





## RESEARCH ARTICLE OPEN ACCESS

# All for One and One for All: Inter-Firm Collaboration in the Transformation Towards a Circular Economy

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## ABSTRACT

Collaboration is central to the circular economy. This study examines ways companies can advance the circular economy in their business operations through inter-firm collaboration. The empirical data consist of 43 semi-structured interviews with representatives of Finnish companies of different sizes and sectors that have implemented aspects of circularity in their operations. The findings reveal that companies approach inter-firm collaboration by means familiar from the linear economy, for example, pooling resources. Still, inter-firm collaboration can advance a circular economy: It not only helps individual companies in their pursuit of a circular economy but wider collaboration can also nudge whole sectors towards the circular transformation. In addition, inter-firm collaboration can introduce new norms for conducting business. In the circular economy context, it was found that inter-firm collaboration is currently a way for companies to overcome inadequacies in the system that are largely due to the relative novelty of the circular economy model.

## 1 | Introduction

To address significant environmental degradation, biodiversity loss and rising emissions in the atmosphere, which are damaging the natural environment and threatening human society, we must reduce activities that damage natural ecosystems, like raw material extraction. Similarly, materials that are extracted need to be used more carefully rather than being discarded quickly as waste. This means that modes of production and operation need to be reevaluated and modified. Solutions that advance sustainable development and lessen environmentally negative effects are urgently needed. A circular economy (CE) could offer sustainability and economic benefits for business practices (Ellen MacArthur Foundation 2013, 2020); however, to function effectively, a CE requires significant changes to current systems

(Kirchherr et al. 2017) and demands involvement from all sectors (Ghisellini et al. 2016).

CE aims to decouple value creation from resource use by keeping products and materials in use longer, minimising waste and pollution generation (D'Amato et al. 2017; Ghisellini et al. 2016). Whereas the linear economic model relies on the notion of infinite resources, the CE model acknowledges the boundaries of the natural environment. The CE concept originates from concepts such as industrial ecology and cradle-to-cradle (Blomsma and Brennan 2017; Kalmykova et al. 2018); with the rapid increase in CE-related research, the topic has branched out from technology and engineering to business practices and business models (Sarja et al. 2021). More recently, academics have been focusing more on human actors

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like managers and human factors like the role of collaboration in CE practices (e.g., Köhler et al. 2022; Sudusinghe and Seuring 2022; Schöggel et al. 2024) and even sociocultural aspects (Pal 2022).

CE research recognises collaboration as central to the CE model (e.g., Ghisellini et al. 2016; Gebhardt et al. 2022; Schöggel et al. 2024). Inter-firm collaboration in general has been recognised as a way to generate more value: firms need complementary goods that can be provided by other firms. This form of collaboration is not a new discovery, but digitalisation and globalisation have added new dimensions to corporate collaboration (Nooteboom 2004). Moreover, CE itself can bring new aspects to the need for collaborating. Previous studies on inter-firm collaboration in the CE context have focused on industrial symbiosis (IS, e.g., Fraccascia et al. 2020; Yeo et al. 2019), supply chain management (e.g., Flygansvaer et al. 2018; Gebhardt et al. 2022; Sudusinghe and Seuring 2022) and the use of resources (e.g., Fischer and Pascucci 2017). CE research has also examined collaboration between different sectors, including public–private partnerships (Uusikartano et al. 2022), cross-sectoral partnerships (Dzhengiz and Patala 2024), multistakeholder perspectives, ecosystems and networks (e.g., Aarikka-Stenroos et al. 2021; Kanda et al. 2021; Köhler et al. 2022).

This study builds on prior understandings of CE collaboration that entail new forms of collaboration in the CE context (Gebhardt et al. 2022; Sudusinghe and Seuring 2022; Schöggel et al. 2024). The study investigates CE and the formation of inter-firm collaboration from a broader perspective that goes beyond a specific industry or location. This wider focus is motivated by the need to understand how companies can initiate CE-based business practices, as this understanding could lower companies' barriers to engagement with CE. A functioning CE must involve activity both inside and outside centralised industrial parks; it demands interaction across industries and regions and along supply chains. This is because practising circular economics creates new interdependencies (Kanda et al. 2021; Kuhlmann et al. 2023) and connects new actors, which requires rethinking and expanding practices outside the siloed supply chains of the linear economy. It is key to connect resources based on the needs of new applications that companies operating within the CE could utilise (van Keulen and Kirchherr 2021).

Thus, this study considers different-sized companies across multiple industries and even some that are decentralised and scattered across regions. It examines how inter-firm collaboration enables companies to pursue CE practices and can catalyse the CE transformation. The company is the unit of analysis, as companies' ability to engage in the CE transformation is important. The research questions are as follows:

1. How do companies collaborate when pursuing CE?
2. How does inter-firm collaboration advance the CE transformation?

The scope of this paper is limited to inter-firm collaboration, acknowledging the importance of collaboration with other

relevant actors, such as the public and non-profit sectors. The study examines how collaboration is described, experienced and approached by Finnish organisations. Although the companies are operating in Finland, some operate internationally and others only locally. Due to the global nature of supply chains, the companies' CE activities also make an impact abroad. The reason for studying CE in Finland is the governmental initiatives to reach a leadership position in CE by 2025 and a carbon-neutral economy by 2035 (Government of Finland 2019, 2021). Finland's national strategy to promote CE and aim to take a leadership position in CE should motivate companies to consider maximising circularity in their operations.

The findings suggest that companies operationalise inter-firm collaboration from the same standpoints as in the linear economy: by allocating and pooling resources in the hopes of a business case. In the CE context, this means establishing or scaling CE-based operations. The findings show that companies have been able to advance CE implementation and scalability. An important finding, less discussed in the CE literature, was that companies used their power to influence politics through macro-level collaboration. This paper contributes to CE literature by introducing an inter-firm collaboration framework that demonstrates the multiple strategies companies can adopt to overcome barriers to CE practices.

The paper is structured as follows. First, the background literature and central concepts are introduced. Then, the methodological choices and data analysis are described, followed by the empirical findings. Those findings are then discussed in the light of previous literature, followed by considerations of limitations and future research directions.

## 2 | Background Literature

Previous research on collaboration in the CE context has taken different inter-organisational perspectives, such as public actors' role in the CE transition (Uusikartano et al. 2020), stakeholder perspectives in CE (Tapaninaho and Heikkinen 2022; Marjamaa et al. 2021) and cross-sectoral collaboration (Köhler et al. 2022; Margolis 2024). In terms of changes at the societal level, collaboration between various types of organisations is needed to enable the transition to functioning circularity. For inter-firm collaboration—that is, two or more businesses working together—prior CE research has examined how companies collaborate within the CE context. These include material, information and capability exchanges that can be assisted by digital solutions or through innovation. Adjusting or reconfiguring partnerships is also relevant to inter-firm activities in the CE context.

Much of the discussion about how companies work together, partner or collaborate to operate under the CE model turns to material exchanges, for example, through IS. Collaboration is a natural component of IS, as it basically consists of a localised company network, where flows of materials and information need to be established, maintained and shared (Ferreira et al. 2023; Agudo et al. 2022; Mulrow et al. 2017). Functioning IS is built around actors with complementary needs in terms of

inputs and outputs as well as an understanding of local regulations (Giannoccaro et al. 2023; Rincon-Moreno et al. 2020). Digitalisation can benefit companies in material exchange as well, as digital platforms facilitate CE collaboration through sharing, access or on-demand economies. Companies can be connected via digital platforms where they can buy or sell excess materials and find relevant suppliers (Franzò and Urbinati 2023).

Material exchange also occurs outside established ISs, along differing value chains. Companies may seek collaboration further along value chains, particularly, for waste stream utilisation partnerships (Arekrans et al. 2023), where digital tools can enable collaboration (Rosa et al. 2020). Moreover, big data can improve processes in supply chain management and help coordination with other actors (Chiappetta Jabbour et al. 2020; Taddei et al. 2022). Still, acquiring digital technologies should be communicated among the value chain, as differing actors benefit from utilising complementary solutions (Gupta and Singh 2024). In addition, collaboration along the value chain increases chances for CE ventures to succeed (Straub et al. 2023) as it advances understanding and can improve an individual organisation's stances within the network. Companies share their viewpoints and thus can aim to improve processes to serve each other better (Kuhlmann et al. 2023).

Another central theme in the literature is information exchange, particularly, in supply chain management. Adopting CE within a company creates new needs and demands that can be eased by exchanging information along the supply chain. Thus, actors along the supply chain can work to improve their operations, but they need to improve collaboration and share their views and abilities so that everyone understands what others can and cannot do (Agrawal et al. 2023). This means a change in what information is shared and how (Kazancoglu et al. 2020; Ukko et al. 2022). Moreover, digital technologies can advance CE collaboration through tracking or monitoring materials, optimising processes and sharing and managing information, thus improving processes in business networks (Rajput and Singh 2019; Sassanelli et al. 2023). Increased traceability and transparency, for example the Internet of Things (IoT) that can enable companies in CE through monitoring and controlling data (Franzò et al. 2022), can enhance trust among partners (Coppola et al. 2023). Openness in the supply chain could improve the success of extended producer responsibility (Rizzi et al. 2013). For instance, the CE requires reverse logistics that can benefit from inter-firm collaboration and advance sustainability performance (Flygansvaer et al. 2018; Stål and Jansson 2017). Companies often struggle with a lack of awareness about how to develop and implement reverse logistics for CE (Sonar et al. 2022). But collaboration and communicating the benefits of establishing reverse logistics have motivated companies to pursue it (Cricelli et al. 2021).

Inter-firm collaboration can facilitate capability and resource exchange by connecting different needs with expertise and resources (Mishra et al. 2019; Sehnem et al. 2022). For example, collaboration can connect those with product ideas with actors with production expertise to create a CE solution. Alternatively, collaborating can mean turning to a familiar

partner for guidance in developing alternative materials (Brown et al. 2020). Similarly, inter-firm collaboration can enable especially smaller companies to establish CE-based business models and gain resource efficiency, use clean technology and improve organisational learning (Mishra et al. 2019). Moreover, smaller companies can help larger actors in their sustainability missions by offering solutions to sustainability-related challenges (Veleva and Bodkin 2018). In addition, inter-firm collaboration can help firms manage uncertainties in the business environment and better access resources such as raw materials (Kusumowardani et al. 2021) or access knowledge, sharing risks or responsibilities (Sudusinghe and Seuring 2022).

CE collaboration can increase partners' knowledge and expertise regarding resource and capability exchange (Bertassini et al. 2021). Through collaborating, companies can share not only capabilities, but also risks and the burden of renewing operations (Straub et al. 2023). For example, collaboration on innovation can offer improvements in expertise and meeting company-specific objectives or sharing resources and risks (Brown et al. 2018, 2019). Smaller and larger companies can collaborate on innovation through cocreation (Blomsma 2023). The innovation solutions and improved competencies or experiments found through collaboration can help companies break away from path dependencies (Arekrans et al. 2023). Open innovation, for example, supports knowledge sharing; communication advances the CE among companies (Köhler et al. 2022) and technological innovation benefits from transparency and shared data management (Sehnem et al. 2022).

To advance CE-based business, firms may need to readjust current partnerships or look for new ones. Raising awareness and strengthening customer relations have been recognised as relevant to inter-firm collaboration, for example within the textile sector in Italy (Coppola et al. 2023). Companies collaborate with customers to better serve their sustainability ambitions (Arekrans et al. 2023). In terms of redefining relationships, firms may go up or down the value chain for collaboration (Arekrans et al. 2023). Companies may find themselves collaborating with new partners, even unexpected ones, when waste streams gain potential reuse possibilities (Lüdeke-Freund et al. 2019). Connecting with new actors or stakeholders is usually required to make a local CE system possible (Giannoccaro et al. 2023; Rincon-Moreno et al. 2020). Companies may also partner to develop certain missing aspects to create loops. For example, producers have created take-back programmes to receive post-consumer materials (Coppola et al. 2023).

CE research mentions dependencies related to the use of different resources. CE-based businesses enter into new types of dependencies Rincon-Moreno et al. 2020; Kanda et al. 2021) and companies can be reluctant to pursue CE-related operations for fear of becoming overly reliant on partners that might not be dependable in terms of, say, quality (Rincon-Moreno et al. 2020). To address this new type of (inter)dependency, companies may start creating their own rules to pursue CE-based business (Fischer and Pascucci 2017). However, companies must be willing to balance their individual needs with economic potential and path dependence (Fraccascia et al. 2020; Yeo et al. 2019). Nevertheless, it has been noted that large actors often use their power to set industry-wide

standards (Parida et al. 2019). Finally, companies collaborate by forming coalitions or working groups to facilitate the formation of different CE-supporting operations (Stewart and Niero 2018). Trade associations can encourage companies to collaborate to increase knowledge and networking for joint value creation (Burger et al. 2019).

Previous CE literature has extensively addressed collaboration as essential to the CE. Research themes include CE collaboration between types of organisations, regionally operating networks of companies (IS) or firms within a specific industry. Other themes include aspects of waste as a resource, companies' approaches to the use of waste or side streams as raw materials and the challenges and incentives involved in using such materials. A third cluster of themes relate to innovation and business models. The prior literature has largely focused on a specific region or industry. Still, CE collaboration is needed and should flourish outside the strict boundaries of an industry or region. This leaves room for the present study to explore how companies are creating collaborative networks that cross sectors and regions. Thus, the focus here is not on a regional IS or specific industry, because to create the loops or flows for circularity, actors across silos are needed and there will be times when sectoral or regional actors cannot provide all the relevant support for a CE transformation. Thus, the aim of this paper is to provide a wider perspective on the different ways companies have collaborated to advance CE-based business.

### 3 | Research Methods

To examine the role of collaboration in the CE context, an empirical study was conducted based on data from interviews with 43 CE experts and practitioners. This section introduces the phases and reasoning of the chosen study context and describes the data analysis methods.

#### 3.1 | Data Collection

An inductive research approach was taken to inter-firm collaboration in the Finnish CE context. The decision to focus on Finland was based on a Finnish government initiative for the country to achieve a leadership position in CE by 2025 and a carbon-neutral economy by 2035 (Government of Finland 2019, 2021). The world's first national road map towards CE was created in Finland in 2016 (Sitra 2016) and the national strategy was to create an atmosphere in which companies are introduced to the idea of CE and motivated to try to implement it.

A qualitative research approach through interviews was selected, as the aim was to focus on companies that are already applying CE principles in their operations. These data were collected to understand the views of the interviewed experts (Juuti and Puusa 2020), that is, how representatives of Finnish companies describe, approach and experience the CE in general and inter-firm collaboration in the CE context, in particular. It is becoming increasingly evident that the CE cannot work in only one sector; a functioning CE demands that multiple sectors

operate under CE principles and that diverse companies and operations feed into their own and other sectors, to form the required exchange loops or circularity. To learn more about this interconnectedness of the CE model in the company context, companies were selected from several sectors.

The data collection and analysis protocol was as follows:

1. Identifying companies with existing CE operations.
2. Contacting those companies to request interviews.
3. Conducting semistructured interviews either in person or online.
4. Transcribing each recorded interview verbatim.
5. Analysing the transcripts for collaboration, especially inter-firm collaboration.
6. Organising and grouping the rich, descriptive data based on the Gioian method (Gioia et al. 2013) to form classes of inter-firm collaboration activities.

##### 3.1.1 | Expert Interviews

The empirical data used in this study consists of 43 semistructured interviews with representatives of Finnish firms that are CE pioneers. To understand the nature and importance of inter-firm collaboration in the CE context, different types of companies were included. The sample was selected from a list of 'The Most Interesting Companies in the Circular Economy' published by the Finnish fund Sitra (Sitra 2019). The list contained companies operating under the CE principles or with operations applying those principles in the following categories: product-as-a-service, renewability, sharing platforms, extending the product life cycle and resource efficiency and recycling. A few companies that were not on the list were included to increase the sample size and add actors in certain relevant sectors.

The individuals interviewed represented different-sized businesses in several industries. Both smaller and larger companies were selected to gain a more diverse picture of the role of inter-firm collaboration; some were more mature, with well-established operations that were later modified for the CE, while others had been established on CE principles. Similarly, the sample was not restricted to a specific industry or operation, even though a few companies were operating within the same value chain. The aim was to collect data across industries and widen the understanding of collaboration from single value chains or IS arrangements to cover companies that operate more independently and are not bound to a specific location. The companies represented industries including textiles, plastics, forest-based, mobility, energy and recycling management; all operated in Finland and some also had operations abroad. A list of interviews by industry sector appears in Table 1.

The interview protocol covered a range of issues, generating information on company history and strategy in terms of sustainability and the CE, how companies had experienced CE orientation and any plans they had regarding the CE. Questions

**TABLE 1** | Summary of the interviews by sector.

Sector	Number of companies
Construction	2
Consulting	2
Consumer goods	2
Energy	4
Forest-based	4
Health	1
Industrial equipment and solutions	4
Interior	3
Information technology	1
Mobility	2
Plastics	2
Recycling management	4
Resale	4
Textiles	3
Wealth management	1
Other	4
Total	43

were asked about how the interviewees saw the CE approached and implemented in their sector and among different stakeholders. Finally, the interviewees were asked to consider the CE and its implementation in Finland, the EU and globally. The aim was to learn about issues on the organisational, sectoral and societal levels, thus covering micro-, meso- and macroperspectives (Sinha 2022). The interviewees mostly seemed enthusiastic about the CE's potential, but mentioned some external challenges in implementing it. For the frontrunner companies, their internal drive to implement the CE lowers many barriers; however, external factors are not so easily tackled by individual frontrunners. Here, the interviewees explained ways their companies had tried to address such challenges, and thus provided descriptions of inter-firm collaboration.

The interviews were conducted between May 2019 and March 2020 by a group of researchers as part of a larger research project. The interviews lasted between 40 and 90 min and were held in person at the interviewees' premises or online via Zoom. The interviews were audiorecorded and transcribed verbatim. Profiles of the expert interviewees appear in Appendix A.

### 3.2 | Data Analysis

Qualitative content analysis was used to examine the data for common themes, following the Gioian method (Gioia et al. 2013). Based on the inductive approach, the method offers a systemic strategy for qualitative data analysis, which can be used for data-driven research. This approach is especially useful when analysing interview data, as the focus is to 'give voice

to informants' (Gioia et al. 2013, 17). This was a vital practice in revealing how business representatives experience the CE phenomenon. During the phase of designing the semistructured interview questions and especially during the interviews, the primary focus was to listen to and learn from the interviewees, who were given ample time to share their own stories.

The interviews revealed many diverse notions of collaboration, like partnering with a firm, negotiating a CE pilot or testing material utilisation. Some described successful collaborations, some mentioned failed attempts to form collaborative partnerships and many interviewees reported collaborating with organisations other than companies, such as governmental actors. Even though the societal change in CE transformation requires more than inter-firm collaboration, the present study focuses only on collaboration between companies to develop a better understanding of how companies can influence one another in the CE transformation. The CE is described as a model for companies to conduct more sustainable business (Gebhardt et al. 2022; Köhler et al. 2022; Schöggel et al. 2024), thus examining how companies interact provides relevant understanding on how the model works in practice.

Data triangulation was ensured by several means. First, the companies' webpages were utilised as a secondary source. Second, the interview protocol was designed to be comprehensive. The interviewees were asked to describe their activities and processes through different questions, allowing them to build and add to their descriptions as the interview proceeded. Third, two of the authors analysed and coded the interview data, while all authors discussed the codes. Finally, the use of 'The Most Interesting Companies in the Circular Economy' itself increased credibility, as Sitra (2019) had checked background information to compile that list.

The analysis began with each author familiarising themselves with the transcripts. Two of the authors analysed and thematically coded the transcripts separately by in late 2020 and early 2021, coding for various notions of collaboration with special attention to sections where interviewees discussed collaborating, working together or partnering with another organisation to advance CE practices. The most common terms used to describe collaboration were 'together', 'with' someone, 'partnering with', 'collaborating', 'co-operating' and 'joint' or 'jointly'. This phase of the analysis contributed to the first-order concepts.

Next, the first and second authors analysed the data thoroughly, inductively coding individual interviews by reading and analysing them for any meaning or mention of collaboration. The large data set provided rich data from which the authors iteratively generated common concepts. Those concepts were grouped, compared and compiled to generate categorisation through different themes that were compared to avoid repetition or excessive breadth. The authors conducted this process through group discussions. This phase began to mould the second-order themes.

At the last stage, the first author formed aggregate dimensions from the analysed data and shaped themes that the group of authors then discussed. This author also translated the citations quoted here from Finnish into English. Figure 1 illustrates the tasks completed during the research process.

## 4 | Findings

The analysis revealed that companies were active on multiple levels, influencing CE transformation on the firm (micro), industry (meso) and national or international (macro) levels. Companies were found to collaborate on advancing their CE pursuit in six ways. Figure 2 presents the data analysis process, adapted from Corley and Gioia (2004), resulting in formulation of the findings. Appendix B provides further information about the category formation.

The first-order concepts demonstrated how differing collaborative activities were done both within existing value chains and in emerging networks. This created a division for the second-order themes. Examining the second-order themes fed into the aggregate dimensions to suggest that companies collaborated with individual companies (micro), within small groups of firms

or an industry (meso) and in larger cross-sectoral networks on a national or international (macro) level.

In general, the interviewees saw that collaboration was needed in CE practices and that their firms could not operate in the CE separately from other actors. The most frequently mentioned way to collaborate was through existing customers. Similarly, collaboration within the existing value chain was often mentioned and viewed as important. Some of the interviewees reported collaborating with companies outside their existing value chains as well.

There were some differences and similarities among the studied companies. A clear distinction was due to firm size: larger companies had CE operations as a side project, whereas smaller companies had CE in their DNA. Some characteristics were straightforward: large companies got involved in the development of CE practices and references and were able to attract significant

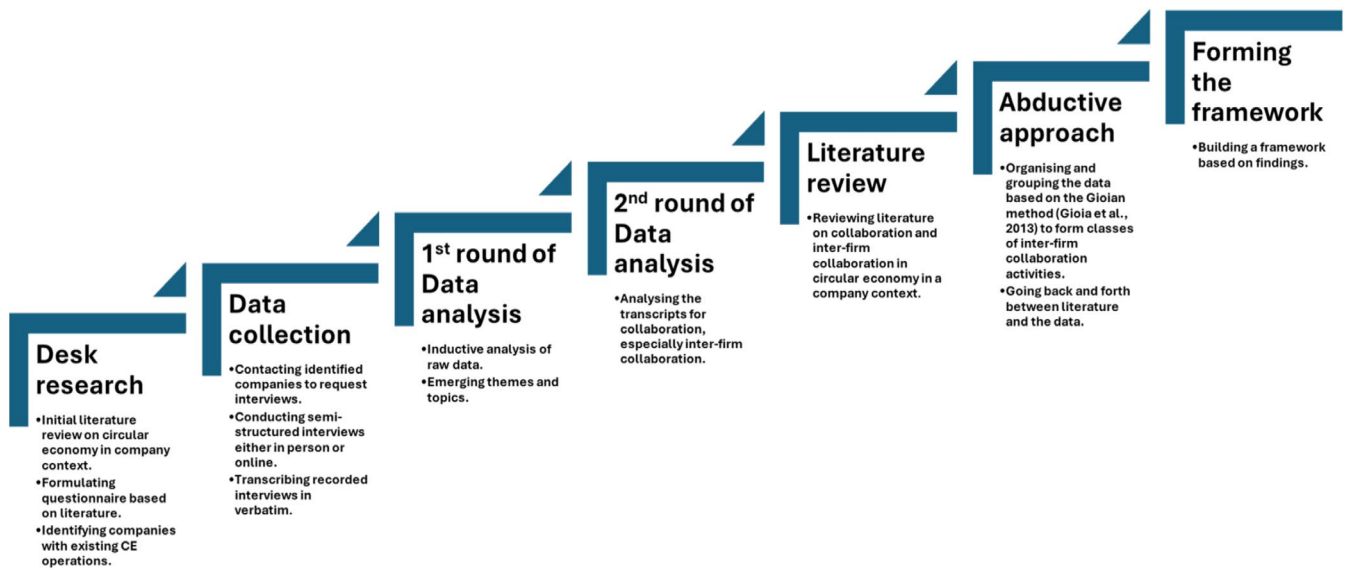


FIGURE 1 | The stages in the research process.

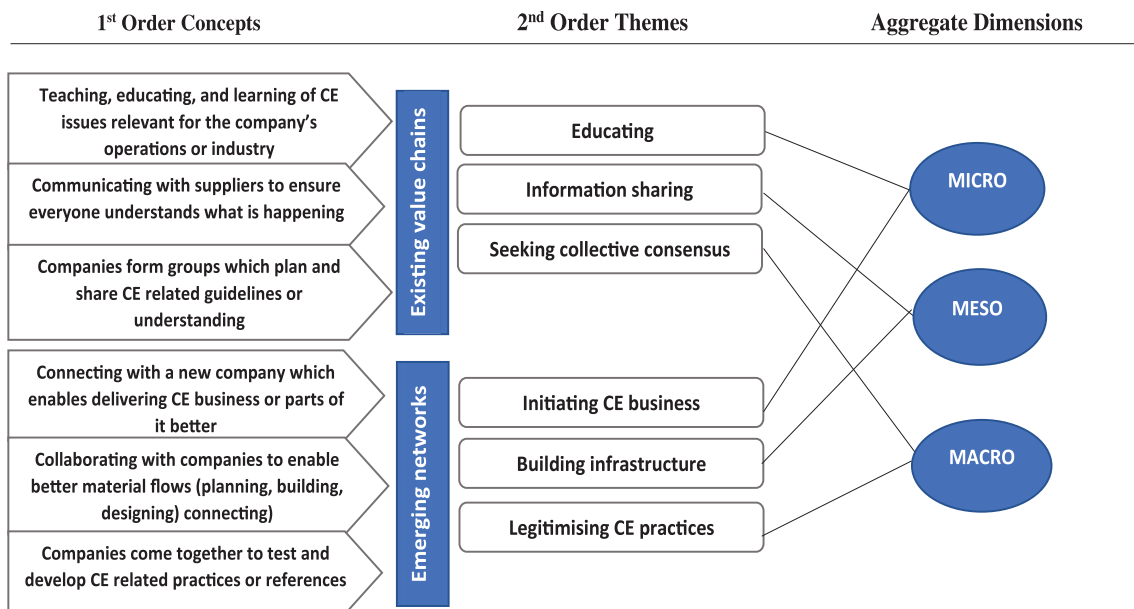


FIGURE 2 | The findings from the data analysis. Analysis model adapted from Corley and Gioia (2004).

partners to their development projects. Larger companies were usually established, dating back decades if not even a century and often had separated their CE business segment from their main business or the nature of their business fit well with the CE ideology (e.g., waste management as recycling or forest-based renewable raw materials). Smaller companies were more CE-oriented; some were even founded on CE principles. The smaller companies did not have the vast resources needed to develop the CE on a large scale but were looking for partnerships to gain access, visibility and contacts to deliver their CE-based solutions. Size seemed to affect what these companies were looking for in the collaboration; larger companies sought improvements on a large scale, whereas smaller companies sought to establish their own operations.

## 4.1 | Micro-Level

Inter-firm collaboration was practised on the micro-level when individual companies engaged with another firm to advance their own CE-based businesses and gain access to markets or by sharing their own CE knowledge. Micro-level collaboration benefitted companies by generating new knowledge and understanding as well as introducing them to potential collaborators with business potential.

### 4.1.1 | Educating

Educating customers or other firms about the CE was mentioned on 12 occasions. The interviewees mentioned how they educated others by sharing their own experiences about CE principles, best practices or benefits. This included teaching them about how prolonging the product lifecycle was reflected in prices, materials, reuse and recycling. Educating customers about CE principles in relation to company products and services was also noted. The interviews showed that educating and knowledge sharing were central to inter-firm collaboration and that companies shared their expertise with other actors to advance CE in different organisations, motivating others to engage with the CE. This type of collaboration increased understanding of the CE's potential in an issue-specific context. As a consumer goods sector representative put it:

I was speaking [about our CE experiences as a company] at this event in [city] for a large group of local firms. (C16)

A construction sector representative noted the following:

We believe that CE is done together, and we aim to improve our partners' CE understanding as well, as to educate them. We share our learning openly with others. (C15)

### 4.1.2 | Initiating CE Business

The second-highest number of mentions (17) interviewees made was about creating ties with other companies to deliver CE activities in a real-world context. Such collaborations included

exploring production side or waste streams for useful new products. In addition, inter-firm collaboration was mentioned in terms of new openings, as when a digital marketplace offered a platform for different brands to sell pre-owned goods when the company image might not support them being sold directly from the brand's own shops or when companies wanted to access a wider audience. This type of collaboration called for making new connections to create new opportunities for companies to realise CE in practice. A resale sector representative put it this way:

For example, [Company Z] has been doing this for a long time now; when customers come to buy a new [product], they take back the old [product] and its components, and then the company sells the pre-owned product. And now we have partnered with Company Z so that it can sell pre-owned products online to a wider market, and our users have the chance to compare the possibilities of buying a new or pre-owned product from Company Z or elsewhere. (C9)

Some interviewees noted that collaboration gave them better access to potential customers or users. As a mobility company representative noted:

There is this business park that has our [mobility service]; the businesses, the tenants, can use [the mobility service] when they need it. The property owner is our partner, and they offer us [space and exposure for the mobility service], and we provide them with the chance to offer this mobility service to their tenants. (C3)

Moreover, by collaborating with an established brand or larger company, smaller companies not only gained access but also benefitted from the other company's reputation, image and, in some cases, visibility. Representatives from a couple of larger companies reported that they had either been contacted by smaller companies or start-ups or put out their own calls for collaboration. The larger companies used their size and established brands, networks and resources to facilitate and cocreate solutions for CE.

## 4.2 | Meso-Level

Companies collaborated on the meso-level when a small group of companies worked together to share information and resources to improve their CE business. The meso-level comprises firms within the same value chain or sector, but also companies across sectors. Collaboration on the meso-level not only advanced those businesses' operations but also developed infrastructure that supported CE practices more widely.

### 4.2.1 | Information Sharing

The most reported inter-firm activity was information sharing, which was mentioned by 32 interviewees. Collaboration to share information along the value chain was motivated by the importance of learning about partners' needs and demands. This form of

collaboration was especially important when regulation was unclear and the company needed to communicate the challenges and possibilities resulting from that lack of clarity to other actors in the chain. Similarly, gaining knowledge of current and potential future needs was a motivation for collaboration that enabled a proactive approach to learn about needs, changes and challenges, which in turn paved the way to respond more effectively and strategically to pressing issues. As a plastics sector representative put it:

In this area, regulation and legislation are unclear; this lack of clarity affects our product development and how we can instruct our clients. Thus, we have actively built cooperation along the value chain aiming to establish information flows that would reach our customers and our customers' customers up and down the chain. These types of information flows are needed as they ease the current and potential future needs in advancing CE. (C30)

#### 4.2.2 | Building Supporting Infrastructure

Seven interviewees discussed at length how the lack of CE-supporting infrastructure had led to inter-firm collaboration to build the needed systems by themselves. This included finding new ways to recycle or reuse materials that were difficult to recycle with the current system. Similarly, this meant collaboratively creating the structure for reverse logistics or collection points for consumers. This type of collaboration aimed to bridge the gap in existing systems. A consumer goods sector representative put it this way:

A good example is this [material] for recycling. You were not able to recycle that in Finland previously, but now we have built the system with [Company A and Company B] and are able to recycle 100% of that material; nothing goes to landfill anymore. (C16)

An interviewee from the resale sector described forming a reverse logistics system: 'now, with [grocery store chain], we are developing these collection points where people can bring their old textiles' (C17).

### 4.3 | Macro-Level

Finally, inter-firm collaboration was practised on the macro-level, when different companies came together regardless of sector to improve their own prospects and gain an understanding of the changes required by the CE transformation. Companies engaged in larger networks on national or international levels, both industry-specific and cross-sectoral. Macro-level engagement had the potential to introduce new norms to a wider public as it dealt with CE-based solutions and ways in which they could be scaled.

#### 4.3.1 | Seeking Collective Consensus

Twelve notions on the benefits of networking were mentioned in the interviews. These networking opportunities included

associations, development organisations and networks related to specific industries, themes or issues. By networking in this way, the companies gained both access to relevant information and a forum for sharing challenges and victories. Development and trade organisations acted as platforms for companies and had the power to influence their industry but also represented the sector or group of companies in societal developments. At its best, collaboration through collective action could seek and find consensus for best practices when novel issues need to be addressed in industry and society. As a textile sector representative explained, 'in the business segment, we [companies] know one another and together we can have an effect' on the industry (C10). A plastics sector representative noted that associations help them follow and get involved in the field, putting it this way:

Behind us are [these] large associations ... and we gain a lot [by the connection], as the world is changing so fast, and you must follow the scene: new things, new materials are being developed all the time. (C27)

#### 4.3.2 | Legitimising CE Practices

The CE challenged companies in many ways as they tried to legitimise CE practices. This notion was mentioned by six interviewees. Perhaps the most challenging aspect of the CE is its relative novelty, which means that there is a lack of references, norms or general guidelines regarding how to execute it. Similarly, a lack of legislation and governmental guidance can drive companies to try to find their own solutions. Through collaboration, companies can pool resources to search for best CE-based practices.

A few companies were driving change in the CE with such energy that they had partnered with other companies to create references to demonstrate that the CE is possible in reality. This type of activity was cited by interviewees from larger companies with established brands that were more likely to enjoy financial stability.

As a recycling management company representative put it:

To be able to go forward, references are needed, and that requires investments that require financing. Currently, we are building a CE plant with [Company X and Company Y] and once operational, this plant will demonstrate that closed-loop solutions do work. (C7)

Thus, there was a need to find assurances as to how CE should be done. This called for common guidelines for CE business that could emerge from references, testing and sharing experiences with others. Moreover, as legislation develops, new ways to handle environmental responsibilities will arise. Legitimising collaboration can provide vital direction and benchmarking for CE operations: in short, it can give CE practices legitimacy. Finally, legitimising collaboration can serve as a path towards bringing the CE onto a larger scale, which is a central requirement for it to become mainstream.

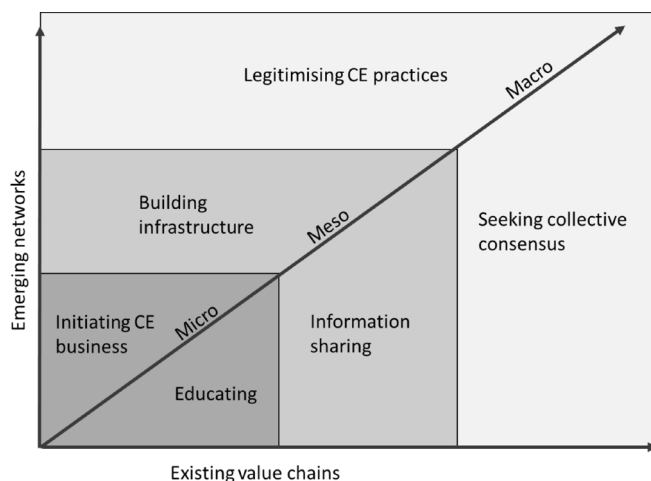
Based on the categorisation of the findings, Figure 3 presents a theoretical framework for inter-firm collaboration in the CE context. The inter-firm activities are described as divided between existing value chains and emerging networks, advancing CE on micro-, meso- and macro-levels.

## 5 | Discussion

The findings show that inter-firm collaboration in pursuit of the CE is exercised on the micro-, meso- and macro-levels, with activities divided between existing and emerging networks (Figure 3). Pioneer companies are eager not only to develop their own business but also to influence their value chains and industries. Inter-firm collaboration was aimed at supporting companies in their current CE operations or developing, building and testing potential solutions for future CE businesses. Existing relationships were altered to align with CE practices, such as reaching further down the value chain to create reverse material flows. Industry-specific solutions were developed through collaborating in existing networks and value chains, while emerging networks were created to form a wider CE ecosystem. Surprisingly, companies initiated CE collaboration in similar terms to the linear economy by seeking business potential, building readiness for expected changes and partnering to share risks and capabilities to scale solutions.

On the micro-level, educating was cited as one of the many ways to collaborate. Companies both wanted and needed to exchange their experiences and understanding related to CE practices. By educating and sharing their knowledge, companies tried to motivate others to implement the CE. This suggested that by normalising CE practices they could help legitimise companies' actions. As the interviewees' companies were pioneers, they have crucial information about implementing CE practices in real-world business contexts. This may be why educating people about CE issues was so heavily emphasised in the interview data.

Another finding on the micro-level is that forms of inter-firm collaboration emerge from the specific interest in developing CE-related solutions. This topic of initiating CE business by seeking collaboration outside the existing value chains has



**FIGURE 3** | Inter-firm CE activities divided between existing value chains and emerging networks.

received significantly less attention in the CE literature or has not been covered with sufficient clarity. Still, it was clearly a category in the data. Only a few existing studies have discussed how new actors or stakeholders are required to develop a local CE system for IS (Rincon-Moreno et al. 2020) or to undertake CE practices on a large scale; collaborating outside the existing value chain is essential (Brown et al. 2020). The newness of CE solutions is driving companies to collaborate outside their current value chains or to re-evaluate the roles of value chain members. Collaborating with new partners can offer vital access to new markets, information or other resources that companies need to conduct CE-based business effectively.

On the meso-level, the relevance of sharing information and knowledge was clear and these themes have been recognised in prior CE literature, for example, in relation to joint action directed at product design (Sudusinghe and Seuring 2022) and sustainability-driven cross-sectoral partnerships (Margolis 2024). In addition, information needs to be shared throughout the value chain, as it can boost sustainability performance (Flygansvaer et al. 2018). This shows that the supply chain can indeed work to improve operations, but its actors need to share their views, abilities and visions so that everyone understands what others can and cannot do. When actors in the chain are open about current and potential future needs and thoughts concerning product development, other actors can modify their actions and strategies accordingly. This means that suppliers can better meet needs and that value chain actors can jointly develop products and services while proactively reducing waste and undesirable aspects.

Another finding on the meso-level is that inter-firm collaboration can be used to overcome deficiencies in logistics or infrastructure. Like earlier research (e.g., Mishra et al. 2019; Veleva and Bodkin 2018), our data shows that collaboration often combines larger actors with smaller firms or even start-ups to provide smaller firms with access to resources, markets and expertise. Meanwhile, the larger actor gains additional value for their own products or services. Moreover, it was evident that collaboration was needed when key infrastructure did not yet exist and when companies needed access to new user bases or materials. Similarly, larger established companies connected actors from different parts of the value chain to create new roles; for example, a recycling management company and a producer or retailer could jointly develop systems to support the use of side or waste streams for a product. Alternatively, a retailer might offer a drop-off site for consumers and lay the groundwork for a reverse logistics process.

On the macro-level, it was evident that companies can come together and aim to influence markets, even to convince decision-makers of the relevance of the CE. The findings demonstrated this in two ways. First, companies operating roughly in the same industry come together and collectively aim to improve their own positions and to learn about and influence how the CE is being adopted in their industry and nationally. Second, companies operating in different lines of business collaborated to create legitimacy for practices in the CE arena. This type of collaboration was aimed at introducing new norms for CE business in general and was initially driven by interest in the CE and the search for CE-based solutions. Similar findings have been reported by Blomsma, Bauwens, et al. (2023) and by Margolis (2024) in the context of cross-sectoral partnerships.

This notion that companies create solutions themselves is partly presented in the previous literature on inter-firm collaboration: companies are motivated to pursue collaboration when the future of business (as usual) is uncertain and they need to find ways to proceed without the clarity of legislation (Fischer and Pascucci 2017). Furthermore, companies may form coalitions, working groups or the like to develop CE-supporting practices and operations (Stewart and Niero 2018; Blomsma, Bauwens, et al. 2023). Similarly, previous research states that larger companies often use their power and seek to set standards for their industry (Parida et al. 2019) and collaborate to maximise their impact. The data showed that companies are eager to test, set references and find solutions that serve their CE-based businesses.

One aspect of our findings that has received little attention in the CE literature was how networks can be used for support in areas like setting standards or even lobbying. Inter-firm collaboration in existing value chains on the macro-level aimed to influence industry and trade organisations to speak on behalf of the companies in political arenas, whereas macro-level collaboration in emerging networks formed around the motivation to advance the CE and companies from different backgrounds gravitated towards the networks based on their own motivation to learn and do this. It was clear from the data that collaboration activated companies in influencing wider networks, even politics, which was important for the development of CE itself. This influential collaboration was not as clear in prior CE literature.

The findings did not show clear distinctions between industries on how they approached collaboration. Perhaps the difference between companies' business models affected the degree of influence. Service providers were generally engaging with other companies directly, whereas producers with long value chains could go up or down the chain to obtain or share information and knowledge. In addition, the growth of second-hand platforms created reverse logistics or collection points with other companies to facilitate consumers' resale and reuse of goods. Some companies were focused on developing the handling of their waste streams to aid the recycling process and reuse those material streams. This showed product and material stewardship and was not motivated solely by extended producer responsibility requirements. New types of collaboration were sought by both large and small companies, regardless of sector. Similarly, both smaller and larger companies showed interest in developing their take-back systems or reverse supply streams, to regain their own products or materials.

In all, the findings showed that inter-firm collaboration was driven by similar motives as with the traditional, linear business logic; namely, companies saw the business potential in the CE and wanted to get involved in this emerging market. However, for CE to become profitable and eventually enter the mainstream, companies need inter-firm collaboration to bridge gaps on that exist largely due to the novelty of the CE model and to form value chains that support CE activities. Ghisellini et al. (2016) reported that through collaboration, companies would be able to establish the necessary exchange networks or 'loops'. Thus, CE-based business is about creating cross-industry connections, with the use of services, raw materials and side or waste streams

being reinvented based on the need to use non-virgin resources. Since wider cycles or loops of material use are not likely to be handled by a single company, no one actor can realise the CE alone. Thus, a functioning CE model creates an inherent need for an intertwined network of companies exchanging different resources at differing phases (Kanda et al. 2021). As a consumer goods representative said, 'You need to create those networks, because they are long and heavy chains and no one is able to do it alone' (C14), recalling the famed 'All for one and one for all'; if we aim to benefit others, their work will benefit us in return. This highlights that the CE is achieved only when different actors come together and network to form an ecosystem to make it happen.

## 6 | Conclusions

This paper explored how companies collaborate when pursuing the CE and how inter-firm collaboration is enabling the CE transformation. The study was motivated by the frequently mentioned notion of collaboration as central to CE. The authors adopted the decentralised view that collaboration between companies was not restricted to any industry or specific region. This was important, as CE should not be restricted to being practised only in regional CE parks through IS; rather, the whole economy should support CE and companies in general should be able to operate on CE principles. Based on the findings, it seems evident that inter-firm collaboration is at the core of the CE—it is necessary for CE ecosystems to function. Collaboration is necessary as the benefits of the CE are largely gained once goods have passed through the hands of several actors in the value chain. Collaboration is especially crucial when initiating the transition because the CE transition requires restructuring operations and value chains, as well as establishing supportive operations.

Inter-firm collaboration aimed to either support companies in their current CE business operations or to build and test potential solutions for future CE businesses. Much of the collaboration was aimed at shaping a business environment that would enable CE-based firms to overcome inadequacies in infrastructure, access, existing operational modes and knowledge. The CE brings a new dimension to collaboration due to its complexity, namely circularity demands more than a single organisation feeding into others' production systems; it requires new networks of accommodating actors. What is more, the findings demonstrated how companies aimed to influence politics and society by engaging in macro-level collaboration. The findings showed that companies collaborate on many levels and that both tangible and intangible assets and resources were shared in CE-based collaborations. The developed theoretical framework describes inter-firm collaboration activities that advance business operations in the CE.

Thus, inter-firm collaboration can be viewed as advancing the CE transformation in both businesses and society. Companies use different strategies to enter or improve their CE-based business and are likely to apply several of the strategies mentioned in the framework, because each strategy influences their CE-based business in differing ways. Still, the rationale for companies to enter collaboration can be different: size, business model and other aspects can affect which collaboration strategies each company could apply.

## 6.1 | Research Contributions and Managerial and Policy Implications

The theoretical contributions of this research are many. First, it introduces a new framework for inter-firm collaboration in the CE context. Building on prior work on CE-related collaboration, this paper offers a more nuanced understanding of the topic by suggesting a novel approach to important aspects like inter-firm collaboration. Second, the paper adds new knowledge on companies' CE agency, especially by introducing the important role of macro-level collaboration where companies move closer to influencing politics. Third, this paper introduces strategies for inter-firm collaboration that can foster companies' CE implementation and thus improve their sustainable business operations. Last, the findings contribute to the CE literature by identifying potential sources and types of CE collaboration.

This study has managerial and practical implications. Figure 3 describes the various strategies that companies can develop and use at the industry (meso) and national (macro) levels to facilitate CE practices on their own firm (micro) level. Through close collaboration in CE-related networks, managers can gain access to information, knowledge and shared experiences that may help them clarify which issues should be examined more closely. This networking helps individual firms to develop and implement CE practices. Similarly, through networks, managers can find relevant actors with whom to start new business collaborations. Finally, the networks can give both CE companies and other actors guidance regarding the directions in which the CE has the greatest potential.

Based on the findings, the authors suggest that both local administrators and national policymakers could better support the formation of CE collaboration. This can be done in three ways. First, to promote the CE through a neutral party that acts as a facilitator. Second, to acknowledge, communicate about and support CE ecosystems, both regional and scattered, as facilitators of the CE transition. This support includes developing financial instruments. Third, to promote the benefits of the CE both to companies and to citizens.

## 6.2 | Limitations and Future Research

This study has certain limitations that can be addressed in future research. First, it focuses on Finnish companies. While Finland's government-driven agenda may activate companies to pursue circularity in the country, the possibilities of companies collaborating on CE initiatives should also be studied in other national contexts. Second, the sample consists of CE pioneers, which could affect how the interviewees view and experience collaboration. Research investigating the ways laggards use collaboration could bring valuable insights to the topic. Third, only a couple of the interview questions specifically asked about collaboration-related issues, but the importance of collaboration was still highlighted in the data. Thus, future research could investigate the role of collaboration in greater detail, such as evaluating how different forms of collaboration like alliances, partnerships and joint ventures affect the way businesses can collaborate and catalyse CE practices. Future research could also continue to address the challenges in and solutions for

finding suitable collaborators. Finally, as the role macro-level collaboration in companies' influence on political and societal levels was only introduced here, future research could address this topic further and more in detail.

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### References

- Aarikka-Stenroos, L., P. Ritala, and L. D. W. Thomas. 2021. "Circular Economy Ecosystems: A Typology, Definitions, and Implications." In *Research Handbook of Sustainability Agency*, edited by S. Teerikangas, T. Onkila, K. Koistinen, and M. Mäkelä, 260–276. Edward Elgar Publishing. <https://doi.org/10.4337/9781789906035.00024>.
- Agrawal, D., A. Dwivedi, A. Patil, and S. K. Paul. 2023. "Impediments of Product Recovery in Circular Supply Chains: Implications for Sustainable Development." *Sustainable Development* 31, no. 3: 1618–1637. <https://doi.org/10.1002/sd.2472>.
- Agudo, F. L., B. S. Bezerra, J. A. Gobbo Jr., and L. A. B. Paes. 2022. "Unfolding Research Themes for Industrial Symbiosis and Underlying Theories." *Sustainable Development* 30, no. 6: 1682–1702. <https://doi.org/10.1002/sd.2335>.
- Arekrans, J., S. Ritzén, and R. Laurenti. 2023. "The Role of Radical Innovation in Circular Strategy Deployment." *Business Strategy and the Environment* 32, no. 3: 1085–1105. <https://doi.org/10.1002/bse.3108>.
- Bertassini, A. C., A. R. Ometto, S. Severengiz, and M. C. Gerolamo. 2021. "Circular Economy and Sustainability: The Role of Organizational Behaviour in the Transition Journey." *Business Strategy and the Environment* 30, no. 7: 3160–3193. <https://doi.org/10.1002/bse.2796>.
- Blomsma, F., T. Bauwens, I. Weissbrod, and J. Kirchherr. 2023. "The 'Need for Speed': Towards Circular Disruption—What It Is, How to Make It Happen and How to Know It's Happening." *Business Strategy and the Environment* 32, no. 3: 1010–1031. <https://doi.org/10.1002/bse.3106>.
- Blomsma, F., and G. Brennan. 2017. "The Emergence of Circular Economy: A New Framing Around Prolonging Resource Productivity." *Journal of Industrial Ecology* 21, no. 3: 603–614. <https://doi.org/10.1111/jiec.12603>.
- Blomsma, F., M. Tennant, and R. Ozaki. 2023. "Making Sense of Circular Economy: Understanding the Progression From Idea to Action." *Business Strategy and the Environment* 32, no. 3: 1059–1084. <https://doi.org/10.1002/bse.3107>.
- Brown, P., N. Bocken, and R. Balkenende. 2020. "How Do Companies Collaborate for Circular Oriented Innovation?" *Sustainability* 12, no. 4: 1648. <https://doi.org/10.3390/su12041648>.
- Brown, P., N. Bocken, and R. Balkenende. 2018. "Towards Understanding Collaboration Within Circular Economy Business Models." In *Sustainable Business Models: Principles, Promise, and Practice*, edited by L. Moratis, F. Melissen, and S. O. Idowu, 169–201. Springer. [https://doi.org/10.1007/978-3-319-73503-0\\_9](https://doi.org/10.1007/978-3-319-73503-0_9).
- Brown, P., N. Bocken, and R. Balkenende. 2019. "Why Do Companies Pursue Collaborative Circular Oriented Innovation?" *Sustainability* 11, no. 3: 635. <https://doi.org/10.3390/su11030635>.

- Burger, M., S. Stavropoulos, S. Ramkumar, J. Dufourmont, and F. van Oort. 2019. "The Heterogeneous Skill-Base of Circular Economy Employment." *Research Policy* 48, no. 1: 248–261. <https://doi.org/10.1016/j.respol.2018.08.015>.
- Chiappetta Jabbour, C. J., P. D. C. Fiorini, N. O. Ndubisi, M. M. Queiroz, and É. L. Piato. 2020. "Digitally-Enabled Sustainable Supply Chains in the 21st Century: A Review and a Research Agenda." *Science of the Total Environment* 725: 138177. <https://doi.org/10.1016/j.scitotenv.2020.138177>.
- Coppola, C., A. Vollero, and A. Siano. 2023. "Developing Dynamic Capabilities for the Circular Economy in the Textile and Clothing Industry in Italy: A Natural-Resource-Based View." *Business Strategy and the Environment* 32, no. 7: 4798–4820. <https://doi.org/10.1002/bse.3394>.
- Corley, K. G., and D. A. Gioia. 2004. "Identity Ambiguity and Change in the Wake of a Corporate Spin-Off." *Administrative Science Quarterly* 49, no. 2: 173–208. <http://www.jstor.org/stable/4131471>.
- Cricelli, L., M. Greco, and M. Grimaldi. 2021. "An Investigation on the Effect of Inter-Organisational Collaboration on Reverse Logistics." *International Journal of Production Economics* 240: 108216. <https://doi.org/10.1016/j.ijpe.2021.108216>.
- D'Amato, D., N. Droste, B. Allen, et al. 2017. "Green, Circular, Bio Economy: A Comparative Analysis of Sustainability Avenues." *Journal of Cleaner Production* 168: 716–734. <https://doi.org/10.1016/j.jclepro.2017.09.053>.
- Dzhengiz, T., and S. Patala. 2024. "The Role of Cross-Sector Partnerships in the Dynamics Between Places and Innovation Ecosystems." *R and D Management* 54, no. 2: 370–397. <https://doi.org/10.1111/radm.12589>.
- Ellen MacArthur Foundation. 2013. "Towards the Circular Economy Vol. 1: An Economic and Business Rationale for an Accelerated Transition." <https://www.ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an>.
- Ellen MacArthur Foundation. 2020. "The Circular Economy: A Transformative Covid-19 Recovery Strategy: How Policymakers Can Pave the Way to a Low Carbon, Prosperous Future." <https://ellenmacarthurfoundation.org/a-transformative-covid-19-recovery-strategy>.
- Ferreira, I. A., R. Godina, A. Pinto, P. Pinto, and H. Carvalho. 2023. "Boosting Additive Circular Economy Ecosystems Using Blockchain: An Exploratory Case Study." *Computers & Industrial Engineering* 175: 108916. <https://doi.org/10.1016/j.cie.2022.108916>.
- Fischer, A., and S. Pascucci. 2017. "Institutional Incentives in Circular Economy Transition: The Case of Material Use in the Dutch Textile Industry." *Journal of Cleaner Production* 155: 17–32. <https://doi.org/10.1016/j.jclepro.2016.12.038>.
- Flygansvaer, B., R. Dahlstrom, and A. Nygaard. 2018. "Exploring the Pursuit of Sustainability in Reverse Supply Chains for Electronics." *Journal of Cleaner Production* 189: 472–484. <https://doi.org/10.1016/j.jclepro.2018.04.014>.
- Fraccascia, L., D. M. Yazan, V. Albino, and H. Zijm. 2020. "The Role of Redundancy in Industrial Symbiotic Business Development: A Theoretical Framework Explored by Agent-Based Simulation." *International Journal of Production Economics* 221: 107471. <https://doi.org/10.1016/j.ijpe.2019.08.006>.
- Franzò, S., and A. Urbinati. 2023. "Managing Resource Loops in Circular Supply Chains: A Taxonomy of Multi-Sided Platforms in the B2B Setting." *Industrial Marketing Management* 115: 185–197. <https://doi.org/10.1016/j.indmarman.2023.09.016>.
- Franzò, S., A. Urbinati, F. Pacicco, and D. Chiaroni. 2022. *The Role of Digital Technologies in Designing Circular Business Models*. International Society for Professional Innovation Management (ISPIM). <https://www.proquest.com/conference-papers-proceedings/role-digital-technologies-designing-circular/docview/2694492325/se-2>.
- Gebhardt, M., M. Kopyto, H. Birkel, and E. Hartmann. 2022. "Industry 4.0 Technologies as Enablers of Collaboration in Circular Supply Chains: A Systematic Literature Review." *International Journal of Production Research* 60, no. 23: 6967–6995. <https://doi.org/10.1080/00207543.2021.1999521>.
- Ghisellini, P., C. Cialani, and S. Ulgiati. 2016. "A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems." *Journal of Cleaner Production* 114: 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>.
- Giannoccaro, I., V. Zaza, and L. Fraccascia. 2023. "Designing Regional Industrial Symbiosis Networks: The Case of Apulia Region." *Sustainable Development* 31, no. 3: 1475–1514. <https://doi.org/10.1002/sd.2462>.
- Gioia, D., K. Corley, and A. Hamilton. 2013. "Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology." *Organizational Research Methods* 16, no. 1: 15–31. <https://doi.org/10.1177/1094428112452151>.
- Government of Finland. 2019. "Inclusive and Competent Finland: A Socially, Economically, and Ecologically Sustainable Society." <https://julkaisut.valtioneuvosto.fi/handle/10024/161664>.
- Government of Finland. 2021. "Strategic Programme to Promote a Circular Economy." <https://ym.fi/en/strategic-programme-to-promote-a-circular-economy>.
- Gupta, A., and R. K. Singh. 2024. "Applications of Emerging Technologies in Logistics Sector for Achieving Circular Economy Goals During COVID 19 Pandemic: Analysis of Critical Success Factors." *International Journal of Logistics* 27, no. 4: 451–472. <https://doi.org/10.1080/13675567.2021.1985095>.
- Juuti, P., and A. Puusa. 2020. "Johdanto. Mitä laadullisella tutkimuksella tarkoitetaan?" In *Laadullisen tutkimuksen näkökulmat ja menetelmät*, edited by A. Puusa and P. Juuti, 9–19. Gaudeamus.
- Kalmykova, Y., M. Sadagopan, and L. Rosado. 2018. "Circular Economy – From Review of Theories and Practices to Development of Implementation Tools." *Resources, Conservation and Recycling* 135: 190–201. <https://doi.org/10.1016/j.resconrec.2017.10.034>.
- Kanda, W., M. Geissdoerfer, and O. Hjelm. 2021. "From Circular Business Models to Circular Business Ecosystems." *Business Strategy and the Environment* 30, no. 6: 2814–2829. <https://doi.org/10.1002/bse.2895>.
- Kazancoglu, I., Y. Kazancoglu, E. Yarimoglu, and A. Kahraman. 2020. "A Conceptual Framework for Barriers of Circular Supply Chains for Sustainability in the Textile Industry." *Sustainable Development* 28: 1477–1492. <https://doi.org/10.1002/sd.2100>.
- Kirchherr, J., D. Reike, and M. Hekkert. 2017. "Conceptualizing the Circular Economy: An Analysis of 114 Definitions." *Resources, Conservation and Recycling* 127: 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>.
- Köhler, J., S. D. Sönnichsen, and P. Beske-Jansen. 2022. "Towards a Collaboration Framework for Circular Economy: The Role of Dynamic Capabilities and Open Innovation." *Business Strategy and the Environment* 31, no. 6: 2700–2713. <https://doi.org/10.1002/bse.3000>.
- Kuhlmann, M., J. Meuer, and C. R. Bening. 2023. "Interorganizational Sensemaking of the Transition Toward a Circular Value Chain." *Organization & Environment* 36, no. 3: 411–441. <https://doi.org/10.1177/10860266231162057>.
- Kusumawardani, N., B. Tjahjono, and C. R. Priadi. 2021. "Circular Economy Adoption in the Upstream Agri-Food Supply Chain: Understanding the Implications of the Two Theoretical Lenses." Paper presented at the 11th Annual International Conference on Industrial Engineering and Operations Management, Singapore, March 7–11, 2021. <http://www.ieomsociety.org/singapore2021/papers/866.pdf>.
- Lüdeke-Freund, F., S. Gold, and N. M. P. Bocken. 2019. "A Review and Typology of Circular Economy Business Model Patterns." *Journal of Industrial Ecology* 23, no. 1: 36–61. <https://doi.org/10.1111/jiec.12763>.

- Margolis, A. 2024. "Do all Roads Lead to Rome? How Three Process Pathways Contribute to Transformative Innovation in Cross-Sector Partnerships." *Business & Society*. <https://doi.org/10.1177/00076503241289929>.
- Marjamaa, M., H. Salminen, J. Kujala, R. Tapaninaho, and A. Heikkinen. 2021. "A Sustainable Circular Economy: Exploring Stakeholder Interests in Finland." *South Asian Journal of Business and Management Cases* 10: 50–62. <https://doi.org/10.1177/2277977921991914>.
- Mishra, J. L., K. D. Chiwenga, and K. Ali. 2019. "Collaboration as an Enabler for Circular Economy: A Case Study of a Developing Country." *Management Decision* 59, no. 8: 1784–1800. <https://doi.org/10.1108/MD-10-2018-1111>.
- Mulrow, J. S., S. Derrible, W. S. Ashton, and S. S. Chopra. 2017. "Industrial Symbiosis at the Facility Scale." *Journal of Industrial Ecology* 21, no. 3: 559–571. <https://doi.org/10.1111/jiec.12592>.
- Nooteboom, B. 2004. *Inter-Firm Collaboration, Learning and Networks: An Integrated Approach*. Routledge.
- Pal, V., ed. 2022. *Social and Cultural Aspects of the Circular Economy: Toward Solidarity and Inclusivity*. Routledge.
- Parida, V., T. Burström, I. Visnjic, and J. Wincent. 2019. "Orchestrating Industrial Ecosystem in Circular Economy: A Two-Stage Transformation Model for Large Manufacturing Companies." *Journal of Business Research* 101: 715–725. <https://doi.org/10.1016/j.jbusres.2019.01.006>.
- Rajput, S., and S. P. Singh. 2019. "Connecting Circular Economy and Industry 4.0." *International Journal of Information Management* 49: 98–113. <https://doi.org/10.1016/j.ijinfomgt.2019.03.002>.
- Rincon-Moreno, J., M. Ormazabal, M. J. Alvarez, and C. Jaca. 2020. "Shortcomings of Transforming a Local Circular Economy System Through Industrial Symbiosis: A Case Study in Spanish SMEs." *Sustainability* 12: 8423. <https://doi.org/10.3390/su12208423>.
- Rizzi, F., I. Bartolozzi, A. Borghini, and M. Frey. 2013. "Environmental Management of End-Of-Life Products: Nine Factors of Sustainability in Collaborative Networks." *Business Strategy and the Environment* 22, no. 8: 561–572. <https://doi.org/10.1002/bse.1766>.
- Rosa, P., C. Sassanelli, A. Urbinati, D. Chiaroni, and S. Terzi. 2020. "Assessing Relations Between Circular Economy and Industry 4.0: A Systematic Literature Review." *International Journal of Production Research* 58, no. 6: 1662–1687. <https://doi.org/10.1080/00207543.2019.1680896>.
- Sarja, M., T. Onkila, and M. Mäkelä. 2021. "A Systematic Literature Review of the Transition to the Circular Economy in Business Organizations: Obstacles, Catalysts and Ambivalences." *Journal of Cleaner Production* 286: 125492.
- Sassanelli, C., J. A. Garza-Reyes, Y. Liu, D. A. de Jesus Pacheco, and S. Luthra. 2023. "The Disruptive Action of Industry 4.0 Technologies Cross-Fertilizing Circular Economy Throughout Society." *Computers & Industrial Engineering* 183: 109548. <https://doi.org/10.1016/j.cie.2023.109548>.
- Schögl, J., L. Stumpf, and R. J. Baumgartner. 2024. "The Role of Interorganizational Collaboration and Digital Technologies in the Implementation of Circular Economy Practices—Empirical Evidence From Manufacturing Firms." *Business Strategy and the Environment* 33, no. 3: 2225–2249. <https://doi.org/10.1002/bse.3593>.
- Sehnm, S., D. S. Bispo, J. O. Jo-ao, et al. 2022. "Upscaling Circular Economy in Foodtechs Businesses in Emergent Countries: Towards Sustainable Development Through Natural Resource Based View." *Sustainable Development* 30, no. 5: 1200–1221. <https://doi.org/10.1002/sd.2311>.
- Sinha, E. 2022. "Circular Economy—A Way Forward to Sustainable Development: Identifying Conceptual Overlaps and Contingency Factors at the Microlevel." *Sustainable Development* 30, no. 4: 771–783. <https://doi.org/10.1002/sd.2263>.
- Sitra. 2016. *Leading the Cycle: Finnish Road Map to a Circular Economy 2016–2025*. Sitra.
- Sitra. 2019. "The Most Interesting Companies in the Circular Economy in Finland: Business Examples." Accessed August 18, 2019. <https://www.sitra.fi/en/projects/interesting-companies-circular-economy-finland/#business-examples>.
- Sonar, H., A. Mukherjee, A. Gunasekaran, and R. K. Singh. 2022. "Sustainable Supply Chain Management of Automotive Sector in Context to the Circular Economy: A Strategic Framework." *Business Strategy and the Environment* 31, no. 7: 3635–3648. <https://doi.org/10.1002/bse.3112>.
- Stål, H. I., and J. Jansson. 2017. "Sustainable Consumption and Value Propositions: Exploring Product–Service System Practices Among Swedish Fashion Firms." *Sustainable Development* 25: 546–558. <https://doi.org/10.1002/sd.1677>.
- Stewart, R., and M. Niero. 2018. "Circular Economy in Corporate Sustainability Strategies: A Review of Corporate Sustainability Reports in the Fast-Moving Consumer Goods Sector." *Business Strategy and the Environment* 27, no. 7: 1005–1022. <https://doi.org/10.1002/bse.2048>.
- Straub, L., K. Hartley, I. Dyakonov, H. Gupta, D. van Vuuren, and J. Kirchherr. 2023. "Employee Skills for Circular Business Model Implementation: A Taxonomy." *Journal of Cleaner Production* 410: 137027. <https://doi.org/10.1016/j.jclepro.2023.137027>.
- Sudusinghe, J. I., and S. Seuring. 2022. "Supply Chain Collaboration and Sustainability Performance in Circular Economy: A Systematic Literature Review." *International Journal of Production Economics* 245: 108402. <https://doi.org/10.1016/j.ijpe.2021.108402>.
- Taddei, E., C. Sassanelli, P. Rosa, and S. Terzi. 2022. "Circular Supply Chains in the Era of Industry 4.0: A Systematic Literature Review." *Computers & Industrial Engineering* 170: 108268. <https://doi.org/10.1016/j.cie.2022.108268>.
- Tapaninaho, R., and A. Heikkinen. 2022. "Value Creation in Circular Economy Business for Sustainability: A Stakeholder Relationship Perspective." *Business Strategy and the Environment* 31, no. 6: 2728–2740. <https://doi.org/10.1002/bse.3002>.
- Ukko, J., M. Saunila, M. Nasiri, and T. Rantala. 2022. "The Importance of Sustainability Engagement in Small Businesses Supplier Collaboration." *Sustainable Development* 30, no. 1: 1–9. <https://doi.org/10.1002/sd.2224>.
- Usikartano, J., P. Saha, and L. Aarikka-Stenroos. 2022. "The Industrial Symbiosis Process as an Interplay of Public and Private Agency: Comparing Two Cases." *Journal of Cleaner Production* 344: 130996. <https://doi.org/10.1016/j.jclepro.2022.130996>.
- Usikartano, J., H. Väyrynen, and L. Aarikka-Stenroos. 2020. "Public Agency in Changing Industrial Circular Economy Ecosystems: Roles, Modes and Structures." *Sustainability* 12: 10015. <https://doi.org/10.3390/su122310015>.
- van Keulen, M., and J. Kirchherr. 2021. "The Implementation of the Circular Economy: Barriers and Enablers in the Coffee Value Chain." *Journal of Cleaner Production* 281: 125033. <https://doi.org/10.1016/j.jclepro.2020.125033>.
- Veleva, V., and G. Bodkin. 2018. "Corporate-entrepreneur collaborations to advance a circular economy." *Journal of Cleaner Production* 188: 20–37. <https://doi.org/10.1016/j.jclepro.2018.03.196>.
- Yeo, Z., D. Masi, J. S. C. Low, Y. T. Ng, P. S. Tan, and S. Barnes. 2019. "Tools for Promoting Industrial Symbiosis." *Journal of Industrial Ecology* 23: 1087–1108. <https://doi.org/10.1111/jiec.12846>.

## Appendix A

## See Table A1

TABLE A1 | Expert Interviewee Profiles.

No.	Industry	Interviewee's position	Gender	Interview duration
C1	Consulting	Circular economy specialist	F	39 min
C2	Energy	Director of biomass refining	M	61 min
C3	Mobility	Marketing and sales coordinator	F	45 min
C4	Health	CEO	M	52 min
C5	Other	CEO	M	100 min
C6	Energy	CEO	M	54 min
C7	Recycling management	Senior vice president, corporate relations	M	57 min
C8	Industrial equipment and solutions	CEO	M	37 min
C9	Resale	CEO	M	53 min
C10	Textile	Senior vice president, business concept development	F	65 min
C11	Resale	CEO	M	48 min
C12	Interior	Sustainability manager	F	69 min
C13	Interior	Strategy director	M	50 min
C14	Consumer goods	CEO	F	27 min
C15	Construction	Board member	M	40 min
C16	Consumer goods	Director, new business and growth	F	75 min
C17	Resale	CEO	M	55 min
C18	Industrial equipment and solutions	CEO	M	69 min
C19	Interior	CEO	M	47 min
C20	Other	Business manager	M	27 min
C21	Textile	CEO	F	41 min
C22	Industrial equipment and solutions	Director	M	91 min
C23	Forest-based	Manager, Environmental production support and responsibility/director, strategic partnerships and technology	F&M	45 min
C24	Forest-based	Business unit director	F	71 min
C25	Forest-based	Director of sustainability	F	42 min
C26	Plastics	Chief marketing officer	M	60 min
C27	Textile	CEO	F	55 min
C28	Forest-based	VP sustainability	M	86 min
C29	Energy	Sales director	M	35 min
C30	Plastics	Sustainability specialist	F	31 min
C31	Consulting	Director, circular concepts	F	31 min
C32	Wealth management	Investment director	M	54 min
C33	Recycling management	Business director	M	62 min
C34	Information technology	Sales director	M	49 min
C35	Energy	CEO	M	65 min

(Continues)

**TABLE A1** | (Continued)

No.	Industry	Interviewee's position	Gender	Interview duration
C36	Recycling management	CEO	M	62 min
C37	Mobility	CEO	M	49 min
C38	Construction	CEO	F	35 min
C39	Recycling management	Circular economy specialist	F	45 min
C40	Other	CEO	F	68 min
C41	Industrial equipment and solutions	CEO	M	42 min
C42	Resale	Marketing and communications specialist	F	47 min
C43	Other	CEO	M	37 min

**Appendix B****See Table B1****TABLE B1** | Data Analysis Process Description With Definitions and Exemplary Quotes.

	Second-order themes	Theme description	First-order concepts	
			Exemplary quotes	
	Educating	Providing motivation and growing understanding of the possibilities of CE in a specific context	I was speaking in this event in [city] for a large group of local firms [about our experiences]. (C16)	We believe that CE is done together, and we aim to improve our partners CE understanding as well, educate them. We share our learnings openly with others. (C15)
Existing value chains	Information sharing	Proactive approach to learn about needs, changes, and challenges (helping in adapting)	[A logistics operator] was willing to adjust their current logistic processes to better serve our [CE-based business]. (C17)	Customers are important collaborators as we are not doing this for us, but for them. (C21)
	Seeking collective consensus	A search for consensus of best practices within the sector	We are part of an employer's association, and they have created a CE roadmap. And they try to help the member organisations to find suitable ways to enter the CE. (C34)	Our advocacy organisation engages in these discussions [on CE challenges and how to tackle them on our behalf]. It requires national consensus on how to [practice these] and how to incorporate them into legislation. (C25)
	Initiating CE business	New collaboration opens possibilities for realising CE in practice	We are actively looking for growth opportunities by scouting new places for secondary supply, but also scouting for scaling opportunities abroad. (C41)	We collaborated with [company C] to collect old jeans for them [from our second-hand stock], and they use those as a raw material. (C17)
Emerging networks	Building CE supportive infrastructure	Planning and developing infrastructure for a functioning CE	Now we are, together with [grocery store chain], developing these collection points where people can bring their old textiles. (C17)	A good example is this [material] for recycling. You were not able to recycle that in Finland previously, but now we have built the system with (Company A and Company B) and are able to recycle 100% of that material; nothing goes to the landfill anymore. (C16)
	Legitimising CE practices	Creating references, common norms, and guidelines for CE operations Scaling CE solutions (making CE a reality)	We participate in [sustainability related network] where we get to network with large companies. In the network we work together and share experiences, thoughts on the topics. Trying to help one another in these matters. (C34)	We engaged with [a CE network for companies] and there each company plans and develops solutions to tackle plastic waste, starting from their own operations. (C31)