reflecting the firm, dyadic, and network levels in our framework.

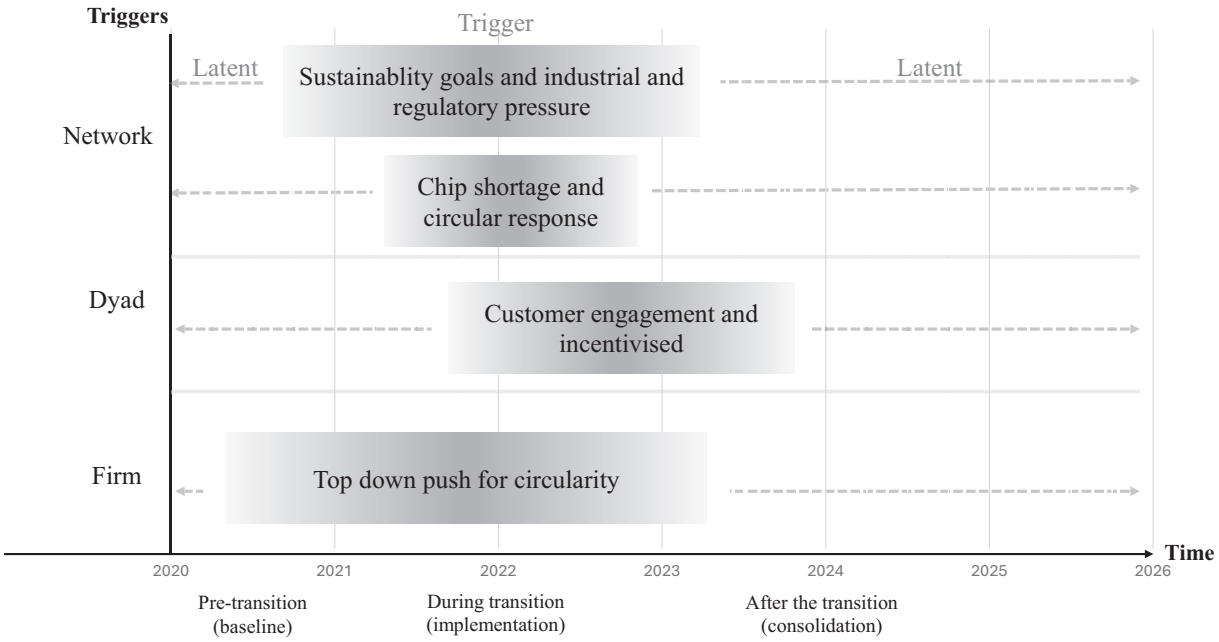

Fig. 3. Key triggers over time and across firm, dyadic, and network levels.

This does not imply that interaction cascades necessarily stop after three steps. In practice, cascades may repeat to additional levels (n), as new triggers and interactions emerge further. The point is not to delimit the process, but to highlight how triggers unfold across the central levels of interaction (Fig. 4). Once an interaction is established (e.g., contracts requiring returns), it doesn't belong to just one trigger. The interaction may have been first activated by accountability gaps, but it also responds to regulatory pushes. In Table 3 the potential feedback loop summarizes the directional consequence of the overall cascade of a trigger and its episode, which unfolds around that trigger, feeding back

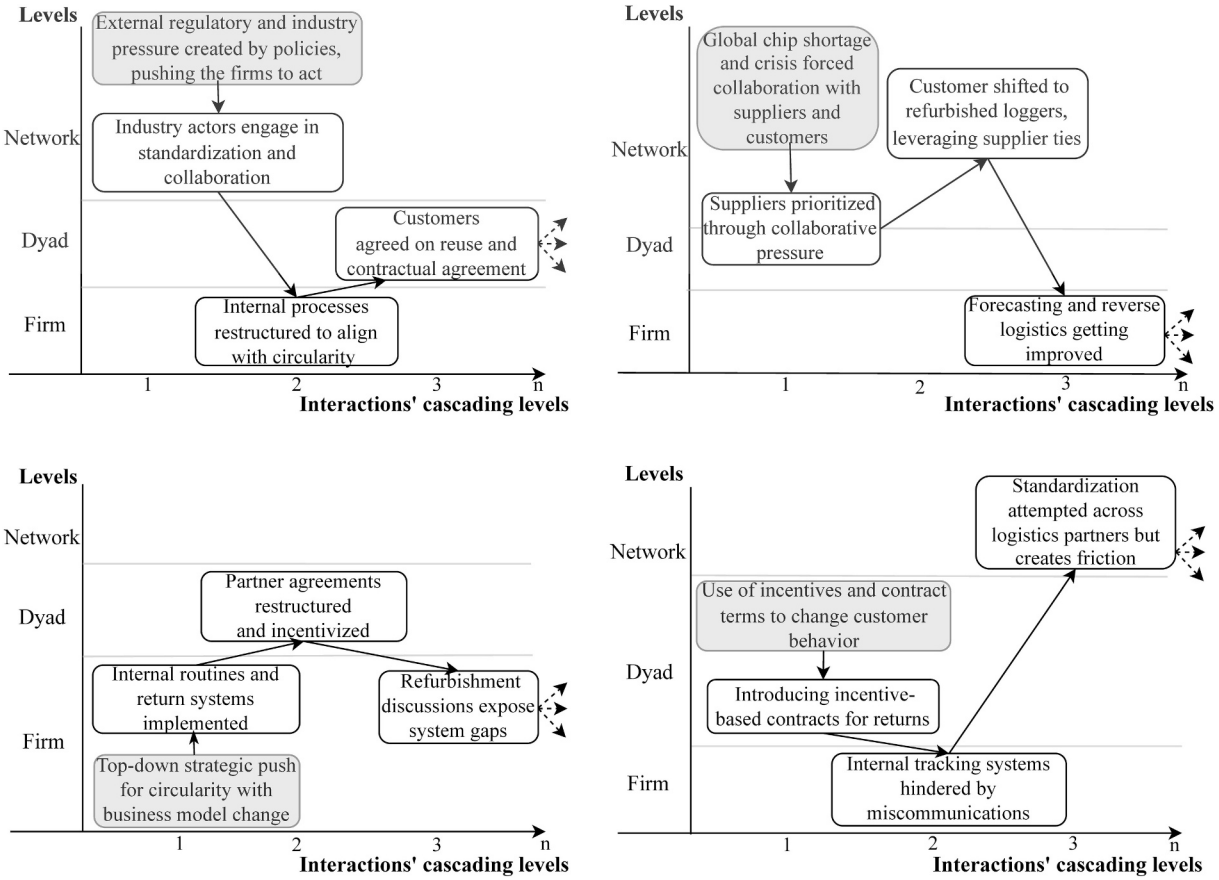

Fig. 4. Cascading interactions following the identified triggers across firm, dyad, and network levels.

to the system. We structure the analysis around firm, dyadic, and network level interactions, using these IMP levels as the primary analytical frame, while drawing on insights from the MLP as a background for interpreting how interactional dynamics connect to broader transition processes.

6. Discussion

In this paper, we investigated how interactions within and across multiple levels of business networks (intra-firm, dyadic, and network) are involved in and developed throughout the transition from linear to CBMs, adding to the discussions on circular business networks (Aarikka-Stenroos et al., 2022; Huemer & Flygansvær, 2025; Vellesalu et al., 2025). Our findings show that the nature of the interactions at the different business network levels change as the transition process moves in time. Interactions become more structured while circular routines and processes are established.

Our empirical findings are developed into the framework in Fig. 5, which draws inspiration from the MLP on sustainability transitions (Geels, 2002), while integrating the interactional lens from the IMP tradition (Håkansson & Snehota, 1995). The framework shows how the introduction of a CBM unfolds through a series of 'active' interactions (those within the shaded area of the transition process in the figure) triggered by both internal and external events. In our case, the CBM started with high degrees of uncertainties, experimentations, and tensions, which are both due to and giving rise to business network interactions, but over time these became more short-term and manageable. In this process, the network of interactions evolves over time, from initial interactions to structured relationships and process standardization. To support the transition, the firm needs to ensure continuous interaction processes (Håkansson & Snehota, 1995). Each element in the framework can be traced back to specific empirical episodes summarized in Table 3 and illustrated through the interaction cascades in Fig. 4.

The framework adopts a horizontal axis representing time, capturing the progression of the transition, and a vertical axis distinguishing the three system levels of firm, dyad, and network. Once interactions are activated, they generate new conditions, dependencies, and learning experiences that push the firm and its network further along the circular transition. This continuous cycle of triggering and responding explains why circular business transitions are not linear shifts but dynamic and evolving processes shaped by ongoing, cross-level interactions (Schurr et al., 2008).

The framework also captures the presence of feedback loops, where the outcomes of interactions, such as improved return logistics or breakdowns in coordination, inform and reshape future practices. These loops can reinforce earlier routines or generate new triggers, contributing to the dynamic and recursive nature of the transition. Cascading and iterative interactions that span firm, dyadic, and network levels play a role in emergence of CBMs rather than a top-down or one-directional process. These cascading interactions and feedback loops are illustrated by the loops in the middle of the framework in Fig. 5 and take place during the transition process.

By bringing together MLP's structural view of transitions and the IMP tradition's emphasis on interactional processes, our framework contributes to both literatures. MLP has been central in explaining how transitions unfold across niche, regime, and landscape levels and helps to explain where pressures originate and when they gain momentum, such as through regulatory change, industry norms, or resource scarcity (Geels, 2002; Geels & Schot, 2007). But our findings show that IMP helps to explain the relational mechanisms through which change actually takes place and explains how these pressures are translated into concrete business model reconfigurations through interaction. Our study complements this by showing how interactions, within and across levels, drive and shape transitions in practice. At the same time, we extend the IMP literature by demonstrating how interactions are not only embedded in existing relationships but also evolve dynamically in response to systemic pressures and opportunities.

The relationship between IMP and MLP in this study is best understood as bidirectional. While landscape and regime pressures shape interaction patterns at the firm, dyadic, and network levels, our findings also show how repeated interactions within business networks feed back into the broader system gradually. As interaction patterns stabilize through recurring practices and coordination mechanisms, they begin to influence how circularity is interpreted beyond individual relationships. This view is consistent with recent work on sustainability in business

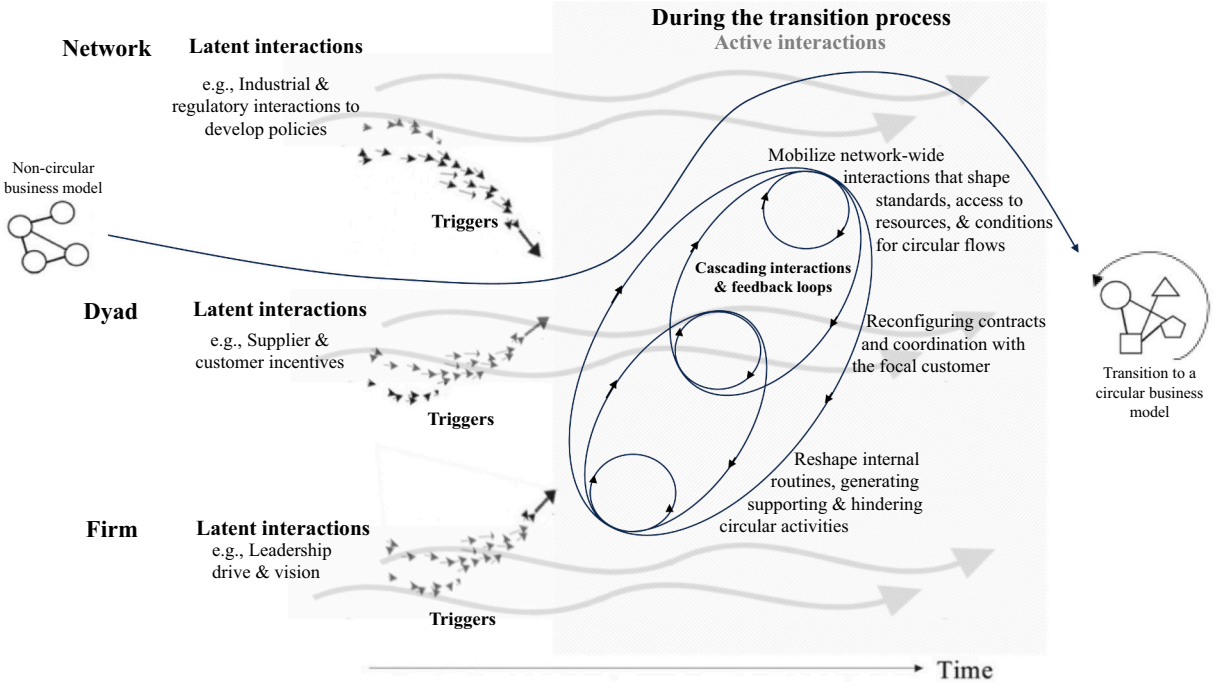

Fig. 5. A framework of interactions during the transition process to a circular business model.

networks, which emphasizes how connected and repeated interactions can accumulate into broader system reorganization rather than remaining confined to isolated dyads (Harrison et al., 2023). Over time, stabilized interaction patterns, such as standardized return agreements or shared refurbishment practices, contribute to the normalization of circular practices and influence how circularity is understood and enacted beyond individual relationships. This highlights that transitions are not only driven by top-down structural change, but also by bottom-up interactional processes through which expectations, roles, and coordination mechanisms are gradually reconfigured.

Before the transition begins, some of the interactions existed in a latent form, embedded in routines, expectations, or informal practices. These latent interactions can be activated as triggers when shifting events punctuate the process, catalysing change through strategic decisions, regulatory shifts, supply chain disruptions, or the alignment of other latent interactions. A trigger sets off *episodes* of interaction, understood as sequences of supporting and hindering interactions that cascade across firm, dyadic, and network levels (Halinen et al., 2012): negotiation, joint problem-solving, engagement in contractual changes or technology adoption, etc. In other words, triggers set active interactions in motion. Importantly, these triggers do not remain isolated within a single level. Instead, they lead into interactions that cascade across levels, meaning that a change initiated at one level (e.g., firm) can provoke new interactions at another (e.g., dyadic or network). For instance, a regulatory push for sustainability at the network level may compel firms to adjust internal processes and reshape customer-supplier agreements. This cascading nature of interactions highlights the need to consider how internal dynamics and external influences jointly shape strategic orientation (Melander & Lind, 2022; Tandon et al., 2024).

While prior studies highlight the role of buyer-supplier collaboration in enabling CBM (Aarikka-Stenroos et al., 2022), this framework extends the understanding of dyadic interactions by emphasizing how firms and their partners engage in continuous problem-solving to refine circular practices. As the CBM matures, interactions become more structured, shifting from overcoming initial resistance, negotiation, and experimentation to refining and optimizing circular practices, sustaining long-term transformations in business networks (Geissdoerfer et al., 2018). The CBM transition is not primarily defined by the introduction of new technologies or operational solutions, even though these may support the change. Following CE work that positions circularity as requiring business model change, we interpret TEMP's shift as a reconfiguration of the business model logic affecting changes in the activities and relationships (e.g., allocation of responsibilities for returns and reuse, new incentives and forms of contracts, and coordination), rather than an efficiency-oriented adjustment within a stable linear transaction model (for example, making production more efficient while keeping the same transactional structure) (Aarikka-Stenroos et al., 2022; Dzhengiz et al., 2023). Prior research highlights the importance of networks in supporting circular transitions by providing access to resources, regulatory frameworks, and industry-wide initiatives (Franzò & Urbinati, 2023). Our study highlights the need for a network perspective in the transition to circular practices (Averina et al., 2022).

Our findings allow us to reframe the concept of triggers in circular transitions. Rather than treating them as isolated external shocks, as often conceptualized in the MLP, we show that triggers can be activated from latent interactions such as tensions, visions, or routines that gain relevance under shifting conditions. For example, TEMP's CEO had long envisioned a CBM, but the latent interactions related to this were only activated as a trigger when the chip shortage exposed vulnerabilities in the linear business model. In this way, triggers are not standalone events but activated forms of latent interactions, embedded in the day-to-day dynamics of business networks. Once activated, they initiate cascading 'active' interactions across firm, dyadic, and network levels, shaping the transition. This perspective aligns with recent developments in MLP that emphasize gradual, multi-level change and feedback loops (Ahmadov et al., 2025) and adds to our understanding by showing how relational mechanisms, drive transitions forward instead of only structural pressures. In our case, sustainability concerns, such as resource scarcity and environmental goals, were activated as triggers for the transition to a CBM. Yet, the implementation also required continuous innovation in processes, relationships, and technologies.

Moreover, our study reveals that interactions themselves can generate new triggers in some cases. This challenges linear models of transition and supports a processual view where feedback loops reinforce or redirect the transition (Schurr et al., 2008). For instance, contractual negotiations at the dyadic level exposed accountability gaps, which then triggered internal restructuring and new network-level agreements. Importantly, some interactions, such as return contracts or supplier prioritization, recurred across multiple triggers. Each repetition strengthened these practices, moving them from experimental solutions toward stable routines. In this way, cascades across different triggers acted as a shared mechanism: multiple pressures fed into the same interactions, embedding them more firmly over time.

These developments also reshaped B2B relationships. The firm's transition moved its customer and supplier relationships from transactional to more interdependent and adaptive forms, characterized by new contracts, shared logistics systems, and evolving roles increased interdependence, while trust and adaptation mechanisms became central for sustaining circular practices (Ford et al., 2011; Ryan et al., 2012). CBMs therefore required not only technical or contractual adjustments, but also deeper relationship change across dyadic and network levels. Also, customers were not passive adopters but co-shapers of the transition, influencing product refurbishment, inventory management, and service design. As customers increasingly asked for sustainability reporting and more flexible supply solutions, TEMP had to adjust its offerings accordingly illustrating how CBMs are co-developed, rather than being simply imposed.

External events such as material shortages or regulatory shifts (discussed in the MLP model of Geels, 2010, 2011) provided opportunities for TEMP to activate pre-existing visions and engage its network in a CBM. Importantly, these triggers moved across levels, landscape pressures reshaped regime practices and enabled niche experimentation, and interactions among actors implied how these pressures were interpreted and responded to. When viewed through an interaction lens, triggers are not just events that prompt interactions, they are activated forms of latent interactions, as they require firms to engage, negotiate, and adapt within their networks (Ford et al., 2011; Ryan et al., 2012). Our study by combining MLP's structural lens and the IMP tradition's focus on interactional adaptation contributes to a more detailed understanding of how circular transitions unfold in practice and they emerge as multi-level processes shaped by business network triggers and interactions.

7. Conclusions

7.1. Theoretical contributions

This study contributes to the IMP literature on interactions in business networks, as firms transition from a traditional linear supply chain to a circular business network; something that has been deemed pivotal in previous research (Aarikka-Stenroos et al., 2022; Huemer & Flygansvær, 2025) but not fully explained. The findings provide a multi-level and processual perspective on interactions that trigger and facilitate the transition to a CBM, with MLP providing the broader context for these interactional dynamics.

Our first contribution argues for the need of a multi-level system view on circular transitions. Combining MLP and IMP enables micro empirical on-going detailed data (IMP) to be integrated with the *meso* and macro perspective on transitions (MLP). We thus provide a more nuanced understanding of how circular transitions develop through cross-level interactions (Aarikka-Stenroos et al., 2022; Vellesalu et al., 2025). The MLP framework explains systemic transitions across niche, regime, and landscape levels (Geels, 2002; Geels & Schot, 2007). It

emphasizes structural pressures such as regulatory shifts, that destabilize existing regimes and open windows for niche innovations. However, MLP does not discuss the micro level and the relational and interactional mechanisms through which transitions actually take place (Ahmadov et al., 2025; Colovic et al., 2025). By integrating IMP's focus on interaction, our study shows that transitions are not only shaped by macro-level pressures but also by fine-grained, iterative interactions between actors in a business network. These interactions, characterized by mutual dependence, adaptation, and trust (Ford et al., 2011; Håkansson, 1982), are central to how firms respond to, negotiate, and co-develop change.

The second contribution focuses on latent interactions, which have the potential to evolve into active triggers. These triggers set off interactions that cascade across levels (firm, dyad, network), provoking new interactions. We conceptualize triggers not just as external events that prompt change (Laari-Salmela et al., 2019; Ryan et al., 2012) but as an activated form of latent interactions that have existed in the system. These latent interactions reach a point of alignment or reinforcement, turning into triggers, in these turning points. Interactions are not only responses to triggers when transitioning but also key mechanisms that generate further triggers and transitions. The cascading nature of interactions highlights how internal dynamics, and external influences jointly shape strategic orientation.

The third contribution answers the call for research to understand the world's transition to CE better (Knight et al., 2025), where we contribute to the understanding of how firms transition to CBMs (Franzò et al., 2021) and interactions on multiple levels (Vellesalu et al., 2025). While previous studies have focused on barriers and enablers for CBMs (e.g. Farooque et al., 2019; Geissdoerfer et al., 2023; Urbinati et al., 2021), our study complements this stream of literature by providing insight into supporting and hindering interactions for transitioning to CBMs. Hence, our study contributes to the on-going discussion on how business relationships change, as firms embrace CBMs (Aarikka-Stenroos et al., 2022; Huemer & Flygansvær, 2025; Sairanen et al., 2024).

The buyer-supplier relationships are important in CBM research, although these studies point to the importance of including the broader market and society (Ranta et al., 2020; Sairanen et al., 2024). Recent research into CBMs argues that business networks need to include a multi-level perspective (e.g. Aarikka-Stenroos et al., 2022; Vellesalu et al., 2025). We add to this literature stream by combining transition theory (MLP) with an interaction lens (IMP), providing insight into firms' transitions to CBMs.

7.2. Managerial implications

Managers should see the transition to CBMs as a dynamic and changing process that needs ongoing interaction with internal teams, suppliers, customers, and other actors in the network rather than as a one-time structural adjustment and have a proactive and iterative approach to circular transitions. Obstacles, such as firms not being prioritized by their e.g. tier-two suppliers and lacking leverage, can be overcome by interactions across networks including impactful stakeholders, such as customers with whom the firm can get the suppliers' attention. When going through a transition, firms engage in dialogue with suppliers and customers to address concerns, refine processes, and align their sustainability goals. Small-scale pilot projects that test and refine return models can assist firms in identifying operational challenges, optimizing logistics, and building trust among stakeholders before large-scale implementation. The difficulty of setting up a large-scale return flow requires continuous interactions with customers' sites and standardizing processes for return flows. To foster interaction in circular business networks, firms need to combine contractual and relational governance mechanisms. By combining monetary and environmental incentives for customers, firms can improve the engagement in the return flows from customers. Implementing a CBM, such as return flows of used products, requires control of tracking these products. Customers need to allow for firms to track where the products are located, so that products can be shipped to where they are needed at the right time. In information sensitive industries, such as the pharmaceutical industry, firms need to ensure that data is secure. Hence, to enable a CBM managers need to build trust, not only in return processes but also in ensuring privacy.

7.3. Limitations and future research

Our study is limited to the contextual factors and borders of our single case study. The focal firm's size (SME), industry niche and regulatory environment (pharmaceutical industry) may limit the transferability of our conclusions to other industries. In future studies it would be interesting to compare these findings with other industries where firms transition to CBMs under different regulatory environments and market conditions. Another interesting venue would be to examine how interactions change when CBMs become standard practice rather than a new approach and how entirely circular firms, born with CBMs, structure their interactions compared to firms undergoing CBM transitions. Also, while our study focused primarily on interactions, future research could build on our findings by examining the nuances of triggers more explicitly and in greater depth than was possible here. That could include how they are activated, reinforced, and connected to latent interactions or interactional cascades.

CRediT authorship contribution statement

Mandana Emad: Writing – original draft. **Ala Arvidsson:** Writing – original draft. **Lisa Govik:** Writing – original draft.

Appendix A. Appendix

A.1. Interactions

Triggering	First interactions	Subsequent interactions
Firm		
(Q1) "Initially, it came very much from top management's drive for sustainability initiatives. So, our customers had sustainability goals in their private targets. So, everyone has sustainability and circularity goals. And so they scramble for applications and verifications of their reaching these goals. I think that triggered it." (TEMP chief revenue officer)	***Supporting:*** *(Q14) "The integration of circularity into organization value submission, has probably accelerated in the last two years when we can see how you can do that. How you can bring it down to concrete actions and policies." (TEMP chief revenue officer)*	***Supporting:*** *(Q38) "…if you're looking at a small company, you want to make sure that you integrate with a prior forwarder or a module of a prior forwarder that is dynamic, which allows you to focus on the actual development of a service or the reverse supply chain or reverse logistics in this case, without having to use multiple options or multiple different carriers to meet the demand. Because you'll have some prior forwarders that are more accessible in some regions and*
(D2) "I kept a bunch of the loggers in my office in the corner just in case…. At one point I was forced to throw half of the	*(Q15) "If we then go to the circularity transition process, not so deliberate on a product as a service, it's a little bit*	

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Triggering	First interactions	Subsequent interactions
stuff out …" (TEMP CEO, roundtable discussions) *(Q3) "I think that that was probably from different triggers. One commercial. We make more money. Since the PCB is a substantial cost, we make more money if we reuse the PCB. Secondly, internal is the willingness to differentiate and drive sustainability topics from a way to… Or staff to feel engaged in the company vision. And so that comes bottom up then maybe." (TEMP chief revenue officer)* *(Q4,S5) "First of all I had an idea, and I told you that story when you were here, that the hardware we had and provided has always been over-engineered in the sense that the regulatory framework that set the agenda for how we and my customer for instruments, so you can only use it for one year and then you need to recalibrate it, but my focus very early on that we should be able to at least find an aftermarket that wasn't that regulated."(TEMP CEO) and (during the site visits)*	*too… That is complicated. It has several different steps to get there. Research and investment in reuse, refurbishment, and product lifecycle assessment, definitely. I think that was part of our DNA long before circularity became a topic on our customer agenda." (TEMP chief revenue officer).* *(D16) "I wanted this business model since way before the customers accepted it" (TEMP CEO, roundtable discussions)* *(Q17) "The business case is a minimum of four times. So what we have now, rather than relying on our own people, we have TEMP managing from a control tower, where they can see how many monitors are in each location at any time. If they are going to be used based on historical data or forecasting, they remain there and then they use them. It means we don't have to send any products directly to them. If the inventory isn't moving, then they request the return back to Sweden and redeploy them somewhere else." (TEMP customer)* *(R18) "The results clearly indicate that the refurbishment, recalibration, and reuse approach had significantly lower impacts, compared to a single mission approach" (Published report on "A sustainability analysis of the electronic components" with TEMP)* ***Hindering:*** *(Q19) "So it's sort of finding bits of bits information and adding that up to sort of get a forecast on what we can expect to be returned. Some loggers disappear and they don't find them, and some throw them away because the information hasn't funnelled through all the way. So, it's, and that also we need to build up our knowledge about what was expected yield and stuff like that." (TEMP Chief Operating Officer)*	*less accessible in others. So instead of having to use several different, we can use one forwarding module." (The head of supply chain and trade compliance TEMP)* *(S39) "We don't have a purchasing manager yet, but it's clear we need one. So, we have an ad out now" (TEMP CEO, during the site visit)* *(Q40) "Internally, we have a new role within TEMP that is logistic manager, is probably called something much fancier, that has worked within the logistic network. So, it is more bidirectional. So, for us, we needed to strengthen that organization in order to drive that direction more efficiently." (TEMP CEO)* *(Q41) "We have improved our sending out model where we build this machine learning system for determining when our customers replace an order. So sort of try to optimize the inventory for them, knowing that they shouldn't over order or they shouldn't under order. So they should have the right number of devices in stock in a descending site. So there is a lot of infrastructure and when it comes to this site facilities that we monitor, it's a bit trickier because there we want to have multiple users." (TEMP CEO)* ***Hindering:*** *(Q42) "…we decided we wanted to try and simplify by adding something to the hardware and that caused different issues further down the line… as soon as they fix one problem, then another one arose. So, it was just constant that they had to deal with lots of issues…" (TEMP Customer)*
Dyad *(Q6) "…and having taken that step, not all of them have done that yet, but having taken that step they become much more willing to set these business models where they were obligated to send them back. We created an incentive for it as well that made it more acceptable because we were able to lower the cost for them and then at the same time increase our market, so it was a win-win situation when we looked at more in detail." (TEMP CEO)* *(S7) Managers and staff described how TEMP had to actively engage with customers to sell the idea of circularity by emphasizing cost savings, security of supply, and alignment with customers' own sustainability goals. (Site visits)*	***Supporting:*** *(Q20) "…It's not a requirement but there are certain incentives so to speak in returning the longer incentives that are very much appreciated by the clients. Obviously environmental incentives but there's contractual stuff so I'm a bit uncertain of how deep I can go into that. But there's more incentive more than ever into returning the devices for each customer that you know either no matter the age no matter the product, there's an incentive to return it and a penalty of sorts of not returning them." (The head of supply chain and trade compliance TEMP)* *(D21) "They [the customers] just knew that they need to accept the business model to get their hands on some products… There was no other way" (TEMP CEO, roundtable discussions)* *(Q22) "So we ran a tender and included multiple companies who could provide data on temperature and location. The outcome of the tender was that we retained TEMP for their software because they have all the data that we used to perform the analytics to see whether the shipment's been kept and maintained within temperature. And TEMP proposed a new device that's made by another third party on the asset which provides location and temperature and some other things." (TEMP Customer)* *(Q23) "…there's obviously, for other sites with more complexity in their own supply chain…Our customer has a high employee turnover so we must communicate very clearly what devices they can still use and which should be returned. Making it clear which products to return is always going to be a work in progress. I would say that's probably the second one, making it clear that you're supposed to return device type A and C and not device type B, because this must be at your location for a certain period of time, and they can still be reused." (The head of supply chain and trade compliance TEMP)* *(Q24) "Our customers are still immature enough. They ask*	***Supporting:*** *(Q43) "It has been well received. It can play out a little bit differently. Sometimes it's a voucher, sometimes it's an upfront penalty fee. But they are all accepting it. They understand the necessity of changing their behavior. And also, I have no qualms about it because the implementation of the circularity mostly comes down to explaining and communicating and driving changed behavior rather than some kind of magic. So it mostly comes down to will firstly…So we don't do business unless that is accepted by the customer. Now in pharma you don't have to explain why sustainability is important. Or why there is a cost related to it." (TEMP Chief Revenue Officer)* *(Q44) "…they can see how many monitors are in each location at any time and if they are going to be used based on historical data or forecasting data, they are going to be used at that location, they remain there and then they use them. It means we don't have to send any directly to them." (TEMP Customer)* *(Q45) "We are now working, trying to work with other freight forwarders that see that they take the full accountability for making a success of picking it up. But that was really in both directions, both for sending out and picking up. Sending out is easier, of course, than fetching." (TEMP CEO)* *(Q46) "Now we need to reduce the number of monitors in the fleet and increase the number of times that we use the monitors in the fleet. The output of that is that we reduce our carbon and our cost, which is always a nice thing to do. But the priority is we need to have an understanding of what the monitors do in terms of our carbon footprint" (Key Global Sourcing Manager of one of TEMP's key customers)* ***Hindering:*** *(Q47) "We don't know which cost centre and we can ship the loggers back with and we receive them only, but another*

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Triggering	First interactions	Subsequent interactions
	us and want us to help them with their sustainability reporting when it comes to how we are contributing to their circular behavior. That is from the top of my head what I can see. I don't think there are any purchasing activities that do not have circularity or sustainability as one of the basic requirements these days." (TEMP Chief Revenue Officer) *(R25) "One recommendation for TEMP's supplier could be the adoption of eco-friendly PCBs that are lightweight, durable, and biodegradable." (Published report on "A sustainability analysis of the electronic components" with TEMP)* ***Hindering:*** *(Q26) "I think that also could be a lack of information between the ones who order the system, who use the system, and the ones who actually using the loggers in the warehouse or in the freight companies. So that needs to be funnelled down to everyone using the product." (TEMP Chief Operating Officer)* *(D27) "…but who should take the risks and the costs of* e.g., *the extra logistics. We need new contracts." (TEMP CEO, roundtable discussions)* *(C28) "With 'other' software platforms, where we [a customer] often need to manually download data and send it to the supplier, shipments can often get quarantined for a longer time due to communication lead times." (Published case study of TEMP and a customer)*	*side has bought them. And sometimes we were external companies or partners of our customers, and they said why should we pay for something that we're not getting reimbursed by the customer. So there's a lot of complexity in that when you want to get them returned, but we try to create incentives both for us as a supplier as well as for the customer." (TEMP key account manager)*
Network *(Q8) "…focus on sustainability, another important factor for us has been that we are not just here to sell a solution that tells you if you are good or bad we are coming from the quality field, continuous improvement, action by the insights as utilizing data has always been of interest what can we learn and how can we change and where should we focus our changes?" (TEMP CEO)* *(Q9) "Our view is that each supplier that we work with, we try to reduce the emissions that the service that we purchase from them on an annual basis. Now we have a target to be carbon neutral by 2030." (TEMP Customer)* *(Q10) "We have been successful in recovering volumes and getting priority when we went to the actual manufacturers or the manufacturers' suppliers and explained who we are and what we are doing and what that means for the society," (TEMP CEO)* *(Q11) "…But we had saved them here in stop but I threw them all away when we moved to the new office first of January in 2020 and then the good thing with the pandemic was the consequence and the willingness to change when there were new components available so suddenly my customer had to deal with they didn't have any loggers or they had to deal with refurbished or circular loggers and that made the shift mentally for them" (TEMP CEO)* *(R12) "The production phase of the electronic component loggers has a significant impact on the overall environmental footprint, accounting for over 90% of the total impact in most cases." (Published report on "A sustainability analysis of the electronic components" with TEMP)* *(R13) "Transportation is the second-largest contributor to the overall impact, ranging from approximately 5% across most impact categories." (Published report on "A sustainability analysis of the electronic components" with TEMP)*	***Supporting:*** *(Q29) "Through a very close collaboration with the manufacturer, as we call - front-loading, we could ensure regardless of what happened in the market situation, we still had our volumes." (TEMP CEO)* *(Q30) "We have been successful in recovering volumes and getting priority when we went to the actual manufacturers or the manufacturers' suppliers and explained who we are and what we are doing and what that means for the society," (TEMP CEO)* *(Q31) "We went together with our supplier to their supplier of components and showed them a couple of letters from all our big customers. Where they said that it is really mission critical to get the components. If we don't then we can't ship medicine and, in the pandemic, it's devastating if we can't ship the vaccines for example, or other medicines. With that, we got prioritized. Because we were competing with firms that were building play stations or other electronics that no one needed. We helped our supplier to get prioritized. We started to get involved in the sourcing of the components for something that we had outsourced to one supplier. That was due to the pandemic and the shortage of supplies in the semiconductor industry." (TEMP key account manager)* *(Q32) "We have circularity agreements in place with all our major contracts. The requirement to return our hardware after it has been used so that we can recuperate the PCBs and refurbish and reuse the loggers is now a mandatory requirement in all our contracts with our biggest customers. That plays well into their strategies because, in pharma, they are very ambitious with establishing circularity in their partnerships." (TEMP chief revenue officer).* *(Q33) "I think our biggest challenge now is basically getting the loggers back. That's the first part and then secondly how to do that's as effective as possible if that is to go through hub and then everything back. That's something that we need to look into and see what the future might bring. But one of our challenges also is from a sustainable supply chain and we need to balance and get the information knowing how much we are getting returned and we can refurbish* versus *how much we need to order new devices to meet the demand from our customers." (TEMP Chief Operating Officer)*	***Supporting:*** *(Q48) "So, on a bigger picture, if companies want to move to this, enforce their sustainability with recycling, you need to look at the internal process as well. It's not just the external process that needs to be analysed, you also need to do it internally. Mainly just making sure that our production systems are built and designed for reuse of the IDs or the individual PCBs that we are using." (TEMP Chief Operating Officer)* *(Q49) "We have a very open and honest relationship, and they need to be able to tell us what we're doing wrong and challenge us. And we need to do the same. The key to it is, in any supplier relationship, you've got to have open and honest dialogue and be clear on expectations. They have to be clear on what we should expect or what they're able to achieve." (TEMP customer)* *(Q50) "One of the key components to reverse logistics and I've thought about this a lot myself… it really does speak volumes about visibility, so supply chain visibility and the digitalization of the supply chain, what kind of tools are you ready to invest in and what kind of tools are you ready to implement either internally or through external parties in order to gain that visibility, to track the key performances, the metrics so you can actually build out of your own recycled stock." (The head of supply chain and trade compliance TEMP)* *(Q51) "We've got an additional supplier in the mix as well… it's taken a bit longer and there's an extra reliance." (TEMP customer)* *(Q52) "On the relationship you have with the supplier, it's just an added dimension that you've got to include, so it means potentially more things to consider when you are working with a new supplier." (TEMP customer)* *(Q53) "We really won't understand it until it's rolled out in its entirety… if the number of reuses doesn't start to increase, then we know we've got a problem.... If it's too difficult to ensure that everybody sends them back, we need to find something that has less of an impact on the environment." (TEMP customer)*

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Triggering	First interactions	Subsequent interactions
	(D34) "I spent so much time talking to our partners and explaining how important our work is and how they needed to help us get chips." (TEMP CEO, roundtable discussions) ***Hindering:*** *(Q35) "…a lot of these pharmaceuticals have subsidiaries or use a third-party freight company. And they might not also be introduced in what to do with it. So, I think it's a lot of information that needs to be passed on to the ones using loggers." (TEMP Chief Operating Officer)* *(D36) "We didn't get any priority. They [the USA] prioritized their own. We had no voice, and no one saw us." (TEMP CEO, roundtable discussions)* *(C37) "Automating manual processes in heavily controlled industries, such as pharmaceutical manufacturing and logistics, is complex. It is affected by global and local regulations, laws, and distribution practices and often involves several stakeholders." (Published case study of TEMP and a customer)*	*(D54) "We need to look at the network again… who's new and who do we need now." (TEMP CEO, roundtable discussions)* ***Hindering:*** *(Q55) "The mentality is that things within the life science industry are one-time use. So that could be one of the reasons that needs to change so they know that this is not one-time use, it can be reused." (TEMP Chief Operating Officer)* *(Q56) "…some of these use loggers from several companies and then they need to okay which one is a TEMP that I should return which one is the competitor that we just throw away. So, when we do get returns, we get basically a variety of loggers even from our competitors because they don't know to separate out which one is which, so they just dump everything in a box and ship it. So, we have a lot of our competitors' devices they return to us." (TEMP Chief Operating Officer)*

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