

JENNI KAIPAINEN

Strategic Development of Circular Economy Business in Established Companies

A process approach to business strategy,
business model innovation, and collaboration

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ACADEMIC DISSERTATION

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PREFACE AND ACKNOWLEDGEMENTS

“Unless we can make the economy solve the world's biggest challenges for us as it operates, we are never going to solve the world's biggest issues.”

— Ellen MacArthur, Founder of the Ellen MacArthur Foundation

Fully agreeing with Ellen MacArthur, delving into companies' role in solving grand challenges by strategically developing circular economy business felt very meaningful and intriguing when the opportunity first arose. Once finding such an interesting research topic and encouraging environment for the doctoral work, I was too tempted not to seize the moment and unleash my drive to contribute to the understanding of circular economy business from a strategic viewpoint. Looking back, I am very happy and proud I had the courage to take this leap. Although the progress of my doctoral work has been seemingly smooth observed from outside, the successful advancement has been a result of hard work, devotion, and sacrifices from me and my closest ones. Thus, the journey has covered an emotional spectrum from occasional moments of tiredness and disappointment to the dominance of pure joy and excitement. Indeed, the doctoral journey has taken a lot, but in exchange I found it very rewarding, as I discovered a lot related to circular economy business; research, teaching, and societal impact; as well as myself and how my perspectives fit to the diverse ways the world can be perceived by others.

In the spirit of systemic circular economy transition, writing this thesis has not been my journey alone but has demanded the help and efforts of many others. First, I am deeply thankful to my two wonderful supervisors. Professor Aarikka-Stenroos—dear Leena, thanks to your endless inspiration, and believing in me, I started initially thinking of the doctoral journey. Thanks to your ability to throw yourself into exploring the new, it became possible to turn this doctoral journey into a unique double degree with two universities involved. Your positively infectious ambition, excitement, and engagement have enabled me to pull this journey off more successfully than I had ever imagined. Professor Chiaroni—dear Davide, your kindness and wisdom have amazed me. Thanks to you, this journey has been one of a kind, and I have been privileged to enjoy it from two different angles, the Finnish and the Italian. Time and again, you have always been there to welcome me back to Milan, help with any possible issue, and patiently guide me forward on my research

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In Hervanta, on the 9th of November 2023,

Jenni Kaipainen

ABSTRACT

Circular economy (CE) promises a pathway to decouple economic and environmentally sustainable growth. Therefore, it has gained the attention of both policymakers and companies around the world and across industries. For companies, a shift to CE offers competitive advantage, cost-savings, and engagement with key partners. Nevertheless, established companies struggle to implement CE business in practice and absorb its long-term implications, as CE requires a fundamental rethinking of extant business models, business strategies, and collaborations with other organizations. Hence, companies need to adopt a strategic viewpoint to manage the complex, overarching strategic development process of CE business.

To date, research in the field of CE as a business paradigm has focused on operational and static issues in CE implementation but not on guiding established companies in developing circular business models and strategies. Such long-term processes call for inter-organizational collaboration, but the roles and timing of collaborations have been overlooked in CE business research and remain empirically underexplored. This work addresses the gap in company-centric yet collaborative CE implementation as a strategic consideration for established companies' business by developing a lacked processual and pragmatically valuable strategic management framework, which is based on empiric cases of companies pioneering in CE business. Three research questions are addressed to holistically explore the strategic development of CE business: How can established companies (i) develop circular business strategies and (ii) innovate circular business models aligned with circular business strategy development? (iii) How can collaboration support established companies in their strategic development of CE business?

To this end, this pragmatist-based research adopts a qualitative process approach to exploring multiple- and single-case study settings. Twelve cases of CE pioneer companies are sampled from environmentally burdensome industries in CE-driven institutional contexts in Finland and Italy. Rich data obtained from these companies, via interviews, documents, and other secondary data, are analyzed from an abductive approach and the findings are presented across four publications.

The key findings are summarized as nine propositions and conceptualized as a process model that captures how circular business strategy, circular business model

innovation, and collaboration for CE business dynamically intertwine and can be managed over time in the overarching process of proactive, even radical strategic development of CE business in established companies. The findings reveal that circular business strategy is developed over time through strategic cycles with varied focus areas and intertemporal decision-making. Environmentally burdensome temporal contexts demand it to take particularly proactive and radical forms, and it is implemented through circular business model innovation, which can comprise diverse interlinked innovations and evolve from diversifying to transforming the linear business. Spillovers to spin-off CE business opportunities can be managed under a CE-driven corporate strategy or as spin-off ventures. Collaboration plays an increasingly important role in enabling circular business models with identified managerial practices, in accelerating circular business strategy development with feedback for learning and radical change, and in aligning the ecosystem to the company's CE vision through the development of industry, markets, and regulation.

This dissertation makes several contributions to the literature on CE as a business paradigm. It highlights that the strategic development of CE business in established companies in environmentally burdensome contexts involves proactivity, radicality, systemic change, and temporal considerations. It fills a gap in the circular business strategy stream by defining circular business strategy development and conceptualizing its proactive type, which in turn paves the way for studying other emergent types of this process. It augments the research on circular business models with processual insights on temporality and radical innovation of circular business model undertaken as part of implementing a circular business strategy. Research on collaboration for CE business is enriched with new insights on how collaborations can be harnessed timely to pace and align the development in circular business strategies and in the business ecosystem. The findings inform managerial guidelines on what actions to take and when in established companies for surviving and proactively building long-term competitive advantage in disruptive CE transition across industries. Meanwhile, policymakers and other organizations are encouraged to engage—in a timely fashion and in diverse roles—with companies' CE efforts to promote shared sustainability goals in the economy and society. This dissertation concludes by discussing the limitations and future research avenues that stem from the insights of this research.

Key words: Strategic development, circular economy, circular business strategy, circular business model, circular business model innovation, collaboration, process approach, established companies, qualitative case study

TIIVISTELMÄ

Kiertotalous mahdollistaa taloudellisesti ja ympäristöllisesti kestävä kasvun. Siksi se on saanut sekä poliittisten päättäjien että yritysten huomion ympäri maailmaa ja eri toimialoilla. Yrityksille kiertotalousliiketoiminta tarjoaa kilpailuetua ja kustannussäästöjä sekä sitouttaa avainkumppaneita. Vakiintuneilla yrityksillä on kuitenkin yhä vaikeuksia toteuttaa kiertotalousliiketoimintaa sen pitkän aikavälin vaikutukset huomioiden, sillä kiertotalous edellyttää nykyisten liiketoimintamallien, liiketoimintastrategioiden ja organisaatorajat ylittävän yhteistyön perustavanlaatuista uudelleenajattelua. Yritysten tuleekin omaksua strateginen näkökulma johtakseen onnistuneesti monimutkaista ja -tahoista strategisen kiertotalousliiketoiminnan kehitysprosessia.

Kiertotaloutta liiketoimintaparadigmana käsittelevä tutkimusala keskittyy kiertotalousliiketoiminnan operatiiviseen ja staattiseen toteutukseen, mutta epäonnistuu yritysten kiertotalousliiketoimintamallien ja -strategioiden pitkän tähtäimen kehitysprosessien ohjaamisessa. Yhteistyö on näissä prosesseissa välttämätöntä, mutta sen oikea-aikaiset roolit ovat jääneet vähälle empiiriselle tarkastelulle. Tutkimus vastaa tutkimusaukkoihin yrityskehityksessä, mutta yhteistyöhön perustuvassa strategisessa kiertotalouden toteutuksessa aiemmin puuttuneella, käytännön pioneeritapauksiin perustuvalla strategisen johtamisen prosessiviitekehityksellä. Strategista kehitystä kohti kiertotalousliiketoimintaa tarkastellaan kolmen tutkimuskysymyksen kautta: Kuinka vakiintuneet yritykset voivat (i) kehittää kiertotalousliiketoimintastrategiaansa ja (ii) innovoida sen kanssa yhteensopivia kiertotalousliiketoimintamalleja? (iii) Miten yhteistyö voi tukea vakiintuneita yrityksiä niiden kiertotalousliiketoiminnan strategisessa kehityksessä?

Tämä pragmaattiseen tieteenfilosofiaan nojaava, neljästä julkaisusta koostuva tutkimus tarkastelee kvalitatiivisesti ja prosessuaalisesti empiirisiä moni- ja yksittäistapaustutkimusasetelmia. Runsas haastattelu- ja dokumenttiaineisto on kerätty 12 kiertotalousedelläkävijäyrityksestä, jotka toimivat ympäristöä kuormittavilla toimialoilla kiertotaloudelle suotuisissa institutionaalisissa konteksteissa Suomesta ja Italiasta, ja sen analyysi nojaa abduktiiviseen logiikkaan.

Päälöydökset tiivistyvät yhdeksäksi propositioksi ja prosessimalliksi, jossa kiertotalousliiketoimintastrategiaa, kiertotalousliiketoimintamalli-innovaatiota ja

kiertotalousliiketoiminnan yhteistyötä johdetaan yli ajan vakiintuneiden yritysten proaktiivisessa, usein radikaalissa kiertotalousliiketoiminnan strategisen kehityksen prosessissa dynaamisesti toisiinsa kietoutuen. Kiertotalousliiketoimintastrategiaa kehitetään eri painopisteitä sisältävillä strategiasykleillä ja eri ajalliset näkökulmat huomioivalla strategisella päätöksenteolla. Kiertotalousliiketoimintastrategian proaktiivisuutta ja radikaaliutta lisää ympäristöä kuormittava, aikasidonnainen konteksti ja sen toteutus peilautuu kiertotalousliiketoimintamalliin, joka voi rakentua erilaisista linkittyvistä innovaatioista varsinkin radikaaleissa tapauksissa ja tuottaa uutta liiketoimintaa joko kiertotalouslähtöisen yritysstrategian osana tai spin off -hankkeina johdettavaksi. Yhteistyön merkitys kasvaa ajassa: sen erilaiset tunnistetut johtamiskäytännöt mahdollistavat kiertotalousliiketoimintamallin, se tukee kiertotalousliiketoimintastrategian kehittämistä kiihdyttämällä palautepohjaista oppimista ja radikaalia muutosta ja se saa ekosysteemin seuraamaan yrityksen omaa kiertotalousvisiota ohjailemalla toimialan, markkinoiden ja regulaation kehitystä.

Tämä tutkimus luo ja täydentää tietoa kiertotalouden liiketoimintaparadigman tutkimusalalla korostaen kiertotalouden strategisia vaikutuksia vakiintuneiden yritysten liiketoiminta- ja yritysstrategioihin ympäristöä kuormittavissa konteksteissa, peräänkuuluttaen muutoksen proaktiivisuutta, radikaaliutta, systeemisyttä ja aikasidonnaisuuksia. Kiertotalousliiketoimintastrategian osalta tutkimus luo aiemmin puuttuneen määritelmän sen kehitysprosessille ja avaa sen proaktiivista tyyppiä samalla vaihtoehtoisten tyyppien jatkotutkimukselle pohjaa luoden. Kiertotalouden liiketoimintamallien tutkimus täydentyy prosessuaalisella ymmärryksellä erityisesti liittyen niiden radikaaliin innovointiin osana kiertotalousliiketoimintastrategian toteuttamista. Kiertotalousliiketoiminnan yhteistyön tutkimukseen tulokset tuovat uusia näkemyksiä oikea-aikaisen, erilaisia rooleja ajassa saavan yhteistyön valjastamiseen kiertotalousliiketoimintastrategian ja liiketoimintaekosysteemin kehityksen tahtien yhteensovittamiseksi. Tulokset ohjeistavat yritysjohtajia, mihin toimiin heidän tulee ryhtyä ja milloin selviytyäkseen ja rakentaakseen yritykselleen ennakoivasti kilpailuetua eri toimialoilla disruptiivassa kiertotaloussiirtymässä. Päättäjille ja muille organisaatioille tutkimus osoittaa rooleja ja keinoja tukea oikea-aikaisesti yritysten kiertotalouspyrkimyksiä ja samalla yhteisiä talouselämän ja yhteiskunnan kestäväen kehityksen tavoitteita. Lopuksi summataan tutkimuksen rajoitteet ja niistä ammentavat houkuttelevat jatkotutkimuskohteet.

Avainsanat: Strateginen kehitys, kiertotalous, kiertotalousliiketoimintastrategia, kiertotalousliiketoimintamalli, kiertotalousliiketoimintamalli-innovaatio, yhteistyö, prosessilähestymistapa, vakiintuneet yritykset, laadullinen tapaustutkimus

SOMMARIO

L'economia circolare (EC) promette di combinare crescita economica e crescita sostenibile sotto il profilo ambientale, destando l'interesse sia dei governi che delle aziende in tutto il mondo e i settori industriali. La transizione a un modello aziendale di EC offre vantaggi competitivi, riduzione dei costi e coinvolgimento di partner chiave. Tuttavia, le aziende più affermate faticano ancora a implementare tale modello e a valutarne le conseguenze a lungo termine, in quanto l'EC necessita di un fondamentale ripensamento degli esistenti modelli aziendali, strategie di business e collaborazioni esterne. Pertanto, le aziende devono adottare una visione strategica per gestire la complessità del processo trasformativo verso un modello di EC.

La ricerca sull'EC come paradigma di business si è limitata finora all'implementazione operativa e statica di modelli aziendali di EC, non riuscendo a guidare le aziende affermate nel processo di sviluppo di modelli e strategie aziendali circolari a lungo termine. L'inevitabile collaborazione tra organizzazioni e il suo ruolo tempestivo nel favorire tali processi ha ricevuto poca attenzione empirica. Questa ricerca affronta le attuali lacune sull'implementazione dell'EC intra- e inter-aziendale in quanto strategica per i business affermati, che richiedono una struttura di gestione efficace dei processi, con valore pragmatico basato su casi di successo empirici. Per un'esplorazione olistica dello sviluppo strategico orientato al business circolare sono stati affrontati tre quesiti: In che modo le aziende affermate (i) sviluppano strategie di business circolari e (ii) innovano modelli di business circolari in linea con lo sviluppo di strategie di business circolari? (iii) In che modo la collaborazione aiuta le aziende affermate nel proprio sviluppo strategico verso un modello aziendale di EC?

A tal fine, questa ricerca di carattere pragmatico adotta un processo qualitativo per esaminare casi studio multipli o singoli in quattro pubblicazioni. Dodici casi di aziende pilota in ambito di EC vengono campionati da settori industriali a elevato impatto ambientale in contesti istituzionali centrati sull'EC in Finlandia e in Italia. I relativi abbondanti dati basati su colloqui e documenti vengono analizzati secondo un approccio di orientamento prevalentemente abducente.

I risultati chiave sono formulati in nove proposte e concettualizzati in un modello di processo che rivela come strategia di business circolare, innovazione nei modelli di business circolari e collaborazione finalizzata all'EC si intreccino dinamicamente

e possano essere gestite nel tempo nel processo generale di sviluppo strategico proattivo e spesso radicale verso il modello di EC nelle aziende affermate. Ne risulta che la strategia aziendale circolare viene sviluppata nel tempo in cicli strategici in varie aree di interesse. In contesti temporali a elevato impatto ambientale, essa richiede una forma particolarmente proattiva e radicale e viene implementata tramite un nuovo modello aziendale circolare che può comprendere diverse innovazioni interconnesse ed evolvere dalla diversificazione alla trasformazione del business. Le risultanti aziende di EC derivate possono essere gestite con strategie aziendali fondate sull'EC o come spin-off. La collaborazione ha acquisito importanza nel tempo poiché favorisce il modello aziendale circolare con pratiche manageriali identificate, accelera l'apprendimento e il cambiamento radicale nello sviluppo di una strategia aziendale circolare tramite il feedback, e allinea l'ecosistema alla visione aziendale di EC tramite lo sviluppo di settori industriali, mercati e normative.

Questa dissertazione contribuisce alle pubblicazioni sull'EC come paradigma aziendale, evidenziando le implicazioni strategiche dell'EC nello sviluppo delle aziende affermate in contesti a elevato impatto ambientale che richiedono proattività, cambiamento radicale e sistemico e valutazioni temporali. Riguardo al flusso di strategie aziendali circolari, viene proposta una definizione di sviluppo di una strategia aziendale circolare definendo tale processo in base al relativo tipo proattivo e ponendo le basi per studiare tipi alternativi emergenti. Il flusso dei modelli aziendali circolari viene ampliato con le analisi dei processi delle specifiche innovazioni radicali che sono parte della strategia aziendale circolare. La ricerca getta luce su come cambino i ruoli nelle collaborazioni finalizzate al modello aziendale di EC e come queste vengano prontamente gestite per sincronizzare lo sviluppo nell'ecosistema aziendale e circolare. I risultati danno forma a linee guida manageriali su quali azioni intraprendere, e quando, per sopravvivere e stabilire proattivamente un vantaggio competitivo a lungo termine nella dirompente transizione circolare dell'ecosistema industriale. Quanto prima, i governi e altre organizzazioni economiche e sociali sono invitate a impegnarsi con diversi ruoli e mezzi per favorire gli sforzi delle aziende nell'EC e promuovere obiettivi condivisi di sostenibilità. La ricerca si conclude con limiti e prospettive di esplorazione futura.

Parole chiave: Sviluppo strategico, economia circolare, strategia di business circolare, modello di business circolare, innovazione del modello di business circolare, collaborazione, approccio di processo, aziende consolidate, di caso di studio qualitativo.

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ABBREVIATIONS

Abbreviation	Meaning
CE	Circular economy
CBM	Circular business model
CBMI	Circular business model innovation
CBS	Circular business strategy
CSC	Circular supply chain
R&D	Research and development
RQ	Research question

LIST OF ORIGINAL PUBLICATIONS

- Publication I Kaipainen, J., & Aarikka-Stenroos, L. (2022). How to renew business strategy to achieve sustainability and circularity? A process model of strategic development in incumbent technology companies. *Business Strategy and the Environment*, 31(5), 1947-1963. <https://doi.org/10.1002/bse.2992>
- Publication II Kaipainen, J., & Aarikka-Stenroos, L. (2021). From vision to commercialization of a circular economy innovation: a longitudinal study of overcoming challenges throughout the full innovation process. In S. Jakobsen, T. A. Lauvås, M. T. Steinmo, E. A. Rasmussen, & F. Quatraro (Eds.), *Research handbook of innovation for a circular economy* (pp. 59–71). Cheltenham, UK: Edgar Elgar Publishing. <https://doi.org/10.4337/9781800373099.00013>
- Publication III Kaipainen, J., Urbinati, A., Aarikka-Stenroos, L. & Chiaroni, D. (2022). How companies innovate business models and supply chains for a circular economy: a multiple-case study and framework. *International Journal of Innovation Management*, 26(9), 2240024. <https://doi.org/10.1142/S1363919622400242>
- Publication IV Aarikka-Stenroos, L., Chiaroni, D., Kaipainen, J., & Urbinati, A. (2022). Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda. *Industrial Marketing Management*, 105, 322-339. <https://doi.org/10.1016/j.indmarman.2022.06.015>

AUTHOR'S CONTRIBUTION IN THE PUBLICATIONS

- Publication I The ideation for the research design was primarily developed by me, with the support of L.A.-S. and Dr. Valtteri Ranta. As the first and corresponding author, I was responsible for writing and editing all sections of the manuscript that provides foundational contributions and novelty for the dissertation. I also performed data collection and analysis. I first developed and presented an early version of the paper at the conference of International Society for Professional Innovation Management (XXXI ISPIM Innovation Conference “Innovating Our Common Future,” 20–23 June, 2021, Virtual), after which the manuscript was further developed based on the received feedback. The manuscript drafts were edited by me as we proceeded in the review process, and I was responsible for managing the publication process and correspondence with the journal. I was also responsible for developing the illustrations. L.A.-S. provided input via comments to the paper drafts and other guidance throughout the paper development.
- Publication II The initial idea originated as a follow-up of the development of Publication I and was jointly elaborated further by the two authors to obtain the research design of the paper. I performed the data collection and analysis. As the first and corresponding author, I was responsible for writing the manuscript and preparing its visualizations. L.A.-S. contributed by writing parts of the theory section and providing comments. In the review process, I revised the paper with the comments provided to the manuscript by L.A.-S., attended the paper development workshop organized by the editors, and managed the correspondence with the reviewers and editors.
- Publication III The research design was jointly developed by all four authors as a spin-off idea from the development of Publication IV. As the first and corresponding author, I wrote the first draft and made revisions throughout the publication process. The early drafts benefited from the support of A.U. in addressing the literature on the part of circular business models as well as from D.C. in complementing the case sampling and findings of the Italian cases.

Meanwhile, a major part of the literature review, including circular supply chains and linkages of CE business research with innovation management, was covered by me. The Finland-based cases were my responsibility, and I collected a large part of their data and analyzed them. An early manuscript version was composed and presented by me at the conference of International Society for Professional Innovation Management (XXXIII ISPIM Innovation Conference “Innovating in a Digital World,” 5–8 June, 2022, Copenhagen, Denmark), Council of Supply Chain Management Professionals European Research Seminar (17th CSCMP European Research Seminar on Logistics and Supply Chain Management, 20–21 June, 2022, Milano, Italy), and Responsible Business Research Seminar (16–17 March, 2022, Tampere, Finland). With the feedback and notes I took at the conferences and seminars, I developed the early version into a full paper. During the review process, I held the main responsibility of editing the paper and managed the correspondence with the editor and publisher; meanwhile, the three co-authors supported in enhancing and revising the paper with their insights.

Publication IV The research idea was proposed by L.A.-S., D.C., A.U., and Dr. Valtteri Ranta and developed into an early draft together with Sepehr Ebrahimian Amiri. When both Dr. Valtteri Ranta and Sepehr Ebrahimian Amiri wanted to step out of the project, I joined the author team. My responsibilities were as follows: I developed the literature review for circular supply chain management, which served as the theoretical foundation of the paper. As the expert in the field of circular supply chains, I provided important theory-based input to the introduction, discussion, and contribution sections. I was also responsible for half of the cases—namely, the three Finnish cases—and I carried out a major portion of the data collection, including complementary new interviews and secondary data collection during the review process; within- and cross-case analysis; and writing of the findings. Overall, I provided inputs based on my knowledge from the literature review and the cases throughout the publication process, thoroughly edited the manuscript from abstract to contributions, and supported the analytical development of the discussion and key contribution sections, including the frameworks, synthesis, and research agenda.

1 INTRODUCTION

1.1 Motivation and background: Established companies in circular economy transition

Circular economy (CE) has been recognized as an extremely prominent path to sustainability because it offers much-needed concrete solutions to decoupling environmentally sustainable economic growth, use of natural resources, and climate neutrality, thus tackling the current global environmental issues (European Commission, 2020; Kirchherr et al., 2017). CE contributes to sustainable development as a regenerative system where the maximum value of products and materials is maintained while minimizing waste and using renewable energy (see e.g., Chen et al., 2020; Geissdoerfer et al., 2017; Guldmann & Huulgaard, 2020). To protect the environment, reduce raw material dependence, and create job opportunities (European Parliament, 2023), CE has been introduced to governmental and policymaking agendas not only in the European Union (Deselnicu et al., 2018; European Commission, 2020) but also in the United States (United States Chamber of Commerce Foundation, 2015), China (National People’s Congress, 2008), and other countries across the world. Besides policymaking, CE has received increasing attention among practitioners, industry, and academia worldwide (Chen et al., 2020; Ghisellini et al., 2016; Hofmann & Jaeger-Erben, 2020; Kirchherr et al., 2017, 2023a, 2023b; Urbinati et al., 2017).

This dissertation adopts the *perspective of established companies* transitioning toward CE, i.e., companies with existing, profitable business operations, models, strategies, and collaborations that follow linear business logics and need to be changed to address the CE transition. Companies play a critical and central role in enabling the transition from the current linear take–make–dispose economic model to a system-wide sustainable and transformative CE (European Commission, 2020; Geissdoerfer et al., 2018a; Henry et al., 2020; Lieder & Rashid, 2016; Rovanto & Bask, 2020). This is because companies—particularly the established ones with the largest resources and capabilities (Porter & Kramer,

2011; Santa-Maria et al., 2021a)—are the most important organizations in the market and therefore the most important mechanisms driving change for sustainability (Hoffman, 2017). Thus, industrial progress is only possible if company managers learn to identify and seize the business opportunities instead of the challenges presented by sustainable business (Hart & Milstein, 1999). Established companies, particularly those with large and global market shares, can have a significant environmental impact on advancing the CE and sustainability transition if they change their unsustainable business logics (Frishammar & Parida, 2019; Kuhlmann et al., 2022; Santa-Maria et al., 2021b; Schaltegger et al., 2012): for example, only 100 companies accounted for 71 per cent of the global industrial greenhouse gas emissions from 1988 to 2015 (Griffin, 2017). Thus, it is essential to investigate the established companies that have already succeeded in proactively scaling up their CE business and can thus call themselves CE pioneers across varying industries and institutional contexts.

To remain competitive and profitable during CE transition in the face of new, even disruptive institutional and market pressures (European Commission, 2020; Ranta et al., 2018), established companies need to proactively shift their extant linear business to the CE (Geissdoerfer et al., 2018a) through *strategic development of CE business*. CE can offer companies growth opportunities through, for instance, reaching sustainability commitments, engaging new and retaining existing customers, lowering costs, increasing brand value, and securing supply (Ellen MacArthur Foundation, 2023). Sustainability issues are making their way to the top of corporate agendas and business strategies as a promising source of novel business and competitive advantage (Engert et al., 2016; Frishammar & Parida, 2019; Porter & Van Der Linde, 1995). Nevertheless, despite the broad interest in CE implementation as a crucial pathway to sustainable business, the business world has been slow in employing CE's principles (Bocken et al., 2017; Laukkanen & Patala, 2014; Santa-Maria et al., 2021b) and company-level CE implementation remains limited in many sectors (OECD, 2018), demanding further company-centric research (Franco, 2017; Ghisellini et al., 2016; Hofmann & zu Knyphausen-Aufseß, 2022; Lieder & Rashid, 2016; Ritala et al., 2023; Santa-Maria et al., 2021a; Urbinati et al., 2017).

Established companies, in particular, lack the ability to develop CE business because of their operational structures, cultural fixation, and the financial, institutional, legislative, and infrastructural decisions causing path dependency to the “take–make–dispose” paradigm (Khan et al., 2020; Rovanto & Bask, 2020; Tura et al., 2019; Vermunt et al., 2019). Even the largest leading companies are

struggling to identify the benefits of CE business, make strategic CE decisions, and implement circular changes in their business and corporate strategies (Khan et al., 2020; Lieder & Rashid, 2016; Trigkas et al., 2020; Ünal et al., 2019). Changes required in the development of CE business in established companies are manifold, challenging, and often fundamental, starting from the way companies manage their operations, technologies, business portfolios of products and services, innovative practices, and collaborations with other organizations (Brown et al., 2020; Gandolfo & Lupi, 2021; Ranta et al., 2018), and extending to implications on long-term business practices and strategies in the overarching strategic development of CE business (Chen et al., 2020; Gandolfo & Lupi, 2021; Ranta et al., 2018; Ranta et al., 2020; Rovanto & Bask, 2020). To succeed in this drastic change, companies need to define novel collaborations as inseparable from their business models and activities, to extend from their organizational boundaries to circular supply chains and untypical collaborators (Brown et al., 2021; Geissdoerfer, et al., 2018; Leising et al., 2018; Lüdeke-Freund et al., 2019; Luthra et al., 2022; Rovanto & Bask, 2020). Owing to the scale of challenging changes, in practice, the transformation from linear to circular business models and strategies is slow in companies, taking up to 25 years (Guldmann & Huulgaard, 2020; Santa-Maria et al., 2021a). The long timelines in CE projects demand companies to employ proactive management actions with a long-term perspective (Geissdoerfer et al., 2018a) and invite researchers to engage in them with a long time horizon (Köhler et al., 2022).

The complexity and long-term nature of developing CE business in established companies demands a *strategic standpoint* (Ferasso et al., 2020) that considers how CE implementation changes a company's business and related collaborations in the long term (Kaipainen et al., 2023a). Beyond the strategic implications of CE for companies themselves, they need to consider the impact of their strategic decisions for future generations (Geissdoerfer et al., 2018a). Nevertheless, a long-term strategic view to companies' CE business development is largely missing from the literature: The research field of CE as a business paradigm has focused on operational and static perspectives (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019), such as circular design practices and circular business models (CBMs), whereas strategic management research has largely neglected the context of CE. Thus, extant research fails to capture the changes and temporalities, including experiences rooted in time and different perceptions of time (Ancona et al., 2001), in strategic development of CE business and guide companies over time in this process with

insights from successful empirical case studies (Bocken et al., 2017; Brown et al., 2020; Linder & Williander, 2017). To build an understanding of how pioneer companies strategically navigate and succeed in the real-life implementation of CE business (Bressanelli et al., 2020; Ranta, 2021; Ünal et al., 2019), research is needed from a strategic management perspective on its key core processes (Centobelli et al., 2020; Ferasso et al., 2020; Urbinati et al., 2017), of which *circular business strategy (CBS) development, circular business model innovation (CBMI), and collaboration for CE business* are addressed in this research.

Although the first-hand understanding of the “what” has been valuable in early CE business research, moving toward understanding the “how” in the actual implementation of CE business has become alarmingly crucial. This calls for challenging the current ontological approaches for influential theory development (Alvesson & Sandberg, 2011) and complementing static and cross-sectional studies with not only a strategic viewpoint but also a dynamic *process approach* (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019). This need has prompted CE business researchers to integrate process thinking into studying CBMI (see e.g., Pieroni et al., 2021; Pollard et al., 2021) and circular innovation in general (Brown et al., 2021), but it has not yet extended to examining companies’ strategic development of CE business. Thus, to best capture how the process of strategic development of CE business unfolds over time and to support companies’ proactive movement toward circularity, this research adopts a process approach (Antikainen & Bocken, 2019; Langley & Montréal, 2007). A process approach helps address prior calls for identifying and conceptualizing via frameworks how established companies can plan and implement fundamental changes in systematically reinventing their business for CE (Chen et al., 2020; Frishammar & Parida, 2019; Gandolfo & Lupi, 2021; Lieder & Rashid, 2016; Ranta et al., 2020; Ünal et al., 2019; Urbinati et al., 2017). A process approach is also very practical, as it helps understand how established companies can integrate circularity into their business step by step, identify what challenges and advantages emerge and when (Antikainen & Bocken, 2019), and anticipate how this otherwise lengthy process can be accelerated (see Santa-Maria et al., 2021a).

Accordingly, it is in the scope of this research to explore how established companies can transition to CE through the strategic development of their business, which is rooted in the development of CBS, innovation of CBMs, and collaboration for CE business. To this end, the research adopts an established company’s perspective in investigating unique research data from CE pioneer

companies in European countries known for their particularly advanced institutional environment and embeddedness in CE transition, namely Finland and Italy, (Alcalde-Calonge et al., 2022; Finnish Ministry of Environment, 2018; Italian Ministries for the Environment, Land and Sea & Economic Development, 2017). Such cases, representing environmentally burdensome industries, are particularly interesting to explore through processual, qualitative, and explorative methodological approaches, as they allow us to understand how established companies can succeed in their proactive strategic development of CE business as pioneers to respond to the environmental pressures echoing from their institutional and industrial contexts. The findings provide valuable insights for not only academics and companies but also their stakeholders, supporting the development toward the environmentally sustainable future of businesses, industries, economies, regions, as well as the overarching society.

1.2 Key concepts, theoretical positioning, and research gaps

CE has grown into an established theoretical field (Kirchherr et al., 2023a), also called as CE theory (Del Vecchio et al., 2021). However, CE's theoretical evolution is relatively short. The concept of CE dates back to the 90s, when waste began to be considered as valuable (Salvador et al., 2020), cycling of materials as “industrial metabolism” was proposed in industrial ecology (Bocken et al., 2016), and sustainable development was increasingly considered to drive competitive advantage and industrial renewal and progress (Hart & Milstein, 1999; Porter & Van Der Linde, 1995). Yet, CE gained notable traction only in 2008, with China introducing its “Law on the Promotion of the Circular Economy” (Alcalde-Calonge et al., 2022; National People's Congress, 2008). Consequently, the emerging CE research revolved around China, both in terms of authors and regions of research interest (Alcalde-Calonge et al., 2022). CE research in Europe began to grow around mid-2010s (Alcalde-Calonge et al., 2022), escorted by the European Union manifesto for a resource-efficient Europe, calling for a circular, resource-efficient, and resilient economy (European Commission, 2012), as well as the broader diffusion of CE awareness by the World Economic Forum and the Ellen MacArthur Foundation (Ellen MacArthur Foundation, 2013; WEF, 2014). With the expansive interest of researchers and practitioners, by 2019, the number of CE publications has increased tenfold over the last decade (Geissdoerfer et al., 2017), and research

streams started to emerge under the conceptual umbrella of CE (Blomsma & Brennan, 2017).

CE has been broadly divided into two schools: in the more established one, engineers and environmental scientists investigate CE applications with focus on manufacturing and environmental issues, such as technical issues and treatment for bio-chemicals, new materials, metals, plastics, and food (Alcalde-Calonge et al., 2022). This approach is typically limited to operative activities for looping materials, thus neglecting the strategic implications of circular business from a company perspective, including how the novel circular activities comply with existing activities and how the change to circular can be managed (see Kuhlmann et al., 2022). Therefore, a business management school of CE research has emerged, first around the development of CBMs (Alcalde-Calonge et al., 2022) and later rapidly expanding into a theoretical paradigm that currently pursues multiple streams, including for instance strategy, learning, and innovation; supply chains and implementation; consumer behavior and remanufacturing; emerging technologies; and industrial symbiosis (Ahmad et al., 2023).

To understand how established companies can strategically develop CE business, the theoretical background of this research draws on the paradigm of business management in CE research, shortened hereafter as the field of CE business research. In this field, this research's focus is particularly on the streams on CBS (Bui et al., 2022; Tseng et al., 2022); CBMs (Bocken et al., 2016; Ferasso et al., 2020; Urbinati et al., 2017); and collaboration for CE business (Brown et al., 2021; Mishra et al., 2019). The research streams are connected; in particular, the CBM and collaboration streams overlap. Figure 1 illustrates the theoretical positioning under CE business, how the research streams interact and overlap, and how the key concepts stem from prior research. Next, I elaborate the rationale and definitions of the key concepts; Table 1 summarizes them.

A gap in the fast-growing body of CE business research pertains to understanding CE implementation from a company-centric perspective (Gandolfo & Lupi, 2021; Guldmann & Huulgaard, 2020), particularly in companies with existing linear business (Franco, 2017; Frishammar & Parida, 2019; Santa-Maria et al., 2019b). Addressing this gap, this research focuses on *established companies* (occasionally typified as “companies” in this research for simplicity). Established companies, in contrast to, say, start-ups, are characterized by larger size and greater age (Antolin-Lopez et al., 2015), for example over three years of business operations (Hartarska & Gonzalez-Vega, 2006), resulting in profitable business with existing resources, operations, business models,

revenues, strategies, and collaborations, which follow linear business logics and are now challenged by the CE transition (Frishammar & Parida, 2019; Kuhlmann et al., 2022; Santa-Maria et al., 2021b). This type of companies, who have extant market share, position, and competences that fit with the extant technological regime, have synonymously been called incumbents (Bohnsack et al., 2020; Tripsas, 1997). However, incumbents are typically associated with being large in size, and strategically defending their privileged position and status quo in the markets against new entrants rather than accelerate transitions (Johnstone et al., 2017; Sovacool et al., 2020). To steer away from this general, often unilateral association related to incumbent companies, this research is interested in established companies that have a pioneering attitude toward advancing CE transition, and frames them to have extant profitable linear business with variation in its size, age of operation, and market positioning.

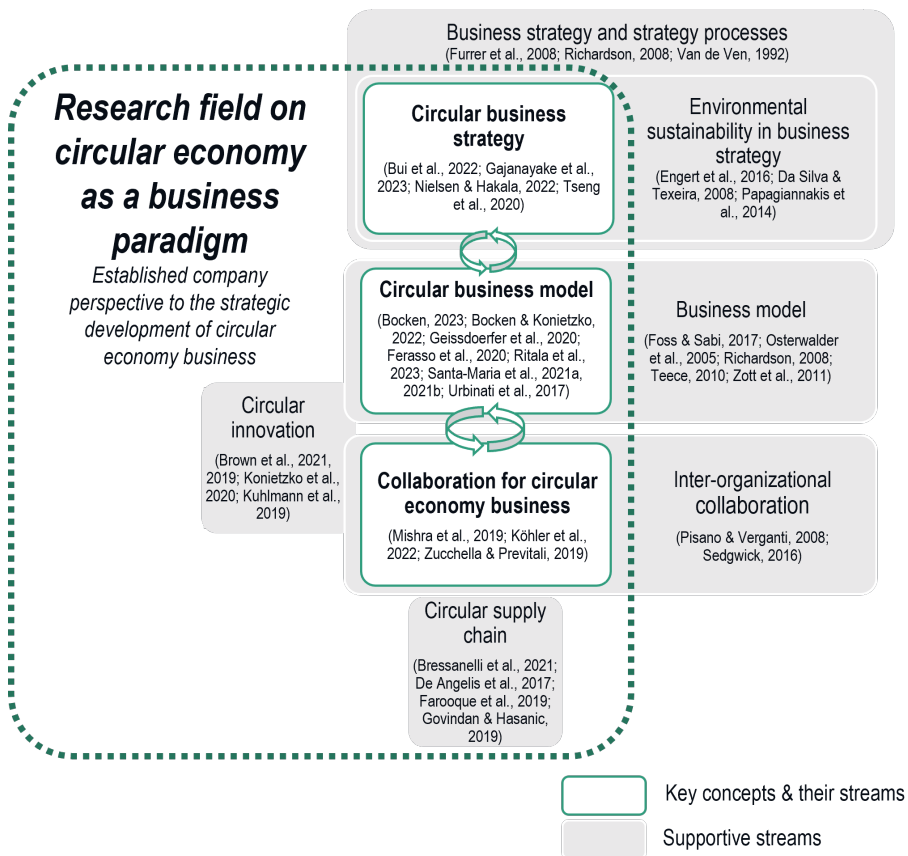


Figure 1. Positioning and key concepts within the field of CE as a business paradigm

Overcoming the challenges associated with *strategic development of CE business* in established companies demands a holistic view that integrates and goes beyond specific subject matters underlying extant CE business research, such as CBMs. Accordingly, this research addresses CE as a strategic phenomenon for business, to be integrated through the holistic strategic development of the company's business—a process through which management informs, shapes, and supports the strategic business decisions to survive in the dynamically changing business environment (adapted from Dyson et al., 2007; Steptoe-Warren et al., 2011). Hence, strategic development of CE business is the overarching process to which the main dissertation title itself is referring to. As such, in this research, the process of strategic development of CE business acts as an umbrella term entailing strategic decisions regarding CBS development, CBMI, and collaboration for CE business.

This research aimed to shed light on the missing strategic perspectives on achieving CE business in the literature; therefore, *CBS* is one of the key concepts in this research. Studies on business strategy and strategy processes have explored how companies can compete and build competitive advantage in their chosen business with a business strategy (Furrer et al., 2008; Richardson, 2008) that integrates environmental sustainability concerns over time (Da Silva & Teixeira, 2008; Papagiannakis et al., 2014), but they have lacked an explicit circular perspective until very recently within the stream of environmental sustainability in business strategy. Moreover, prior research has focused on environmental and sustainability strategies as separate from business strategy (Baumgartner & Ebner, 2010; Papagiannakis et al., 2014), with fewer examples of business strategies that integrate environmental thinking (Da Silva & Teixeira, 2008). Meanwhile, only few papers have been published in the emergent CBS stream in CE business research, and these address CBS on a rather artificial or elusive conceptual level. According to a rare definition, CBS describes how a company competes while dealing with sustainability issues by understanding and harnessing CE principles (Bui et al., 2022). Instead of CBS, the strategic management perspective has been explored in the CE business field through dynamic capabilities, resources, and competences (Ahmad et al., 2023; Khan et al., 2020; Sehnem et al., 2022). Literature often discusses “circular strategies” but rarely from a strategic management approach. Studies mainly refer to circular design strategies for recycling, reducing, reusing, and regenerating materials and products, known as R principles or CE principles (Ellen MacArthur Foundation, 2013; Ghisellini et al., 2016), or CBM strategies, which describe how a business

model can be designed in a circular manner by closing (i.e., closing material loops through recycling), slowing (i.e., prolonging the lifetime of products), narrowing (i.e., using less resources in production) and regenerating (i.e., use of renewables and benefitting the nature) material loops (Bocken, 2023; Bocken et al., 2016). The extant literature does not address the intersection of these currently pursued operative viewpoints and the related long-term business strategy. Thus, uncertainty revolves still around CBS. Deeper investigation is needed to build a concise understanding of what CBS entails for companies, how it can successfully be developed over time, and how it is reflected in their business models to understand the strategic implications of CE for companies (see Centobelli et al., 2020; Urbinati et al., 2017).

In sustaining companies' competitive advantage during CE transition, *CBMs* have become a fundamental and popular concept for company-centric CE business research (Pieroni et al., 2019). Prior research on business models considers them representations of how strategic decisions are practically implemented (Richardson, 2008). Thus, CBMs represent strategic decisions regarding the integration of CE principles into organizational systems, relationships, and value elements of a specific business of a company (Geissdoerfer et al., 2018a; Ranta et al., 2018) and thereby act as an indicator for effective CBS (Bui et al., 2022). To date, CBMs have been studied as static entities in cross-sectional and taxonomic studies (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019; Zucchella & Previtali, 2019) to understand what they are, how to classify them (Lüdeke-Freund et al., 2019; Urbinati et al., 2017), and what are their drivers and barriers (Centobelli et al., 2020; Geissdoerfer et al., 2022; Rosa et al., 2019; Urbinati et al., 2021). Meanwhile, the well-established CBM research stream has overlooked the role of organizational dynamics in managing the transition toward CE business in the constantly changing real-life business world (Hofmann & Jaeger-Erben, 2020). In response, only a handful of studies have attempted to stimulate a discussion on the processual nature of complex CBMI processes, inviting further research to shed light on their mechanisms, stages, and other important factors (Guldmann & Huulgaard, 2020; Pieroni et al., 2021; Pollard et al., 2021). Most of the existing studies on CBMI remain descriptive and limited in terms of advice to managers (Pieroni et al., 2021), underexplore the strategic management perspective (Frishammar & Parida, 2019; Urbinati et al., 2017), and seldom holistically integrate CE into existing business models in established companies (Franco, 2017; Gandolfo & Lupi, 2021; Lewandowski, 2016). Owing to the lack

of comprehensive theoretical and practical understanding on managing CBMI processes and their impact and interaction with CBS development in the long term, companies have limited strategic ability and overview to unlock the business potential of CE (Hofmann & Jaeger-Erben, 2020). Thus, further studies, particularly on established companies, are needed for improved empirical understanding (Santa-Maria et al., 2021b) so as to develop a framework that guides companies in systematically including CBMs as part of their strategy and development actions (Halonen et al., 2019; Puglieri et al., 2022; Urbinati et al., 2017), goes beyond the static approaches to research, and has clear process steps and managerial guidelines to follow (Bocken et al., 2018; Hofmann & Jaeger-Erben, 2020; Santa-Maria et al., 2022).

In this research, I focus on collaboration for CBM, CBMI, and CBS development, which is hereafter referred to as *collaboration for CE business*, and as such, considered to contribute to companies' overall strategic development for CE business. Collaboration for CE business entails a continual series of intentional and voluntary interactions between a company and other organization(s) aiming to achieve a shared CE business goal that they could not achieve individually (Brown et al., 2021; Konietzko et al., 2020). Based on prior research on inter-organizational collaboration, such interactions can relate to, but are not limited to, connecting or sharing resources, capabilities, activities, and information (see e.g., Pisano & Verganti, 2008). When such interactions are repeated and actors are engaged to collaboration over time, collaboration for CE business has a processual nature (Kaipainen et al., 2023b; Mishra et al., 2019). Studies on collaboration for CE business are scattered among multiple research streams, among which this research focuses on the well-established, company-centric research stream of CBM (Brown et al., 2018; Köhler et al., 2022), and supportive research streams on circular innovation (Brown et al., 2021; Konietzko et al., 2020) and circular supply chains (CSC) (Bressanelli et al., 2019b; De Angelis et al., 2018; Farooque et al., 2019). Collaboration has been recognized as an inherent yet challenging factor for successful CE business: neither fully understood or harnessed by companies (Guldmann & Huulgaard, 2020; Korhonen et al., 2018) nor by research, which has only now begun to identify who to collaborate with in CE business (Aarikka-Stenroos et al., 2021; Harala et al., 2023). Given the lack of knowledge, empirical cases of collaboration for CE business are needed (Brown et al., 2018, 2021) to learn about various types of collaborations, their emergence, mechanisms, processes, applications, and success factors, particularly in supply chains in different geographical, industrial,

and company-specific contexts (Bressanelli et al., 2019b; Brown et al., 2018; Govindan & Hasanagic, 2018; Hazen et al., 2020; Leising et al., 2018; Pieroni et al., 2019; Sehnem et al., 2019). Such insights are needed to explain the strategic integration between CBMs and external collaborators (De Angelis et al., 2018; Ferasso et al., 2020; Govindan & Hasanagic, 2018; Hazen et al., 2020; Sehnem et al., 2019) and the characteristics of strategic decision-making for collaboration for CE (Brown et al., 2018). Company-centric CE business research needs to deeply understand the role and significance of collaboration from a systemic lens (Fehrer & Wieland, 2021; Lüdeke-Freund et al., 2019; Urbinati et al., 2017) to unveil how collaborations can be managed in a timely manner and for the right purposes during strategic development of CE business, supporting not only CBMI but also CBS development in established companies.

Based on its theoretical positioning and the core theoretical streams, this research adopts the concepts of CBS, CBM, and collaboration for CE business and investigates how they co-develop over time in the overarching process of strategic development of CE business in established companies. The key concepts are summarized in Table 1 and further theoretically elaborated on in chapter 2. The key gaps are summarized in Table 2 in section 1.3.

Table 1. Key concepts, their definitions and application in this research, theoretical streams, and the relationship with other key concepts

Key concept (abbreviation, if any)	Definition and application in this research	Theoretical field/stream and selected literature	Relationship with other key concepts
Circular economy (CE)	A CE is a regenerative system where the value of products and materials is maintained to maximal length while minimizing waste and using renewable energy by closing, slowing, narrowing, and regenerating material and energy loops.	CE (Chen et al., 2020; Geissdoerfer et al., 2017; Ghisellini et al., 2016; Goldmann & Huulgaard, 2020)	CE is a promising pathway to more sustainable business and society and leads to long-term changes in companies' business environments, implying a need for strategic development of business to remain competitive during CE transition.
Established companies	Established companies have established profitable operations, business, strategies, collaborations, and markets, which follow linear logics and need to be updated when transitioning to CE.	Established companies and incumbents in CE business (Franco, 2017; Frishammar & Parida, 2019; Gandolfo & Lupi, 2021; Santa-Maria et al., 2021b)	Established companies need to rethink their existing business from a long-term perspective, thus demanding strategic development of CE business.

Key concept (abbreviation, if any)	Definition and application in this research	Theoretical field/stream and selected literature	Relationship with other key concepts
Strategic development of CE business	A process through which management informs, shapes, and supports the strategic business decisions (i.e., company's questions related to the past, the present, and the future business) that their company is facing to survive in a dynamically changing business environment; this research particularly focuses on developing CE business.	Adapted to CE business context from strategic management (Dyson et al., 2007 ; Steptoe-Warren et al., 2011)	Strategic development of CE business is used as an umbrella term that manifests CE business development as a comprehensive strategic undertaking with underlying strategic decisions regarding CBS development, CBMI, and collaboration for CE.
Circular business strategy (CBS)	A time-bound guideline that describes how a company competes while dealing with sustainability issues by understanding, harnessing, and integrating CE principles.	CBS (Bui et al., 2022 ; Gajanayake et al., 2023 ; Tseng et al., 2022)	CBS is a concrete outcome of the plan for how a company competes in CE business at a specific moment in time, reflected in practice through the corresponding CBM and arrived at through CBS development.
Circular business strategy development	The process of developing a strategy that describes how a company competes while dealing with sustainability issues by understanding and harnessing CE principles.	Only implicit in CBS and environmental sustainability in the business strategy streams	The process of CBS development unfolds over time and results in a novel CBS, as a central sub-process of a company's overarching strategic development of CE business.
Circular business model (CBM)	A time-bound representation of a company's strategic decisions regarding its organizational systems, relationships, and value elements (value creation, delivery, and capture) in a specific business, to which CE principles are integrated.	CBMs (Bocken et al., 2016; Centobelli et al., 2020; Geissdoerfer et al., 2020; Lüdeke-Freund et al., 2019)	CBM is a concrete outcome of how a company organizes its business in a circular way at a specific moment in time, reflecting how the corresponding CBS is practically implemented.
Circular business model innovation (CBMI)	A process where the entire business model, one or more of its value elements, the interrelations between the elements, or the related collaborations may change owing to the integration of CE principles.	CBMs (Geissdoerfer et al., 2020; Guldman & Huulgaard, 2020; Ritala et al., 2023; Santa-Maria et al., 2021a)	The process of CBMI unfolds over time simultaneously with CBS development and results in a novel CBM as a sub-process of a company's overarching strategic development of CE business.
Collaboration for CE business	The continual series of interactions between two or more organizations aiming to achieve a shared CE	Collaboration for CE business (Brown et al., 2021; Konietzko et	Collaboration for CE business entails collaboration for CBM, CBMI, and CBS development, and as such, it contributes to

Key concept (abbreviation, if any)	Definition and application in this research	Theoretical field/stream and selected literature	Relationship with other key concepts
	business goal that they could not achieve individually.	al., 2020; Zucchella & Previtall, 2019)	companies' overall strategic development of CE business.

1.3 Research objective and research questions

The overarching objective of this study is to *explore how established companies can manage their strategic development of CE business*. Critical gaps remain in both research and managerial practice regarding how established companies can stay competitive and harness business opportunities during CE transition (see Table 2). Thus, further company-centric empirical research and development of comprehensive process-based frameworks on successful CE implementation from a strategic viewpoint is warranted. To respond to the identified research gaps and establish research questions (RQs) with potential for more interesting and influential theory development (see Alvesson & Sandberg, 2011), this research challenges the current static ontological convention of CE business research by adopting strategic, holistic, and process viewpoints. The research seeks new understanding and contribution to theory development with empirically grounded findings of CE pioneer companies, which are summarized in nine propositions and conceptualized in a process model that captures established companies' strategic development of CE business, providing guidance to managers seeking and leading a proactive turn toward CE business in their companies. To address the overall objective, the study formulates three RQs.

Similar to the overall research objective, the first RQ stems from the lack of understanding of CE business implementation from a strategic viewpoint (Ferasso et al., 2020; Urbinati et al., 2017) and addresses this from the perspective of CBS, which has remained a largely underexplored concept in literature. To support companies in their strategic development of CE business and develop theory, a deeper understanding of CBS is clearly required, along with a conceptualization how it can be developed over time in practice. This implies a need for studying how the process of CBS development unfolds, what are the key issues in the process, and how can they be managed in a timely manner. I argue that similar to the rapid popularization and standardization of the CBM concept (Chen et al., 2020), CBS now needs further investigation for uniform

terminology, definitions, and scope to facilitate CBS-related discussions among researchers and practitioners. To advance this understanding of CBS and its development as a process, I ask the following:

RQ1: How can established companies develop circular business strategies?

Second, as business strategy implementation is translated into the business model (Richardson, 2008), a CBS can assumingly lead to a CBM. Thus, while developing their CBS to stay competitive in the rapidly changing dynamic markets, companies also need to constantly consider how the updated CBS must be implemented through innovating CBMs. Despite the continuously growing body of CBM research, the relationships between CBMs and CBSs and the overall strategic development of a company toward CE business are surprisingly under-researched. Such holistic understanding and related strategic frameworks would enable unlocking the full business potential of strategic CE development. In line with this, empirical success examples of CBMI can provide insights into how to best manage this process in practice. Hence, to address these gaps, I ask the following:

RQ2: How can established companies innovate circular business models aligned with their circular business strategy development?

Third, the transition to CE introduces systemic changes with new challenges that companies cannot overcome alone (Aarikka-Stenroos et al., 2021; Fehrer & Wieland, 2021), calling for empirical case research on how companies enable their development of CE business with existing and new collaborations in different contexts. However, although collaboration for CE business appears to be a critical and challenging factor to manage (Korhonen et al., 2018), current research is limited in explaining how companies collaborate, with whom, and when to successfully manage the overall strategic development of CE business. Here, the insights on collaborations' role in CBS development remains almost non-existent, as collaboration is typically associated with CBMIs. Thus, more research is needed to harness collaboration for overarching strategic development of CE business, including the underlying perspectives of both CBM and CBS, formulated as the third RQ:

RQ3: How can collaboration support established companies in their strategic development of CE business?

The three RQs contribute to addressing the overarching objective of exploring how established companies can manage their strategic development of CE business. Below, in Table 2, I summarize the RQs, related key gaps per research stream, key literature, and the dissertation publication(s) answering each RQ.

Table 2. Summary of the overarching objective, research questions, related gaps, selected key literature, and associated publications

	Literature stream and its key research gaps	Selected key literature	Publications
Overarching objective: Exploring how established companies can manage their strategic development of CE business	<i>CE business research focused on established companies</i> - Limited company-centric understanding of CE implementation as a strategic phenomenon with long-term implications for the business; - Under-researched process approach for understanding the strategic changes in business for CE through comprehensive framework(s); - Need for further empirical evidence of successful cases reconciling economic and environmental sustainability through strategic development of CE business.	Bocken et al., 2016; Centobelli et al., 2020; Ferasso et al., 2020; Gandolfo & Lupi, 2021; Halonen et al., 2019; Ritala et al., 2023; Urbinati et al., 2017	I, II, III, IV
RQ1: How can established companies develop circular business strategies?	<i>Environmental sustainability in business strategy, and particularly its sub-stream of CBS</i> - Lack of understanding on how CBS development is conceptualized; - Lack of knowledge on managing CBS development over time in practice and building competitive advantage by integrating environmental sustainability into business strategy.	Bui et al., 2022; Engert et al., 2016; Gajanayake et al., 2023; Nielsen & Hakala, 2022; Papagiannakis et al., 2014; Tseng et al., 2020	I (II, III, IV)
RQ2: How can established companies innovate circular business models over time aligned with their circular business strategy development?	<i>CBM research</i> - Lack of understanding of CBM's role and relationship with CBS and companies' overall strategic development of CE business; - Limited processual views, empirical evidence, and frameworks for understanding how CBMI can be managed in established companies over time.	Bocken & Konietzko, 2022; Geissdoerfer et al., 2020; Ferasso et al., 2020; Pollard et al., 2021; Ritala et al., 2023; Santa-Maria et al., 2021a, 2021b; Urbinati et al., 2017	II, III (I, IV)

	Literature stream and its key research gaps	Selected key literature	Publications
RQ3: How can collaboration support established companies in their strategic development of CE business?	<i>Collaboration for CE business</i> - Under-researched how to manage collaboration beyond company boundaries, with whom and for what purpose as a strategic issue contributing timely to companies' strategic development of CE business; - Overlooked the role of collaboration for CBS development; - Underexplored empirical cases to dive deeper into the emergence and contexts of collaboration for CE business.	Brown et al., 2018, 2020, 2021; Köhler et al., 2022; Mishra et al., 2019; Zucchella & Previtai, 2019	I, II, III, IV

By answering the RQs related to CBS development, CBMI, and collaboration for CE business, this research addresses the manifold critical gaps in literature owing to the under-researched understanding of established companies' strategic development of CE business. Next, I introduce the research process, where four publications contribute to building new knowledge for researchers and practitioners by answering the dissertation RQs.

1.4 Research process and its publications

This dissertation consists of the introduction and four independent yet thematically interconnected publications, each of which provides insights into the overall research objective and RQs of the dissertation. In Table 3, I summarize the RQs of each publication along with an overview to the contributions of the publications to each of the dissertation's RQs.

Table 3. Research questions of the publications and the role of each publication in contributing to the dissertation's research questions

	Publication I	Publication II	Publication III	Publication IV
RQ(s) of the publication	- What constitutes an incumbent's strategic renewal process aimed at achieving sustainability, and how can this process be managed?	- How can a company, together with its ecosystem actors, realize sustainable innovating despite the challenges of the CE innovation process?	- How companies innovate their business models and supply chains for implementing a CE?	- When industrial companies design and implement a CBM, how is this reflected in their supply chain collaborations? - How do such collaborations support companies in the design and implementation of their CBMs?
Contribution to RQ1: How can established companies develop circular business strategies?	- Provides novel understanding of CBS development as a process. - Reveals particularly radical and proactive type of CBS development and its management issues in established companies. - Finds that new CE business opportunities emerge over time from spin-off CBSs and CBMs.	<i>Minor contributions:</i> - Provides insights into CBMI as a repetitive building block in the implementation part of CBS development, suggesting that CBMI and CBS development co-evolve over time in the companies' strategic development of CE business. - Shows that the co-development of CBS and CBMI processes over time is influenced by the context.	<i>Minor contributions:</i> - Recognizes the (co-)existence of different CBS alternatives. - Strengthens the understanding on supply chain collaborations enabling the CBS development of the company.	<i>Minor contribution:</i> - Strengthens the understanding on supply chain collaborations enabling the CBS development of the company.
Contribution to RQ2: How can established companies innovate circular business models over time aligned with their circular	<i>Minor contributions:</i> - Empirically evidences implementation as an important part of strategic cycles in the CBS development, implying the need for frequent alignment of CBMI with CBS. - Contributes to understanding contexts embedded in	- Reveals that radical CBMI demands a combination of diverse and dynamically interlinked innovations, and their time-bound roles need to be recognized and harnessed to	- Finds that supply chain and service innovations drive radical CBMI but seem less feasible to adopt compared with process- and product-	<i>Minor contribution:</i> - Provides a set of different supply chain collaboration practices that enhance the value elements of a CBM and support strategic

	Publication I	Publication II	Publication III	Publication IV
business strategy development ?	environmental pressure to drive radical CBMI. - Strengthens the understanding of radical CBMI to demand diverse, interlinked innovations. - Extends understanding on temporal interlinkages in extant CBMI process types.	enhance the CBMI process. - Finds that CBMI leads to spin-off CE business opportunities. - Shows contexts embedded in heavy environmental pressure to drive radical CBMI. - Extends understanding on temporal interlinkages in extant CBMI process types.	oriented CBMIs. - Shows that innovation of a radical CBM is facilitated by selecting and managing a combination of diverse and dynamically interlinked innovations.	development of the company.
Contribution to RQ3: How can collaboration support established companies in their strategic development of CE business?	- Recognizes collaboration's strategic significance in CE business and its management. - Finds that collaboration provides access to positive and negative feedback for strengthening CBS development. - Shows that collaboration engages others to the company's CE visions, leading to strategic partnerships. - Uncovers that collaboration allows timely ecosystem development aligned with CBS development.	- Explores timely collaboration with diverse actors for proactively overcoming the challenges in the CBMI process. - Deepens understanding on engagement with other organizations to allow long-term strategic collaboration. - Identifies that collaborators can hold multiple roles in the strategic development process of CE business. - Uncovers that collaboration allows timely ecosystem development.	- Shows that collaboration accelerates the innovation of radical CBMs. - Finds the supply chain collaborations to enable innovation for different CBMIs, allowing different CBS alternatives.	- Recognizes that collaboration has strategic importance in CE business. - Provides a set of different supply chain collaboration practices that enhance a CBMI's value elements. - Uncovers that collaboration allows timely ecosystem development and collaborative industry and market development.

The first steps of the doctoral journey (mid 2020–late 2021) were devoted to understanding strategic management perspectives in developing CE business in established companies. Pursued through a single-case study, the aim was to generate in-depth understanding of what kind of process an established company faces when strategically developing CE business, what challenges and management issues might emerge, and how can top management and

collaborations support in navigating this process. The single-case study served as a foundation for two sister publications developed partly in parallel: Kaipainen & Aarikka-Stenroos (2022; hereafter Publication I), focusing on CBS development, and Kaipainen & Aarikka-Stenroos (2021; hereafter Publication II), focusing on the CBMI processes unfolding next to the CBS development process, both interactively contributing to understanding the strategic development of CE business in an established company.

Publication I plays a major role in shedding light on the ambiguous concepts of CBS and CBS development. The publication mainly contributes to RQ1 by expanding the understanding of the steps needed for the CBS development process over time and of what management issues become relevant and when during this process inside and outside the company. The publication approaches business strategy as a process to emphasize the processual nature of strategies. In the dissertation, however, to ensure clarity of the key concepts, I distinguish between strategy as an outcome and a process by labeling them as CBS (outcome) and CBS development (process), respectively, following a substantive metaphysics process ontology (Langley et al., 2013; see also section 3.1.).

Publication II explores the CBMI processes under the lens of circular innovation process and strategy of an established company. The studied overarching innovation process and strategy for a CE eventually lead to multiple new CBMIs over time. The research contributes to all the RQs. Toward RQ1, the publication provides minor insights into CBMI as a repetitive building block in the implementation of the CBS development process, suggesting that CBMI and CBS development co-evolve over time in the companies' strategic development of CE business. In answering RQ2, Publication II has particularly fruitful standpoints owing to the shared case with Publication I and provides several insights into the radical type of CBMI process, its challenges, and action points for management aligned with CBS development, including recognizing the spin-off CE business opportunities and temporal linkages, i.e., connections rooted in time, between extant CBMI types. To RQ3, the publication provides avenues for diverse collaborations to overcome the challenges of the CBMI process.

After publishing the first two publications, I advanced to a research period (late 2021–late 2022) characterized by more systemic view to the research topic, multiple-case methodological approach, and the internationalization of the research after the lift of restrictions related to the COVID-19 pandemic, realized particularly through frequent visits to Politecnico di Milano for the double

degree collaboration. In studying both CBS development and CBMI processes, it became evident that deepening the investigation to collaborations represents an important research area and a source of valuable insights for further investigation to understand companies' strategic development of CE business with a systemic view. To achieve a broader understanding of how CE manifests in diverse business models across industry and country boundaries, a shift from a single-case study setting to multiple case studies was considered valuable. This resulted in two publications: Kaipainen et al. (2022; hereafter Publication III), identifying strategic variants by exploring the intersection between CBMs and CSCs, and Aarikka-Stenroos et al. (2022; hereafter Publication IV), exploring how supply chain collaborations enable companies' CBMIs.

Publication III bridges CBMI with innovating CSCs. Regarding RQ1, the findings on the different combinations of CBMI and CSC innovation enable different circular innovation strategy variants of CE business, which influence CBS development and imply that different CBS strategies exist, even within a single company. The publication provides new insights to the diverse types of circular innovation that lead to CBMI, allowing for radical change and hence contributing to RQ2. By discussing how CSC collaborations accelerate radical CBMIs, the publication also contributes to RQ3.

Publication IV probes into the supply chain collaborations that were identified to be important in all earlier publications for CBMI and the strategic development of a company's business towards CE. The findings deepen this understanding by considering supply chain collaborations to support not only CBMs, but also CBSs (RQ1). The publication provides insights into the practices and themes that need to be addressed when establishing CSC collaborations for inducing circularity into different elements of the business model. Hence, Publication IV mainly contributes to RQ3 and minorly to RQ2.

1.5 Structure of the dissertation

The remainder of this dissertation is structured as follows. Chapter 2 sets the theoretical underpinnings of this dissertation, which focus on the field of CE business, reviewing its past and ongoing discussions in the streams of CBS, CBM, and collaboration for CE business and considering how they interlink in contributing to companies' strategic development of CE business. Chapter 3 presents the dissertation's methodological setting. In addition to the

philosophical grounding in pragmatism and the explorative, processual, and qualitative methodological choices, the chapter presents the single and multiple case study research designs; case sampling and the context of the twelve CE pioneer companies from Finland and Italy; and the management of their data in the collection and analysis phases. The chapter concludes with an evaluation of the research quality and the tactics employed to enhance reliability and validity.

Chapter 4 summarizes the findings of each publication. Chapter 5 discusses the key findings in greater detail in order to answer each of the dissertation RQs, highlighting overarching themes derived from the findings. It also introduces nine propositions and synthesizes the key findings into a process model for established companies' strategic development of CE business.

In chapter 6, conclusions are drawn and presented, along with their theoretical and practical contributions. Theoretical contributions highlight CE's strategic implications for established companies' businesses and corporate strategies in environmentally burdensome contexts—demanding proactivity, radicality, systemic change, and temporal considerations. Practical implications present guidelines for managers across industries on what actions to take and when. They also encourage policymakers and other organizations to engage in supporting companies' strategic development of CE business with different roles and means, to play their part in realizing shared sustainability goals in the economy and society. The conclusion acknowledges the limitations of the scope of research, methods, and available resources and outlines future research avenues, such as expanding the context and level of analysis and pursuing other potential strategic viewpoints to CE business research emerging from the findings, including for example different types of CBS.

2 THEORETICAL BACKGROUND ON ESTABLISHED COMPANIES' STRATEGIC DEVELOPMENT OF CIRCULAR ECONOMY BUSINESS

In this chapter, I discuss in more detail CBS and its development, CBM and its innovation, and collaboration for CE business as the key concepts contributing to established companies' strategic development of CE business. The chapter is concluded with an overview of how CBS development, CBMI, and collaboration interlink in companies' strategic development of CE business under the light of extant research.

2.1 Circularity in business strategy development

As Ferasso et al. (2020) state, “Given the complexity of circular economy implementation, there is an increasing interest in achieving a strategic standpoint for it” (p. 3015). In the same vein, at the very core of this research is companies' strategic development of CE business. Thus, although this research is mainly positioned in CE business research, we first need to delve briefly into the fundamentals of strategic management research to better understand strategic development and business strategy and apply this understanding to integrate environmental sustainability and circularity with the business.

On a broad scale, strategic management covers topics such as strategic visions, objectives, and securing competitive advantages through formulating, selecting, and implementing strategies (Brown et al., 2020). As a key topic of strategic management, strategic development is a process through which the management informs, shapes, and supports the strategic decisions that their company is facing (Dyson et al., 2007). Such strategic decisions in strategic development revolve around questions about the past, the present, and the future of the company to survive in a dynamically changing business environment (Steptoe-Warren et al., 2011). Thus, a critical aspect of strategic development—

and as highlighted in this research, strategic development of CE business—is business strategy, which describes how companies can compete and survive in their chosen business (Furrer et al., 2008; Richardson, 2008).

Over the past decades, business strategy research has yielded numerous frameworks and tools to enhance companies' competitiveness (Vuorinen et al., 2018; Richardson, 2008) by analyzing the impacts of internal and external factors and orientations on the company (Hoskisson et al., 1999), including a company's internal strengths and weaknesses and the opportunities and threats emerging in the company's environment (Gilbert, 1994; Porter, 1979). In balancing between internal and external strategic foci, companies consider and combine strategic orientations that vary from externally focused market orientation to internally focused technological and entrepreneurial orientations. In between these orientations lies the company's orientation to learn from markets, technologies, or the entrepreneurial behavioral processes such as innovativeness, proactiveness, and risk taking (Hakala, 2011).

In business strategy development, finding and maintaining a strategic fit between the rate of strategic changes inside a company to the co-occurring changes of the external environment is central (Ben-Menahem et al., 2013; Fainshmidt et al., 2019). The idea of change and evolution has been broadly adopted in strategic management research and has led to the establishment of its own school of thought (Barnett & Burgelman, 1996), which is often promoted with process-based methods (Langley & Montréal, 2007). Prior research has focused on the pace and paths of strategic change, evolving through events with strategic importance, such as birth, restructuring, technological or product innovation, merger, or failure (Barnett & Burgelman, 1996; Van de Ven, 1992). Over the course of developing business strategies, different degrees of change are possible, from incremental adjustment that leverages on existing competencies and opportunities in an exploitative manner to radical reshaping of the strategy that generates new opportunities and competencies through exploration (see, e.g., Jarzabkowski, 2004; Osiyevskyy et al., 2020).

Owing to the scholarly and practitioner-based interest in understanding the change and dynamics of strategies, strategic development is often conceptualized as a process with multiple, repetitive, and interlinked stages (Furrer et al., 2008) related to formulating, implementing, and evaluating activities (Cohen & Cyert, 1973; see also Vuorinen et al., 2018). Thus, both strategic development and business strategy development are understood in this research as processes following a certain pace and path (Barnett & Burgelman, 1996); nevertheless,

business strategy development focused on one branch of business remains subordinate for the overall strategic development of CE business in a company.

Companies are argued to achieve competitive advantage by integrating environmental issues in the core of their business strategies (Porter & Van Der Linde, 1995). Therefore, strategic management research has gradually incorporated environmental thinking and begun to consider environmental strategies, sustainability strategies, and eventually environmental business strategies (see, e.g., Baumgartner & Ebner, 2010; Papagiannakis et al., 2014). Although environmentally sustainable development has become an important topic for business strategy development (Engert et al., 2016; Geissdoerfer et al., 2017; Martin & Rice, 2010), CE as an avenue for integrating sustainability into strategies is only recently being explored in a nascent stream of CBS research that deals with understanding and designing novel business strategies for circularity (Bui et al., 2022).

Research on the integration of environmental sustainability into business by adopting a process approach has drawn from organizational learning (Banerjee, 2002; Siebenhüner & Arnold, 2007), as learning is central to shifting from conventional to sustainable ways of doing business in established companies (Hofmann & Jaeger-Erben, 2020; Siebenhüner & Arnold, 2007). Learning and the initiation of environmental action, in turn, are driven by dynamic feedback (Papagiannakis et al., 2014), which can either encourage or prevent the development of CE business (Franco, 2017). Inside the company, feedback originates from evaluations of the outcomes of previous environmental decisions against their original goals. Positive results can shape also the future expectations and the level of commitment to environmental strategy (Papagiannakis et al., 2014), helping companies to overcome their path-dependent behavior in a linear economy (Hofmann & Jaeger-Erben, 2020). When integrating environmental sustainability to business strategy, short-term focus is incremental (Siebenhüner & Arnold, 2007) and aims to address legislative pressures (Banerjee, 2002). However, the need for a proactive approach by companies is increasingly highlighted in research on environmentally sustainable strategies (Berry & Rondinelli, 1998; Damall et al., 2010) and is associated with a more holistic and radical search for environmental sustainability, enabled by, for example, communicating about sustainability topics and engaging stakeholders (Siebenhüner & Arnold, 2007).

For established companies, managing the process of business strategy development is particularly challenging, because transformative CE transition

proposes large-scale changes in their business logics and portfolio of existing and new business models (Gandolfo & Lupi, 2021; Geissdoerfer et al., 2020; Ranta et al., 2018; Rovanto & Bask, 2020). Consequently, CE implies critical changes and strategic considerations on the knowledge and resource trade-offs for economic and environmental performance (Takacs et al., 2022) to be addressed in business strategy development. However, CBS introduces novel impediments, such as a lack of knowledge and managerial support and hesitation in adopting CBS (Bui et al., 2022). Severe challenges underlying the CBS development may be related to, for example, circular innovations that disrupt the industry and make the existing competences and business models obsolete (see Kuhlmann et al., 2022). Established companies are expected to overcome such challenges by rapidly developing existing and new technologies and resources and promoting products and solutions that integrate novel and extant knowledge, while ensuring harmony between existing competences, resources, and organizational culture (Bergek et al., 2013).

When CBSs are referred to in the CE business literature, they are typically neither discussed in detail nor defined (see, e.g., Khan et al., 2021a; Khan et al., 2021b). One reason for the vagueness of the CBS concept is that the literature often discusses circular strategies without specifying if the focus is on business strategy, and typically refers to either circular design strategies or CBM strategies (see, e.g., Bocken et al., 2016; Ghisellini et al., 2016). Thus, instead of acting as standalone business strategies (as explicitly framed, e.g., by Jørgensen & Remmen, 2018), such circular strategies discussed in prior research typically represent rather the paths and principles for implementing different business strategies by designing technologies, business practices, and business models (Lieder et al., 2017; Puglieri et al., 2022) instead of directly addressing how companies can compete and survive with their business strategy (Furrer et al., 2008; Richardson, 2008).

In the nascent stream of CBS development, circularity is situated at the core of a company's business strategy (Sousa-Zomer et al., 2018), acting as an incentive for implementing CE practices particularly in medium and large established companies (Gajanayake et al., 2023). A company's CBS is defined based on an analysis of CE trends, visions and goals, and current CE business status (Puglieri et al., 2022) as well as a CE-oriented analysis of extant business strategy and value chains (Jørgensen & Remmen, 2018). Puglieri et al. (2022) suggest that CBSs must be developed based on the seminal Porterian competitive strategies on cost, differentiation, and focus (Porter, 1980). As key indicators for

CBS, Bui et al. (2022) draw attention to deep learning, strategy implementation, collaboration, and sustainable development but do not further elaborate their roles or timing in CBS development. To further enhance CBS, extensive focus is needed on collaboration, strategic internal processes, and technology competency (Tseng et al., 2022). Integrating circularity into a company's strategy and goals demands the commitment of the top management and external collaborators, circular innovation, and CBMs through, for example, the identification of new business opportunities, promotion of circular supply chains, and guidance in the related cultural and organizational changes (Ghisellini et al., 2016; Kuhlmann et al., 2022; Maranesi & De Giovanni, 2020; Pollard et al., 2021; Tura et al., 2019).

Beyond the abovementioned explicit references discussing CBS, management researchers thus far have investigated CE's relationship with current strategic management theories in limited studies where CBS may appear only implicitly. They have examined for example the resource-based-view and dynamic capabilities (Lüdeke-Freund et al., 2019), institutional pressures (Castro-Lopez et al., 2023; Ranta et al., 2018), organizational agility (Castro-Lopez et al., 2023), and business processes, and their implications on business model design and implementation in specific industries (Ahmad et al., 2023; Alcalde-Calonge et al., 2022). For example, Moktadir et al. (2020) identify the critical success factors for business strategy development based on CE practices, and Prieto-Sandoval et al. (2019) identify the strategies, resources, and capabilities for CE implementation, but they do not explicitly refer to CBS or define it. The seminal work of Bocken et al. (2016) identifies strategic decision-making based on a clear vision as a key capability in generating CE business opportunities. Santa-Maria et al. (2021b) distinguish between the criticality of capabilities depending on the company's strategic intention and time horizon varying from short (e.g., reducing material use and reusing products) to long loops of CE (e.g., recycling): with long-term-oriented circular loops, the company needs to pay attention to ambitious vision, sustainability framework guidance, top management support, engagement with strategic partners, and coordination of the business ecosystem. To achieve competitive advantage and manage the continual organizational reconfiguration and adaptation during CE transition, companies are also recommended to adopt circular innovation (de Jesus & Mendonça, 2018; Fowler & Hope, 2007); it has the power to shift, or even disrupt, companies' strategic development through diverse innovation outcomes, processes, and degrees of radicality (Brown et al., 2020; de Jesus et al., 2019; de Jesus & Mendonça, 2018; Kuhlmann et al., 2022;

Suchek et al., 2021). The role of business context and its institutional pressures is also highlighted for companies considering their strategic alternatives for CE implementation (Castro-Lopez et al., 2023; Jørgensen & Remmen, 2018; Tura et al., 2019).

Despite the first efforts to bring CBS into the focus of CE business research, the discussions and frameworks on how to integrate strategic thinking into CE business have remained limited and typically implicit (Centobelli et al., 2020; Murray et al., 2017; Urbinati et al., 2017). Interestingly, although CBS still lacks conceptual clarity through qualitative exploration, the most recent studies in CBS stream employ quantitative methods (Gajanayake et al., 2023; Castro-Lopez et al., 2023; Bui et al., 2022). Table 4 summarizes the selected extant research related to CBS and its development in CE business research.

Table 4. Selected extant publications related to circular business strategies and their development

Reference	Objective	Method & context	Main findings related to CBS
Gajanayake et al., 2023	To understand the organization's behaviors and motivation to identify how CE practices could be encouraged in businesses with linear logics.	Questionnaire for 118 companies in diverse industries in Australia	- Business strategy/organizational policies are the most influential drivers for managers to implement CE practices in established medium and large companies, followed by strategic commitment and business opportunities.
Castro-Lopez et al., 2023	To understand institutional pressures and organizational agility as drivers of the company's strategic shift and tactics toward the adoption of a CBM.	Questionnaire for 218 manufacturing companies in Spain	- Companies' strategic-level changes are driven by institutional pressures and organizational agility. The strategic changes reflect in specific circular practices.
Bui et al., 2022	To determine the definitive CBS indicators for industry 4.0, as well as their opportunities and challenges across regions.	Mixed methods for social media data analysis in Industry 4.0	- Definition of CBS, 28 indicators for CBS in Industry 4.0, and their opportunities and challenges across regions; - Deep learning, strategy implementation, collaboration, and sustainable development are the most prominent indicators of CBS.
Takacs et al., 2022	To identify and categorize internal and external barriers for the CE in small and medium sized enterprises into a sustainable strategic	Interview study of 59 top managers in small and medium-sized companies in food and	- A sustainable strategic management framework with interrelated internal barriers (short-term and economic orientation, risk aversion and avoidance of trade-offs, and shortage of knowledge and resources) and external barriers (technology, market, legislation and society, and consumers)

Reference	Objective	Method & context	Main findings related to CBS
	management framework.	beverages, textile, and logistics industries in Switzerland	- Proposing six strategic focus points: internal awareness; intertemporal and sustainability-based risk assessment and decision-making; comprehensive design; circular ecosystems; and interaction with legislation and public discourse.
Puglieri et al., 2022	To propose and test a strategic planning decision framework oriented to circular business models aligning with Porter's competitive strategies.	Single-case study in a Brazilian cosmetics start-up	- CBS is defined based on the analysis of CE trends, CE visions and goals, and current CE business status, leading to competitive strategies on cost, differentiation, and focus. - Five-stage process model for integrating strategic considerations in CBMs, prioritizing ease of implementation and environmental, social, and economic benefits.
Nielsen & Hakala, 2022	To understand the relationships between CE and quality of life with illustrative examples.	Systematic literature review and exploration of illustrative case examples	- Framing regenerating, sharing, optimizing, looping, virtualizing, and exchanging as business strategies; combining them allows more rapidly advancing the effect of CE on quality of life. - CBS as a driver for not only environmental benefits, but also quality of life more broadly.
Moktadir et al., 2020	To identify and evaluate critical success factors needed in the business strategy development of CE practices.	Literature review, quantitative best-worst method, decision-making lab study in leather industry	- Critical success factors for business strategy development are leadership and top management commitment, CE-driven legislation, lack of ecological resources and knowledge of CE practices, governmental funding, and competitor pressure. - CSCs enable resource optimization for business strategy.
Maranesi & De Giovanni, 2020	To examine CE's connections with the corporate strategy, the activities involved, the CSCs, the industrial symbiosis, and performance.	Qualitative multiple-case study in Italy	- Strategic decisions and commitment by the shareholders and top management are required to identify and implement new CE business opportunities, promote an integrated CSC, and guide the related cultural and organizational changes.
Halonen et al., 2019	To compare extant literature-based CE frameworks and evaluating their suitability to assist manufacturing companies in strategic development towards CE.	Literature review and systemic comparison of existing CE frameworks in manufacturing industry	- CBMs should be systematically considered as part of a company's strategy and into development actions. - CBM strategy formulation and implementation is positively affected by CE frameworks that consider business model, strategy formulation, and capability development as inseparable and iteratively interlinked.

Reference	Objective	Method & context	Main findings related to CBS
Tura et al., 2019	To systemically categorize drivers and barriers for developing new business in the CE.	Qualitative multiple-case study in Finland	- Circularity integrated in company strategy and goals acts as an organizational driver for CE and promotes CSCs. - Lack of CBS acts as a CE barrier.
Prieto-Sandoval et al., 2019	To identify the key strategies and resources that small and medium sized companies need in the CE to eco-innovate, build a competitive advantage, create value, and position in the market.	Literature review and workshops with Spanish researchers and practitioners	- Considers competitive advantage and capabilities in company-level CE transition, and provides a set of 31 strategies/activities that could help small and medium-sized companies to orient their corporate strategy toward CE.

From the emerging theoretical standpoints in CE business research, CBS development can be assumed to play a crucial role in companies' strategic development of CE business. Although the CBS stream has barely investigated CBS development over time, prior strategic management research and its stream pertaining to environmental sustainability considerations indicate that CBS development may have a processual nature and typically entail innovation. CBS development with long-term horizon is characterized by CE visioning and the engagement of different actors in achieving those visions (Puglieri et al., 2022; Santa-Maria et al., 2021b). Strategic business decisions can inspire and frame how CE business opportunities are identified at present and in the future, emphasizing the intertemporal decision-making in the CBS development process (Takacs et al., 2022). Considering the prior insights into CBS, next is the discussion on CBMs.

2.2 Circular business models for circular business strategy implementation

2.2.1 Circular business model

Once companies have developed CBSs, they need to reflect on how and with whom the strategy can be translated into actual business activities. To bridge strategy formulation with its implementation, strategy scholars propose

employing the concept of business model, which traditionally reflects how the company proposes, creates, and captures value from its activities (Richardson, 2008; Teece, 2010). As such, a business model captures the current business logics and conceptualizes how business is done in the company (Magretta, 2002). Scholars and practitioners alike have pursued the concept of business models with enthusiasm, seeing it both as a conceptual tool and a strategic asset for competitive advantage (Geissdoerfer et al., 2020), which facilitates understanding and reflects strategic decisions for the development of business, based on the company’s internal activities and external relationships (Bohnsack et al., 2014; Osterwalder et al., 2005; Zott et al., 2011). Moreover, innovative business models can leverage industrial transition (Schumpeter, 1976), such as the systemic CE transition (Bocken & Antikainen, 2019).

Table 5 illustrates with examples how CBMs can be understood and conceptualized, showing the consensus in recent research that CBM addresses the alignment of value elements with CE principles (Geissdoerfer et al., 2020). Scholars have often highlighted the relationship of CBM with sustainable development (Geissdoerfer et al., 2018b; Ünal et al., 2019; Zucchella & Previtali, 2019) and, like this research, view CBM as a topical sub-category of sustainable business models that inherently advances social, environmental, and economic sustainability by applying CE principles (Lahti et al., 2018; Rauter et al., 2022). Moreover, some scholars have added their own emphases on the CBM concept in sub-streams of the CBM discussion, such as focus on managerial practices (Ünal et al., 2019; Urbinati et al., 2017).

Table 5. Examples illustrating the nature and conceptual focus of circular business models

Reference	Definition	Focus
Ritala et al. 2023, p. 175	CBMs help businesses to create, deliver and capture value in ways that are aligned with economic as well as environmental goals of businesses and their stakeholders.	Value elements; sustainable development
Zucchella & Previtali, 2019, p. 275	A business model's key role is to incorporate CE principles into a design or redesign of business activities and partnerships and to create a cost and revenue structure, which is compatible with both sustainability and profitability.	Collaboration; CE principles; sustainable development
Ünal et al., 2019, p. 291	CBM represents a holistic system of co-evolving managerial practices for collective value creation, delivery and capture, which provide solutions for sustainable development.	Managerial practices; value elements; sustainable development
Geissdoerfer et al., 2018a, p. 713	CBM can be defined as sustainable business models – which aim at solutions for sustainable development by creating additional monetary and nonmonetary value by the proactive management of a multiple stakeholders and incorporate a long-term perspective –	Sustainable development; collaboration

Reference	Definition	Focus
	that are specifically aiming at solutions for the CE through a circular value chain and stakeholder incentive alignment.	
Lahti et al., 2018, p. 3	CBMs explain how an established company uses innovations to create, deliver, and capture value through the implementation of CE principles, whereby the business rational are realigned between the network of actors/stakeholders to meet environmental, social, and economic benefits.	Innovation; value elements; CE principles; collaboration; sustainable development
Linder & Williander, 2017, p. 183	In CBM, the conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings.	Value creation

Similar to strategic management research within the linear economy context, the business model concept has gained extensive traction in CE business research in the last few years (Bocken et al., 2016; Lüdeke-Freund et al., 2019; Ranta et al., 2018). CBMs' popularity is based on their ability to simplify complex organizational systems and relationships in the application of CE principles (Geissdoerfer et al., 2018a). Although still criticized as incipient, taxonomic, and descriptive (Salvador et al., 2020; Zucchella & Previtali, 2019), the CBM stream is rapidly maturing, as indicated by the fast-growing number of articles and particularly recent literature reviews on CBMs (Chen et al., 2020). So far, literature reviews in the CBM stream have covered CBMs' theoretical foundations and definitions, product design and business model strategies, and conceptual frameworks (Bocken et al., 2016; Geissdoerfer et al., 2020); drivers and barriers (Tura et al., 2019); types of CBMs and archetypes (Lüdeke-Freund et al., 2019; Rosa et al., 2019); business model value elements (Lahti et al., 2018; Lüdeke-Freund et al., 2019; Rosa et al., 2019); managerial best practices, challenges, decision support tools, classification methods, contextual factors (Centobelli et al., 2020; Rosa et al., 2019); and the relationship between CBM and products, technology, sustainability, strategy, and industry (Ferasso et al., 2020).

As CBM research typically focuses on realizing the circulation for materials in the business activities, it traditionally has an operative focus, often neglecting the strategic-level considerations (Puglieri et al., 2022). This is surprising, given the strategic emphasis on business models in strategic management research (Osterwalder et al., 2005; Zott et al., 2011). Considering how newly established circular activities for value creation, delivery, and capture align with existing activities presents strategic concerns with implications for strategic management (Bocken & Geradts, 2020). Accordingly, CBMs represent strategic decisions in preserving the embedded environmental and economic value through the

implementation of CE principles into organizational systems and relationships (Centobelli et al., 2020; Geissdoerfer et al., 2018a). This strategic role of the CBM concept is explicitly acknowledged in limited scholarly work, which has mostly focused on the managerial perspective (Ünal et al., 2019; Urbinati et al., 2017) or on strategic collaboration in supply chains (De Angelis et al., 2018). The field of CE business research still lacks the strategic understanding and frameworks that explain how and with what practices innovating a CBM can support companies' strategic development of CE business (Geissdoerfer et al., 2020; Halonen et al., 2019; Urbinati et al., 2017), which is discussed next.

2.2.2 Circular business model innovation

After recognizing the importance of the CBM concept to guide companies in their efforts toward CE business, the mechanisms for developing a CBM have recently gained traction (Chen et al., 2020). Thus, in the past decade, a growing body of literature has emerged as a sub-stream for CBM research to investigate how to actually arrive at a CBM through business model innovation (Diaz Lopez et al., 2019; Guldmann & Huulgaard, 2020; Pieroni et al., 2019; Pollard et al., 2021; Santa-Maria et al., 2022). The rationale behind the growing interest for CBMI is that innovation is seen as a source of strategic competitiveness and considered as a business model problem rather than a technology problem (Christensen, 2006), which was, until recently, common in CE business research with the focus on technology-based innovations (de Jesus & Mendonça, 2018).

Business model innovation is a complex process (Björkdahl et al., 2022; Zott & Amit, 2015), triggered by activities inside or outside the organizational boundaries (Foss & Saebi, 2017). Even in linear settings, both researchers and practitioners lack the full understanding of how this process functions and is managed as part of established companies' strategic development (Andreini et al., 2021). Such understanding is needed to theorize the complex nature of business model innovation, which involves interactions within and across different organizations; reveal its underlying mechanisms, such as feedback loops; and investigate what happens after the outcome is reached (Andreini et al., 2021; Van de Ven, 1992). Building the understanding of the business model innovation process is critical to enable the integration of sustainability concerns into company strategies by introducing CBMIs (Frishammar & Parida, 2019).

Like its linear counterpart, CBMI is also characterized by complexity (Santa-Maria et al., 2022). For CBMI, companies need to rethink and develop novel, well-designed, and nontrivial circular changes in their value elements of value creation, delivery, and capture (Foss & Saebi, 2017; Ranta et al., 2021). This can involve changing a full business model, one or more of its value elements, the relationships between the elements, or the value network and its collaborations owing to the integration of CE principles (Geissdoerfer et al., 2020; Guldmann & Huulgaard, 2020). Besides the abovementioned value elements, the changes in CBMI can be focused on the level of value proposition, company, or ecosystem (Ritala et al., 2023). Accordingly, companies can pursue business model innovation through different CBMI types with varying degrees of radicality (Bocken, 2021), including the transformation of the existing linear business model, designing a fully novel business model; diversifying additional business models besides linear ones; or adding a new business model through acquisition (Geissdoerfer et al., 2018a, 2018b, 2020, 2022).

Table 6 presents the various definitions of CBMI for illustrating the nature and focus of CBMI. Similarly to CBM research, the research on CBMI closely builds on sustainable business model innovation research; CBMI is thus considered its sub-category, with particular focus on adhering to CE principles (Linder & Williander, 2017; Pollard et al., 2021; Santa-Maria et al., 2021a).

Table 6. Selected examples illustrating the nature and conceptual focus of circular business model innovation

Reference	Definition	Focus
Ritala et al., 2023, p. 178	CBMI involves a focus on the elements of a business model and its architecture to improve how tangible resources (e.g., energy, materials) are used, including the principles of narrowing, slowing, closing and regenerating.	CE principles
Geissdoerfer et al., 2022, p. 8; 2020, p. 4	The design and implementation of CBMs, which comprises the creation of circular start-ups, the diversification into CBMs, the acquisition of CBMs, or the transformation of a business model into a circular one. This can affect the entire business model or one or more of its elements, the interrelations between the elements, and the value network.	Scope of change; types of CBMs
Guldmann & Huulgaard, 2020, p. 3	CBMI in incumbent companies is the process of reconfiguring an existing linear business model to include CBM components in the form of value recreation, redelivery and recapture and an extended value proposition, or the process of reconfiguring an existing CBM to include more of, or better versions of, these CBM components.	Types of CBMs; incumbent companies; value elements
Pieroni et al., 2019b, p. 201	CBMI incorporates principles or practices from CE as guidelines for business model design. It aims at boosting resource efficiency and effectiveness (by narrowing or slowing energy and resource	CE principles

Reference	Definition	Focus
	loops) and ultimately closing energy and resource flows by changing the way economic value and the interpretation of products are approached.	
Bocken et al., 2019b, p. 3	The process of CBMI is understood as innovating the business model (i.e., updating the elements of an existing business model, or establishing a new organization and associated business model) to embed, implement and capitalize on CE practices.	Types of CBMIs; scope of change; CE principles
Guldmann & Huulgaard, 2019, p. 81	CBMI is concerned with the incorporation of circular services and product design in an existing or a new business model and commands a reconfiguration of multiple, if not all, business model elements, potentially affecting every part of how the company operates, its existing structures, procedures, values, beliefs, etc.	Types of CBMIs; scope of change

Prior research has mainly taken a theoretical and static standpoint and overlooked the organizational dynamics of how companies can manage CBMIs (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019). Only a handful of key areas have been investigated, including the conceptualization and first-hand understanding of CBMI as a change process (Geissdoerfer et al., 2020; Santa-Maria et al., 2021a), its drivers and barriers (Geissdoerfer et al., 2022; Guldmann & Huulgaard, 2020), and innovation approaches (Pieroni et al., 2019). However, to support the strategic management of CBMI, all these areas lack a holistic systematization (Bocken & Geradts, 2020; Pieroni et al., 2019) as a necessity for CE implementation in companies (Khan et al., 2020). To build this missing knowledge, theoretical research needs to be complemented with empirical insights (Frishammar & Parida, 2019; Guldmann & Huulgaard, 2020; Santa-Maria et al., 2021a) that adopt a more dynamic view of a complex and constantly changing business life (Hofmann & Jaeger-Erben, 2020). Therefore, this research focuses on the process school of CBMI.

The process approach on CBMI allows to understand the changes in value creation activities, resources, and networks when transitioning from a linear to circular business model (Hofmann & Jaeger-Erben, 2020). The stream of CBMI process has focused on the antecedents, steps, actions, and effects in the CBMI process (Pieroni et al., 2021; Santa-Maria et al., 2021a). Research to date has taken first steps toward building process models for CBMI, but these models often neglect the full process of CBMI, particularly the implementation (Pieroni et al., 2021). They remain on either a conceptual or an experimental level, and they rarely propose a formal structure for supporting strategic decision-making (Pieroni et al., 2021). In all the scattered CBM research (Chen et al., 2020), the CBMI process is typically described as dynamic, iterative, and complex, as it involves multiple actors also around the company (Frishammar & Parida, 2019;

Guldmann & Huulgaard, 2020; Pieroni et al., 2019; Santa-Maria et al., 2022). Nevertheless, the extant process models have significant variation in terms of the process stages, activities, deliverables, challenges, tools, and drivers; moreover, the process is presented in formats varying from text to process flows and funnel models (Pieroni et al., 2021). The number of process stages has varied from three (Weetman, 2016) to nine and ten (Kraaijenhagen et al., 2016; Mendoza et al., 2017; Santa-Maria et al., 2022), settling typically, in more recent research, on somewhere between four and five stages (Achterberg et al., 2016; Antikainen & Bocken, 2019; Bocken & Konietzko, 2022; Mentik, 2014; Pieroni et al., 2021; Pollard et al., 2021; Puglieri et al., 2022). These CBMI process models have covered challenges (Antikainen & Bocken, 2019; Kraaijenhagen et al., 2016; Mentik, 2014); tools and operational practices (Antikainen & Bocken, 2019; Kraaijenhagen et al., 2016; Mendoza et al., 2017; Mentik, 2014; Pieroni et al., 2021; Weetman, 2016) and highlighted issues such as strategic planning and practices (Pieroni et al., 2021; Pollard et al., 2021; Puglieri et al., 2022; Weetman, 2016); dynamic capabilities (Bocken & Konietzko, 2022); design thinking and eco-design (Guldmann et al., 2019; Mendoza et al., 2017; Santa-Maria et al., 2022); value chain and collaboration (Achterberg et al., 2016; Kraaijenhagen et al., 2016); and experimentation (Antikainen & Bocken, 2019). The CBMI process in established companies typically occurs in dynamic and complex contexts with inherent uncertainties (Guldmann & Huulgaard, 2020; Linder & Williander, 2017), where CBMI poses strategic issues because its proactive validation is always riskier than the validation of a corresponding linear business model (Linder & Williander, 2017). Particularly in established companies, CBMI is a long process with multiple challenges (van Loon et al., 2022): transforming an existing linear business model to CBM can take up to 25 years (Santa-Maria et al., 2021a). In contrast, innovating a parallel CBM—that is, diversifying CBMs—may take only 1.5–3 years if scale-up is excluded from consideration (Santa-Maria et al., 2021a).

Prior empirical research indicates that the most critical yet under-researched factors supporting the CBMI process include sustainability strategy, role of top management, organizational culture, and organizational structure in addition to other important topics such as organizational inertia and organizational ambidexterity, company characteristics, experimentation and organizational learning, resources, and capabilities (Santa-Maria et al., 2021a). In particular, to manage the transformative CBMI process with long-term strategic orientation, successful cases have the following in common: a clear sustainability vision and

fact-based consistent communication, top management and external expert support, empowered workers in sustainability topics, and proficiency in change management (Santa-Maria et al., 2021b). However, prior empirical research (Table 7) is limited to individual cases and industry-specific studies, leaving room for further empirical research and multiple-case studies to understand how established companies may succeed in implementing CBMI (Guldmann & Huulgaard, 2020; von Kolpinski et al., 2022), as demonstrated in Table 7 with selected examples of recent empirical studies, their key findings, and future research avenues related to this research.

Table 7. Recent empirical research on CBMI processes in established companies, their methods, key findings, and selected avenues for further research

Reference	Objective	Method	Key findings	Selected research avenues
Santa-Maria et al., 2022	To apply design thinking to study time-efficient, early development of CBMs within an online collaboration context.	Action design research approach in six workshops	- Nine-stage process model with the design thinking approach, including 12 stage-specific activities for CBMI, such as problem framing, vision co-creation, actor system, value chain, value exchange mappings, CBM pattern ideation, and business model canvas tools.	- Following the CBMI process until successful commercialization through longitudinal case research, with focus on, for example, external stakeholder involvement. - Examination of the findings in different contexts.
Bocken & Konietzko, 2022	To investigate the essential activities that innovators in consumer-facing corporations carry out as part of CBMI.	Literature review and multiple-case study of three consumer-facing established companies	- Four-stage process model of the CBMI process focusing on envisioning, sensing, seizing, transforming, i.e., dynamic capabilities. - Identifying 28 tools and practices for different stages; emphasis on sustainability impacts, and ambitious, quantitative, long-term yet time-bound vision for CBMI.	- Further research on different types of CBMIs (sufficiency and regeneration aspects in particular) and focus on transforming stage.
Santa-Maria et al., 2021a	To map, frame, and assess the current state of CBMI research with future research agenda and exploring the most relevant	Systematic literature review and explorative multiple-case study of ten incumbents in Austria	- The CBMI process is moderated by organizational culture and structure. - CBMI research has still understudied the practically important top management role and sustainability strategy as	- Further understanding of the CBMI process, particularly for established companies. - Empirical insights and cases of failure.

Reference	Objective	Method	Key findings	Selected research avenues
	elements of the CBMI process in practice.	and the Netherlands	antecedents of CBMI; organizational change management; CBMI process moderated by organizational inertia, ambidexterity, and uncertainties; and CBMI's impacts on systemic change.	
Gandolfo & Lupi, 2021	To present the choices, obstacles and solutions involved in the implementation of a business model that respects the environment and protecting the company's competitive position in the CE.	Qualitative single-case study with 21 in-depth interviews in the pulp & paper industry	<ul style="list-style-type: none"> - Companies' transition to CE is possible by creating and capturing value through technology innovation and rallying together society (industrial players, policymakers, and customers) to create suitable collaboration and exchange patterns within CSCs. Opportunities may arise from collaborations involving also non-industrial players. 	<ul style="list-style-type: none"> - Practical company-level CE implementation via CBMI process in established companies. - Relationship mechanisms in the ecosystem to particularly be able to motivate sustainable innovations in supply chains.
Pieroni et al., 2021	To provide an overview of the approaches for circular or sustainable business model innovation in literature or in practice, and systematizing them with a dynamic capability lens.	Action research with seven manufacturing companies	<ul style="list-style-type: none"> - Systematic four-stage CBMI process model including preparing, sensing, seizing, and transforming. - Recommendations for institutional, strategic, and operational practices, including activities, tools, interdependencies, decision gates, and recommended mindset and attitudes. 	<ul style="list-style-type: none"> - Investigation of holistic, systemized structure to support the strategic decision-making of CBMI, and focus on the institutional and strategic aspects; and CBMI's interdependencies with other business processes. - Longitudinal exploration and engagement of external actors.
Santa-Maria et al., 2021b	To empirically identify the micro-foundations of the dynamic capabilities required to successfully innovate the business model towards the CE in incumbent firms.	Multiple-case study of ten incumbent companies (13 CBMs) in manufacturing and service industries	<ul style="list-style-type: none"> - Comprehensive framework of 33 best practices underpinning 14 microfoundations of dynamic capabilities for sustainability-oriented business model innovation. - Identification of success factors and practices for different timeframes of the circular principles of CBMIs. 	<ul style="list-style-type: none"> - Deeper understanding of and guidelines on the CBMI process, particularly in established companies, through empirical investigations.

Reference	Objective	Method	Key findings	Selected research avenues
Pollard et al., 2021	To develop and refine the steps of a CBMI process framework to support electrical and electronic equipment manufacturers with the creation and implementation CBMIs.	Workshops (7) in the electrical & electronic equipment sector	- Five-stage process model with interconnected layers (i.e., business strategy, circular economic business model canvas, challenges and opportunities, sector-specific policies, and circularity indicators).	- Insights into a sector-wide CBMI approach.
Guldmann & Huulgaard, 2020	To provide an overview of the barriers that hinder adoption of CBMIs to facilitate circumvention of the barriers and a faster uptake.	Longitudinal multiple-case study with 12 CBMIs in Denmark, including incumbents and start-ups from different industries	- Barriers for CBMI are mostly in the organizational level, followed by the value chain, employees, and the market and institutional level. - External barriers relate to the difficulties in establishing collaborations, government, value chain, consumers, other stakeholders, technology. - Internal barriers include lack of management support, resources, knowledge, incentive structures, and organizational adaptability, and complexity in product design and unclear business cases.	- Company-level CE implementation and its challenges regarding CBMI; frameworks and knowledge about CBMI processes. - Empirical multiple-case studies to understand CBMI across industries.
Hofmann & Jaeger-Erben, 2020	To understand how an organizational transition management may be configured and what incumbents require to successfully navigate CBMI.	Problem-centered interview study: 12 interviews with 9 consultancies	- A conceptual model with conditions and management strategies that enable CBMI. - Propositions for successfully navigating CBMI by configuring organizational transition management and requirements. - Success factors likely include strategic agility and flexibility, dynamic	- Investigation and development of a theoretical framework of how a company can initiate and manage CBMI considering organizational dynamics and change processes, retrieved from empirical cases in different industries. - Study of collaborative value creation in inter-

Reference	Objective	Method	Key findings	Selected research avenues
			capabilities, and leadership.	organizational relationships of CBMI.
Antikainen & Bocken, 2019	To design, implement, and identify the main challenges for the different stages of a business model experimentation with a process approach.	Illustrative, qualitative single-case study	- Five-stage process model for CBM experimentation, focusing on practical tools and challenges regarding feasibility of the needed technology, environmental issues, scalability, collaboration, and communication and visibility.	- Identification of major challenges of CBM experimentation and guidance in facing them in CBMI stages. - Understanding of the context of experimentation.

Although circularity has often been viewed as a dichotomist phenomenon in the business model, where circularity either exists or does not exist (see Ranta et al., 2021; Urbinati et al., 2017), the changes in the business model are recently suggested to take place in different forms, scopes, and at different levels, including varying degrees of radicality, novelty, and detachment from linearity (Bocken, 2021; Diaz Lopez et al., 2019; Santa-Maria et al., 2021a). The novelty of changes in CBMI—that is, the degree of radicality (Santa-Maria et al., 2021a), varies from incremental to radical (Ranta et al., 2021); nevertheless, the exploration of this variation and how it manifests in practice remains scarce in literature.

Incremental innovation modifies extant processes, technologies, products, and services and makes improvements and adjustments to existing business models (Brown et al., 2020; Foss & Saebi, 2017). Incremental changes are often deemed insufficient for CBMI (Santa-Maria et al., 2021a). This is likely why CBMI has sometimes been considered solely as a vehicle for radical change and renewal in established companies (Hofmann & Jaeger-Erben, 2020). Radical innovation aims to create business models with novelty that is disconnected from the current context (Brown et al., 2020); novel improvements are made to value creation and capture (Foss & Saebi, 2017), and complementary innovations are introduced (Brown et al., 2020), resulting in entirely new value creation processes in the business model that require learning, re-stabilization, testing, and experimentation (Bocken & Antikainen, 2019; Hofmann & Jaeger-Erben, 2020). Interestingly, the degree of radicality is a time-bound characteristic of business model innovation, which can be assumed to decrease over time together with the spreading of the innovation (Gilbert, 1994). For successful radical CBMI,

experimentation is proposed (see, e.g., Bocken, 2021; Bocken et al., 2017, 2021) as a specific approach; it allows for articulating possible CBM configurations; iterating CBMs based on collected feedback; and rapidly creating positive value for customers, the environment, and the society through the exploration of functional real-world business opportunities (Antikainen & Bocken, 2019; Bocken et al., 2018). To understand experimentation and other processes related to innovating circular business with varying degrees of novelty, more empirical, longitudinal case studies are needed (Brown et al., 2019, 2021).

Based on the introduced CBM research, focusing particularly on the CBMI process stream, I take note on CBM as reflecting the way CE business is implemented in a company. Although interested in the company-centric strategic development of CE business, this research does not consider individual companies acting alone to achieve a CE, as is apparent in the varying definitions of CBMs in Table 5. Hence, collaboration for CE business is discussed next.

2.3 Collaboration for circular economy business

From the company perspective, CBMI demands new circular practices, activities, and production systems, which cannot all be arranged and controlled in-house by one company alone (Fehrer & Wieland, 2021; Mangla et al., 2018; Saccani et al., 2023). Hence, CE requires companies to seek long-term collaborations that often span across industry boundaries for material and product circulation (González-Sánchez et al., 2020; Hofmann & Jaeger-Erben, 2020; Masi et al., 2017; Rovanto & Bask, 2020). Collaboration for CE business entails necessary, continual interactions for engaging others toward achieving shared CE business goals (Brown et al., 2021; Kaipainen et al., 2023b; Konietzko et al., 2020; Mishra et al., 2019).

The conceptualization of inter-organizational collaboration is non-coextensive in prior literature; it is broadly characterized by repetitive interactions for linking or sharing of resources, capabilities, activities, business processes, decision-making, goals, vision, trust, information, communication, and balance of power (Acerbi et al., 2021; Arana & Castellano, 2010; Blomqvist et al., 2005; Blomqvist & Levy, 2006; Brown et al., 2018, 2021; Sedgwick, 2016). Companies may collaborate with various organizations, ranging from other companies, industrial organizations, public and governmental organizations, universities, and non-profit organizations to consumer-citizen groups (Aarikka-Stenroos et al.,

2021). The benefits of collaboration derive from the diversity of perspectives, problem-solving approaches, knowledge, and capabilities, which enable a higher quality and number of ideas generated for innovation, value creation, and the engagement of different customer segments and markets (Arana & Castellano, 2010; Witjes & Lozano, 2016). As collaboration is considered as a potential source of long-term synergies and strategic benefits and a means for securing a strategically attractive position in supply chains and the business ecosystem (Adner, 2017; Arana & Castellano, 2010), companies need to consider how collaborations change the company's positioning in multi-actor systems and what other strategic questions are relevant to collaborating for CE business (Korhonen et al., 2018).

2.3.1 Perspectives on collaboration for circular economy business

Collaboration has been framed under fragmented conceptual lenses within the streams of CE business because collaborators and the multi-actor settings for collaboration often differ. These conceptual lenses provide different perspectives for understanding the pursuit of common goals between a company and its collaborator(s), shedding light on whom to involve, what values they share, and how they can collaborate (Bertassini et al., 2021). Nevertheless, studies adopting different conceptual lenses have broad consensus on collaboration being key to companies' CE business implementation and, from industry and society perspectives, being vital to advancing CE as a systemic industry-spanning transition where materials flow throughout inter-sectoral and inter-organizational networks (Aloini et al., 2020; Ghisellini et al., 2016; Korhonen et al., 2018). However, deeper investigation is required for understanding companies' collaboration in multi-actor systems (Franco, 2017; Korhonen et al., 2018; Roome & Louche, 2016).

Some of the most popular conceptual lenses for studying collaboration for CE business include perspectives of CBM research (Santa-Maria et al., 2021a; Zucchella & Previtali, 2019), circular innovation (Brown et al., 2020, 2021), CSCs and networks (Farooque et al., 2019; Hazen et al., 2020; Masi et al., 2017), circular value chains and networks (Eisenreich et al., 2022; Werning & Spinler, 2020), the stakeholder approach (Kaipainen et al., 2023b; Marjamaa et al., 2021; Tapaninaho & Heikkinen, 2022), and CE ecosystems (Aarikka-Stenroos et al., 2021; Harala et al., 2023; Parida et al., 2019).

Each of these lenses has a different focus area. CBM research considers collaboration as an enabler for activities related to companies' value creation, delivery, and capture (Bocken et al., 2021; Brown et al., 2018; Fehrer & Wieland, 2021). The circular innovation lens seeks to understand how collaboration influences the processes and outcomes of circular innovation, often closely related to CBMI research (Brown et al., 2020, 2021).

Supply chains have traditionally focused on managing and securing supply with conventional roles of the supply chain actors, which are decomposable into bilateral relationships (Adner, 2017). The stream of CSCs and networks emphasizes the supply chain and industry-level analyses of physical production and logistics in inter-organizational networks of business actors, enabling circular flows of materials and products for the inherently material-intensive CE (Farooque et al., 2019; Lahane et al., 2020; Saccani et al., 2023). As a closely related concept, circular value chains and networks focus on creating value through the collaboration focusing particularly on upstream and downstream business actors (Eisenreich et al., 2022; Werning & Spinler, 2020). In contrast to CSC approach, the actors who support value creation activities in the value chain are not necessarily involved in the physical movement of material or products or in the provision of services (Brown et al., 2018).

The circular stakeholder approach follows stakeholder management perspectives, which focus on, for example, organizations' interests and tasks in the networks during inter-organizational collaboration (Freeman, 2010). The stakeholder approach may consider not only business actors but also, more broadly, other types of organizations, such as ministries, industrial organizations, research institutions, cities, and companies to be individually managed in typically networked settings (Kujala et al., 2019; Marjamaa et al., 2021). CE ecosystems also take into account and have identified such a wide range of collaborators needed in CE business (Aarikka-Stenroos et al., 2021; Harala et al., 2023). In particular, they provide a conceptual lens for considering the connections, interdependencies, and co-evolution between actors, technologies, and institutions (Aarikka-Stenroos & Ritala, 2017), thus fitting well with the systemic and complex nature of CE transition (Kaipainen et al., 2023b). CE ecosystems are considered as communities of hierarchically independent yet interdependent actors who are engaged by shared CE goals, focused on either the flow of circular value, knowledge, or materials (Aarikka-Stenroos et al., 2021). In CE ecosystems, collaboration can also engage those not interested in sustainability topics

(Kaipainen et al., 2023b) by aligning their interests cognitively, technologically, and economically (Harala et al., 2021).

These different conceptual lenses for multi-actor settings demonstrate that collaboration for CE business occurs at different levels and can accordingly be studied from different perspectives (see Table 8). Note that the varying lenses are not mutually exclusive; for example, CBMs and CSCs can be considered as part of wider CE ecosystems, as in this research.

Table 8. Conceptual lenses for studying collaboration for circular economy business, their perspectives, key actors, status of current research, and key literature

Conceptual lens	Perspective to collaboration for CE business	Key actors	Status of current research and key literature
Circular business model	Collaboration as an inherent part of the circular business model, enabling value creation, delivery, and capture	Typically focused on, but not limited to, business actors	Established research stream (Bocken et al., 2016; Brown et al., 2018; Santa-Maria et al., 2021b; Urbinati et al., 2017)
Circular innovation	Collaboration as an enabler for developing circular innovation processes and outcomes	Typically focused on, but not limited to, business actors	Established research stream (Brown et al., 2020, 2021; de Jesus & Mendonça, 2018; Konietzko et al., 2020)
Circular supply chains and networks	Collaboration as an enabler of the circular flows of physical products and materials via, e.g., engagement, training, selection of suppliers, and environment-oriented collaboration with customers	Upstream and downstream business-oriented actors involved in the supply of circular solutions	Established research stream (Bressanelli et al., 2019b; De Angelis et al., 2018; Farooque et al., 2019; Govindan & Hasanagic, 2018)
Circular value chains and networks	Collaboration as an enabler of circular value creation compiled from the resources of multiple actors	Upstream and downstream business-oriented actors involved in the value creation of circular solutions	Narrow, emerging research stream (Eisenreich et al., 2022; Mishra et al., 2018; Werning & Spinler, 2020)
Circular stakeholder approach	Stakeholders to be individually managed by the focal company, in typically networked settings	Various actors, ranging from companies and other types of organizations to non-social constructs such as the nature itself	Narrow, emerging research stream (Kujala et al., 2019; Marjamaa et al., 2021; Tapaninaho & Heikkinen, 2022)
Circular economy ecosystems	Collaboration as concrete action to stay connected and influence the existing	Diverse, heterogeneous, yet interdependent	Narrow, emerging research stream

Conceptual lens	Perspective to collaboration for CE business	Key actors	Status of current research and key literature
	system interdependencies, causing co-evolution between actors over time	actors varying from business to societal roles	(Aarikka-Stenroos et al., 2021; Bertassini et al., 2021; Konietzko et al., 2020)

2.3.2 Collaboration enabling circular business models

Among the different conceptual lenses to collaboration for CE, this research draws principally from prior understanding of collaboration in well-established CBM research, where collaboration serves as an enabler for CBMI activities (Bocken et al., 2021; Brown et al., 2018; Fehrer & Wieland, 2021). CBM lens to collaboration aligns with the company perspective adopted in this research by placing a company in the center of investigation (Zucchella & Previtali, 2019) and extending to the collaborations needed for enabling CBMs as inherently networked concepts (Santa-Maria et al., 2021a). As the studies on collaborations that are relevant and discussed in the CBMI stream share characteristics and intersect with research focused on circular innovation and CSCs, their views are integrated into this section as supportive literature streams (see positioning in Figure 1). This integration of insights allows combining different perspectives, which is valuable for understanding collaboration for CE business from a holistic and systematic viewpoint and uncovering the underexplored mechanisms of collaboration in circular multi-actor settings (Schmitt, 2020).

Although collaboration provides opportunities for solving problems and shared issues in CE business (Brown et al., 2021), collaboration between different actors with differing CE interests inherently generates complexities across the system (Brown et al., 2018; Schmitt, 2020), reflecting the systemic impacts of CBM collaborations (Fehrer & Wieland, 2021; Rovanto & Bask, 2020). The complexities include, for instance, selecting and engaging the right partners with innovation-oriented learning culture, clear CE vision, enthusiasm, and credibility (Brown et al., 2019); developing a circular-oriented value capture model; sharing of knowledge and risks; and developing circular-oriented organizational structures, governance, and decision-making (Brown et al., 2018, 2021; Korhonen et al., 2018). Because of their limited understanding of how to progress toward CE business, companies are reluctant to involve external actors and struggle to establish collaborations in CBMI (Guldmann & Huulgaard, 2020). Regarding these complexities, much remains to be uncovered: how

collaboration is manifested in CBM, how does it unfold and work in practice, and how and through which roles are different types of collaboration forged, time-lined, perceived, and facilitated in CE business (Brown et al., 2018; Pieroni et al., 2021).

Despite the complexities, the benefits of collaboration with actors who have developed specific CE knowledge and capabilities can be realized in, for instance, piloting a CBM, financing, contracting, sharing of knowledge, the use phase, networking, and closing the material loop (Brown et al., 2018). Brown et al. (2018) present four types of collaboration that are particular for CE business: co-development and joint learning opportunities enabling the assimilation and exploitation of relevant, situational knowledge in varying contexts; goal congruence or shared goals, referring to the achievement of individual goals through successful collaboration owing to a clear strategy between the involved parties and the alignment of goals and strategic visions; resource sharing as a process of using capabilities, assets, and investments across organizations with joint planning; and finance alignment for organizations to share costs, risks, and benefits in an equitable and fair way.

Interestingly, in contrast to linear business models, a large number of collaborators is more typical for CBMs, as both existing and new partners are often needed (Bocken et al., 2018; Geissdoerfer et al., 2018a; Guldmann & Huulgaard, 2020; Roome & Louche, 2016). Simultaneously, relationships resulting from collaboration for CE business are characterized by a long-term orientation based on mutual trust (Brown et al., 2021). In addition to enabling the activities of CBMs, collaborations fulfil other intrinsic and extrinsic motives of companies and their employees, such as learning, increased reputation and credibility, and encouragement for other companies to pursue CE (Brown et al., 2019).

To harness the benefits of collaboration, companies are expected to take an active role in driving diverse collaboration for CE business; they must pilot and bring circular innovations to the market by formulating circular value propositions, actively involve and align potential partners to a shared CE vision, and coordinate the business ecosystem (Brown et al., 2019, 2021; Santa-Maria et al., 2021b). Companies with an active collaboration approach are considered as supply chain or network orchestrators (Saccani et al., 2023; Zucchella & Previtali, 2019), who bring actors together in support of a shared vision for a win-win strategy and alleviate the lack of communication and trust (Zucchella & Previtali, 2019).

Collaboration in CBM directly impacts the design of CSCs (Geissdoerfer et al., 2018a; Lüdeke-Freund et al., 2019). Hence, recent research on CBMs suggest that CBMI intersects with CSC management “through system-wide innovation in business models and supply chain functions from product/service design to end-of-life and waste” (Farooque et al., 2019, pp. 8–9). CSCs increase the number of actors and develop new relationships in the chain across industries (González-Sánchez et al., 2020), while aiming for restorative and regenerative cycles (Farooque et al., 2019; González-Sánchez et al., 2020); thus, they are critical in implementing CBMs beyond companies’ organizational boundaries (Masi et al., 2017). In the intersection of CBM and CSC research, many relevant aspects of collaboration can be identified for CBMI, such as development of partnerships (i.e., strong business relationships that are characterized by a long-term scope and trust; Tuten & Urban, 2001), horizontal and vertical engagement of new actors, collaboration for reverse and closed-loop logistics, product (re-)design practices, design of new revenue models, enhanced communications, servitization, and integration of (digital) technologies (Bressanelli et al., 2019b; De Angelis et al., 2018; Govindan & Hasanagic, 2018; Hazen et al., 2020; Taddei et al., 2022). However, also the established CSC stream lacks insight into how companies can strategically implement CE in their business models in practice through CSC collaboration (De Angelis et al., 2018; Ferasso et al., 2020; Govindan & Hasanagic, 2018; Hazen et al., 2020; Sehnem et al., 2019) with different company-specific variables and mechanisms, applications, and success factors in different industries and geographical areas (Bressanelli et al., 2019b; Govindan & Hasanagic, 2018; Hazen et al., 2020; Leising et al., 2018; Sehnem et al., 2019).

Considering the characteristics, challenges, and benefits of collaboration for CE business, Table 9 presents the strategic aspects appearing in selected recent research on collaboration for CE business.

Table 9. Selected recent research with insights to collaboration for circular economy business with strategic aspects

Reference	Objective	Method & context	Key findings on collaboration with a strategic viewpoint	Selected future research avenues
Köhler et al., 2022	To understand the outcomes of cross-sectoral collaboration for advancing the	Single-case study in a Danish multi-actor CE construction project	- Collaboration can be driven by strategic focus on sustainability issues.	- Focus on scalability and long-term perspectives in CE research, to understand the interdependencies in value creation and

Reference	Objective	Method & context	Key findings on collaboration with a strategic viewpoint	Selected future research avenues
	CE and its implementation.			whether collaborations build strategic management capabilities.
Bui et al., 2022	To determine the definitive CBS indicators for industry 4.0 and their opportunities and challenges across regions.	Mixed methods for social media data analysis in the industry 4.0 context	- Collaboration must inherently be considered throughout the CBMI process and indicates an effective CBS.	- Explore using various qualitative methods in different industries.
Brown et al., 2021 (see also Brown et al., 2019, 2018)	To build a process model for the design and implementation of collaborative circular-oriented innovation and to propose future research on the role of collaboration in it.	Multiple-case study of 11 cases scaled down to a single-case study of a multi-actor CE construction project in the Netherlands	- CE demands collaboration with mutual trust, opportunities and shared CE visions for solving problems and shared CE issues. - Companies need to actively drive collaboration to pilot and bring circular innovations to the market by formulating circular value propositions and actively involving and aligning potential partners to a shared CE vision.	- Directly engage with empirical cases of collaboration for CE.
Santa-Maria et al., 2021b	To empirically identify the micro-foundations of the dynamic capabilities required to successfully innovate the business model towards the CE in incumbent firms.	Multiple-case study of 10 incumbent companies (13 CBMs) in manufacturing and service industries	- Collaboration supports CBMI by engaging strategic partners and allowing their coordination in the business ecosystem. - The strategic aspect of collaboration for CE is particularly important when the circular loops are longer—e.g., for recycling.	- Obtain deeper understanding and guidelines on the CBMI process, particularly in established companies, through empirical investigations.
Zucchella & Previtali, 2019	To understand business model development based on CE principles from the perspectives of	Single-case study of a CE project in the agriculture and food industry in Italy	- Companies act as network orchestrators, who actively collaborate to bring actors together under a shared CE vision for a win-win strategy and alleviate the lack of	- Learn from different CBMs to understand the factors driving or hindering their growth and diffusion.

Reference	Objective	Method & context	Key findings on collaboration with a strategic viewpoint	Selected future research avenues
	the focal actor and ecosystem.		communication and trust.	
Leising et al., 2018	To explore new ways of supply chain collaboration that contribute to the transition towards CE.	Multiple-case study of three CE pilots in the Dutch construction industry	- Collaboration entails strategic aspects in network dynamics, in the creation of internal support, and in the adoption of new responsibilities within the supply chains for realizing CE principles	- Explore the interactions of CBMs and CSC collaborations as well as how they differ from linear business models. - Understand the circular practices in the wider society with strategic back-casting frameworks.

After reviewing collaboration mainly related to CBM research, supported by related views of circular innovation and CSC research, we can proceed to integrating the already emerged assumptions and insights in prior research on companies' strategic development driven by CBS development, CBMI, and collaboration for CE business.

2.4 Interlinking circular business strategy development, circular business model innovation, and collaboration

The theoretical background of the three key concepts—CBS, CBM, and collaboration for CE business—clearly evidences the interlinkages between them, which together contribute to the strategic development of CE business in established companies. Next, I highlight and integrate the insights from prior literature on these interlinkages and visualize them in Figure 2.

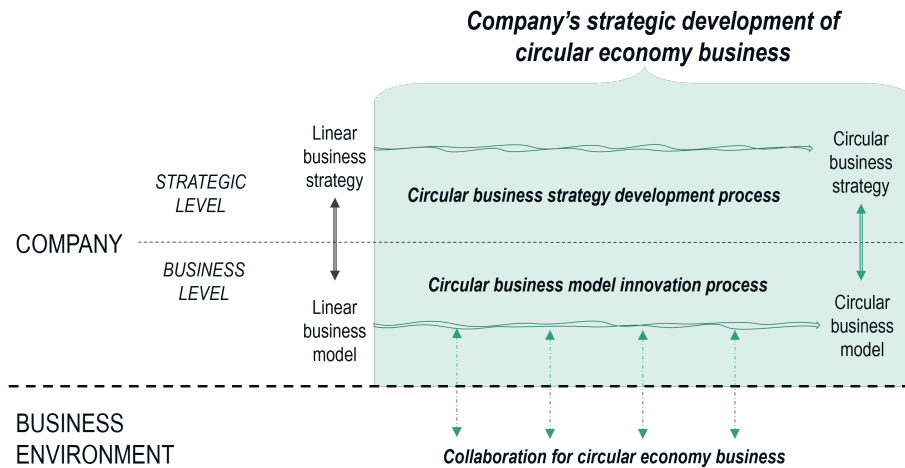


Figure 2. Theory-based and assumed links between the key concepts that together contribute to the strategic development of CE business in an established company

In Figure 2, I consider CBS to be implemented through a CBM, which is an assumption grounded in strategic management literature (Richardson, 2008), where “a business model is a business layer (acting as a sort of glue) between business strategy and processes” (Osterwalder, 2004, p. 15). Thus, at every moment in time, business strategy as a strategic-level concept (linear or circular business strategy) is mirrored in a corresponding business model on the business level (see the strong connection displayed with double arrows in Figure 2). Hence, a business strategy shift is considered to require a business model innovation (Foss & Saebi, 2017). This is assumingly the case when a company begins its strategic development of CE business with linear business strategy and its linear business model: Arriving at a CBS assumingly requires a CBS development process; similarly and simultaneously, for arriving at a CBM, a CBMI process is needed. Both processes are somewhat iterative, non-linear, and still underexplored in literature and are thus illustrated with blurry process arrows. These two internal processes are at the core of a company’s strategic development of CE business, as represented in light green in Figure 2. Collaboration enables the activities for CE business throughout the CBMI process with repetitive two-way interactions and is therefore displayed in Figure 2 below CBMI with dashed arrows that cross company boundaries.

In CE business research, in contrast to strategic management research, the evident connection between CBS and CBM is rather underdeveloped. The two-way interaction of CBS and CBM is addressed in limited research, typically with

strategy serving as a starting point for aligning the objectives with CBMI and guiding the selection of CBMs (Pollard et al., 2021; Puglieri et al., 2022; Santa-Maria et al., 2021b), because the structuring and implementation of CBMs require comprehensive knowledge of creating new business strategies (Lewandowski, 2016). Since this is the antecedent assumption of this research, CBS development is placed above CBMI process in Figure 2. By far, literature often frames the strategy that guides CBMI as sustainability strategy rather than business strategy (see, e.g., Khan et al., 2020; Santa-Maria et al., 2021a). Under this view, a separate sustainability strategy serves as a key antecedent for CBMI (Khan et al., 2020) and guides the strategic direction, whereas CBM objectives inform and underpin the strategy (Pollard et al., 2021). Sustainability strategy can also define the mode of the CBMI process, which can take internal, hybrid, or systemic forms (Guldmann & Huulgaard, 2020). In addition, research indicates that the more embedded sustainability strategy is in the organization and its business strategy, the more radical and ambitious is the CBMI process (Santa-Maria et al., 2021a). Nevertheless, in their systematic literature review, Santa-Maria et al. (2021a) find only a few publications that explicitly investigated the relationship between a company's sustainability strategy and CBMIs (Guldmann & Huulgaard, 2020; Khan et al., 2020). Despite the apparent need for strategic insights into CBM(I), companies lack guidance on deciding their business strategy for establishing CBMs and promoting the related collaborations beyond the company (Puglieri et al., 2022).

A business model not only articulates what collaborations are needed for value creation, delivery, and capture activities (Richardson, 2008), but it also reflects what collaborations are of strategic importance to the selected business and its business strategy. To date, explicit focus on strategic aspects of collaboration and its impacts on CBS remain rare in CE business research, although long-term collaboration is deemed important for successful communication, innovation, planning and flexibility in strategic management in the CE context and particularly with longer circular loops, such as recycling (Brown et al., 2020; Rovanto & Bask, 2020; Santa-Maria et al., 2021b). Strategic questions related to collaboration can consider, for example, the type of collaboration governance (Pisano & Verganti, 2008), how a company positions itself in competitive markets, and, eventually, how a company positions itself in the CE (Hazen et al., 2020). Owing to the strategic implications of collaboration, it is important not only to establish shared CE visions (Brown et al., 2021) but also to consider the business strategy more holistically (Mishra et al., 2019).

Concluding the theoretical background on companies' strategic development for CE business, CE transition forces established companies to seek new ways of organizing their business and rethinking their linear business logics. This leads to a need to manage a process that carries from linear business strategy to CBS. The CBS development process is mirrored into practice through a corresponding and co-evolving business model, which eventually turns into a CBM through a CBMI process. For a successful and effective CBM, collaboration must inherently be considered throughout the CBMI process, which also indicates an effective CBS (Bui et al., 2022). However, much remains to be explored regarding the real-life successful and timely management of the intertwined CBS development, CBMI, and collaborations in established companies that are strategically developing CE business. Leveraging these insights and considering the identified gaps in literature (see also section 1.2. and Table 2), we next move to the selected research design and methodological choices for the empirical part of this research.

3 RESEARCH DESIGN

In this chapter, I first lighten the philosophical stance in pragmatism and the explorative, qualitative, and processual case study design of this research. Rooted in these design choices, the case sampling, data collection, and data analysis are reported in the remainder of this chapter. The chapter is concluded with an evaluation of the research quality and the tactics employed to enhance reliability and validity.

3.1 Explorative, qualitative, and process approach rooted in pragmatist worldview

This research addresses the lack of empirical and practical knowledge on how to successfully manage established companies' strategic development of CE business. As such, the adopted scientific philosophy corresponds to *pragmatism*. Pragmatism, together with critical realism, lies in between the two extremes in the philosophy of research: positivism, starting from the “real world” with an objectivist approach, and constructivism, starting from “discourses” with a subjectivist approach (Martela, 2015; Morgan & Smircich, 1980). Constructivism is criticized for allowing science to drift solely on the basis of discourses, therefore losing the possibility to accumulate real theoretical progress. Meanwhile, both objectivism and critical realism are anchored in the assumption that a real world exists out there (Martela, 2015). By contrast, the underlying pragmatist assumptions of this research considers that instead of the “real world” that we can externally and objectively observe, scientific theories and their truthfulness must be evaluated against “their capacity to settle the problems we face as human beings, their capacity to widen our understanding of what is possible, and their capacity to guide us towards our aspirations” in the world we are embedded in and in which we aim to live our lives as best as we can (Martela, 2015, p. 33).

Following pragmatism, the studied phenomenon in this research is rooted in real-life contemporary challenges with integrated change and complexity

(Farjoun et al., 2015; Kelly & Cordeiro, 2020). The premises of pragmatism emphasize not only the pragmatic impact and outcomes of the research but also its pragmatic-based motivation (Cherryholmes, 1992). As this research aims to understand how to reach a more sustainable economic future of business through CE integration in companies' strategic development, it is strongly guided by values and future visions—related here to reconciling environmental and economic sustainability through CE implementation—and conditioned by “where we want to go in the broadest of senses” (Cherryholmes, 1992, p. 13).

This research derives empirical insights from established companies in environmentally burdensome industrial contexts, acknowledging that multiple solutions may function in practice in different contexts, such as varying industries or types of companies. Hence, the epistemological stance of pragmatism (i.e., what can be known and what is knowledge; Morgan & Smircich, 1980) points to a pluralist understanding of multiple possible truths (Kelly & Cordeiro, 2020; Martela, 2015). Accordingly, the “true” finding of this research is novel knowledge that people find useful in practice in different contexts (Farjoun et al., 2015), following the ontological viewpoint of pragmatism (i.e., regarding what is considered to be true and real; Morgan & Smircich, 1980). The implications of this research are targeted mainly for people working in established companies, particularly managers, aiming to shift their business to circular. As companies comprise people and their continuous interactions, companies are always grounded in social phenomena (Hofmann & Jaeger-Erben, 2020), for which pragmatism is argued to provide a richer and more realistic view than rationalist and structuralist worldviews (Farjoun et al., 2015; Kelly & Cordeiro, 2020).

As the core of this research addresses the changes and development that companies undergo during CE transition, the research is rooted in time and temporalities. Hence, a *process ontology* is adopted, which considers the temporal dimension of strategic development by focusing on how and why things, such as strategies, change over time, often approached as a sequence of events (Langley & Montréal, 2007; Van de Ven, 1992). This approach helps in analyzing processes by detecting different challenges and benefits over time in different process stages (Antikainen & Bocken, 2019), allowing to focus on the most interesting occurrences over time in a more comprehensible way compared with static and cross-sectional research designs (Barnett & Burgelman, 1996). Moreover, the process ontology is well aligned with the pragmatist worldview (Farjoun et al., 2015), which aims for developing a dynamic and multifaceted practical understanding of reality (Kelly & Cordeiro, 2020). Indeed, pragmatism

has been claimed as a relevant, useful, and, possibly, the best suited philosophical paradigm for understanding organizational processes (Casula et al., 2021; Kelly & Cordeiro, 2020) such as strategic development of CE business.

This research adopts the pragmatist process ontology particularly from the perspective of substantive metaphysics, which considers processes to represent changes in things (Langley et al., 2013). In this research, this ontological perspective indicates that CBS and CBM are time-bound concrete outcomes of processes and are changed through respective CBS development and CBMI processes. This choice is rooted in prior CE business literature, which often differentiates CBMI processes from CBMs as an outcome. Together, following process-based theorizing, these processes contribute to the overall strategic development of a company from linear business to CE business, indicating that the chosen substantive metaphysical research design acknowledges and leans toward a deeper process ontology where overarching organizational change is “made up of processes rather than things” (Langley et al., 2013, p. 13) and that it co-evolves with the business environments where the companies are embedded (Farjoun et al., 2015).

Accordingly, the publications of this dissertation adopted a process approach to explain the process patterns in companies transitioning to CE business and to build understanding on how the past and interacting actors shape their business over time (Pettigrew, 1997). The process approach is adopted in Publication I with a strong process ontological view (Abdallah et al., 2019), where CBS is emphasized as an ongoing process of becoming without a specific end point (in contrast to this dissertation, which considers CBS as an outcome of the CBS development process). In the remaining publications, processuality manifests through substantive metaphysics ontology: in Publication II when analyzing circular innovation process and detecting the emerging innovation types, challenges, and related actions at each stage of this process that results in manifold CBMs, and in Publications III and IV in the change that companies drive in innovating their business models and related processes, products, services, and supply chains from linear to circular outcomes. The process approach (Langley, 1999; Langley et al., 2013) is extended in Publications I and II with a longitudinal approach, allowing to unfold the diverse incidents, activities, and stages throughout the studied processes in the long term and in detail (Van de Ven, 1992). Although Publications III and IV do not map and visualize the event sequences of the processes in detail as in Publications I and

II, they follow a process logic to explain the relationships between the inputs and outcomes of the studied processes (Langley et al., 1999; Van de Ven, 1992).

Because the research field and practical understanding of CE business is still in its infancy as a relatively new phenomenon, pragmatically relevant understanding on how established companies can move toward CE business can be best obtained through *qualitative exploration* (Trigkas et al., 2020). Exploration deals with novel discoveries in a constantly changing world where verified knowledge is only temporal; It helps generate insights on the nature of a novel phenomenon, concepts, and their relationships, as well as aids the building of foundational premises and propositions as a key step for theory development (Casula et al., 2021; Ulaga et al., 2021). Accordingly, the objective of exploration in this research lies in generating an understanding of the emerging patterns in strategic development of CE business rather than arriving at statistical generalizations. Although such an explorative objective is principally associated with inductive analysis, it can be pursued through a mix of alternative research logics, abductiveness, and even deductiveness (Casula et al., 2021), which shows also in this research in the adopted abductive-oriented approach. Mixing these analysis approaches iteratively or simultaneously is even encouraged when theorizing from process data (Langley, 1999). To enable exploration, qualitative research is particularly suitable for characterizing the dynamics and temporalities of the observed social phenomenon (Dougherty, 2002). Therefore, qualitative research is also particularly effective in answering “how” type of questions (Yin, 1994), such as the RQs of this dissertation. Qualitative exploration employed by this research helps generate pragmatically valuable insights, following the pragmatist worldview.

3.2 Research strategy: Single- and multiple case study research designs

To explore how established companies can manage their strategic development of CE business and answer the dissertation RQs, a qualitative case study approach is deemed fitting. This research design was particularly suitable for generating rich empirical and contextual insights (Halinen & Törnroos, 2005) into companies’ strategic development of CE business as the studied phenomenon, and served fruitful for related theory development (Aaboen et al., 2012). Case studies, particularly with a qualitative stance as noted earlier, are

suitable for answering “how” types of questions (Yin, 1994), aligning also with the pragmatist worldview and its process ontology. Pragmatism encourages choosing the methods that best allow producing problem-solving knowledge for pragmatic-based issues; Here, case studies are selected because they are particularly fruitful for exploring and theory development for contemporary phenomena (Eisenhardt, 1989; Yin, 1994), such as CE and its impacts on business (Geissdoerfer et al., 2017). Accordingly, case studies have become an established and prominent research strategy for drawing both theoretical and practical insights into CE business (Bjørnbet et al., 2021; Merli et al., 2018).

This research employs case studies in single- and multiple-case settings. Publications I and II employed a single-case study for deep analysis and exploration of an extreme success case over time with details of the involved processes (Leonard-Barton, 1990). A process-based single-case study is a widely accepted and applied strategy for grasping the ongoing interactions in the development of profitable business (Andersen et al., 2018), hence suitable for examining strategic development of CE business. To complement the insights obtained from the single case studies, Publications III and IV employed multiple-case studies, which together with a qualitative approach allow to understand the differences and similarities, via cross-case analysis, of distinct logical patterns in the interplay of the studied phenomenon and contexts (Aaboen et al., 2012; Patton, 1990; Stake, 1995).

3.3 Case sampling and research context: Established companies pioneering in circular economy business

All four publications shared some common guidelines in their purposeful case sampling (with purposefulness being typical for case research; Miles & Hubermann, 1994), although the case unit and the perspective toward companies’ strategic development of CE business differed. A criterion sampling logic was followed as a guideline that informs the case sampling. I first identified over a hundred potential cases with the support of CE researcher colleagues and CE experts at the Finnish Innovation Fund and at the Technology industries in Finland. In this early identification step, the first criterion was that the companies should be CE pioneers in their industries. This means that selected companies have been the first ones to build CE businesses that have reached an established scale in its industry, even an industrial scale for larger companies. This

proactiveness in the strategic development of CE business could have been justified by, for example, recognitions in CE-themed rankings and competitions or participation in leading CE research projects.

In narrowing down the large pool of interesting CE business cases, I conducted preliminary data collection to improve my overview of the potential cases with interviews, informal discussions, and company documents, and three more criteria were applied. The second criterion focused on established companies that have proactively developed CE business. Established company status is observed in extant, well-defined business models, strategies, and collaborations that follow a linear business logic and fit to the extant technological regime and markets (see Bohnsack et al., 2020). In practice, this criterion can be fulfilled by companies that vary in size and age (see e.g., Paiola et al., 2022). This variation reflects into the different environmental aspects and resources of the studied companies (Darnall et al., 2010; Puglieri et al., 2022) in the spirit of maximum variation sampling that ensures grasping common patterns that cut across the variations in the company sizes in the multiple-case study settings of this dissertation (Patton, 1990). Despite this purposefully included variation in size, to increase transparency and allow replication, established status in terms of companies' age was indicated in the case sampling by companies that have operated successfully for three or more years (see Hartarska & Gonzalez-Vega, 2006).

To maximize the pragmatic value of the research, the third criterion focused on companies that operate in environmentally burdensome industries, such as manufacturing, energy, construction, food, and textiles, which are identified as particularly critical for CE transition in both major gray literature (European Commission, 2020) and research (Franco, 2017; Kaipainen et al., 2023b; Lieder & Rashid, 2016). Environmentally burdensome industries are characterized by excessive resource extraction with low material efficiency, resulting in high greenhouse gas emissions, stress in land and water use, and waste generation with low recycling rates (European Commission, 2020).

In terms of geography, the fourth criterion emphasized companies with major CE business operations in European countries that are embedded in an institutional context with an advanced approach to CE transition, namely Finland and Italy (see Alcalde-Calonge et al., 2022), to detect logical patterns in a context that encourages and pressures companies to implement and pioneer in CE business.

After applying all these criteria, the final case sample was defined with accessibility criterion to ensure information richness of each case. Some publications also emphasized additional criteria, such as technology-based (Publication I) or manufacturing business (Publication III), as described in greater detail below Table 10.

Following these sampling criteria and logics, the sampled cases (see Table 10) represent extreme and critical cases (Patton, 1990), manifesting as particularly successful examples of companies pioneering in their strategic development of CE business in environmentally burdensome industries. In practice, I first selected, collected, and partly analyzed data for the single-case study before expanding the case sample and data sets for the multiple-case studies. The selected companies do not have major collaborations nor do they interact in ways that would impact this research, although minor interconnections exist; for instance, the construction company has built the production site of the biofuel company, whose gas stations sell products of coffee cups as a service company. The biofuel company studied in Publications I and II is included in both of the multiple-case samples in Publications III and IV, and construction company in Publication IV was also studied in Publication III (see Table 10).

Table 10. Sampled cases, their key information and description, data, and the corresponding publications

Case company & publications	Country, industry, number of employees, and revenue (million euros, Me)	Description of how circularity manifests in the company's CBS development, CBMI, and collaborations for CE business	Data sources (*Collected by the author, */***Collected by participating in an interview organized and led by research assistant; **Collected by co-author, ***Collected by a research assistant)
Biofuel company I, II, III, IV	Finland, oil & energy industry, >4,800 employees, >15,000 Me	Proactive radical CBS development for competing with closing CBMIs: Sourcing of bio-based residuals, waste, and bio-based virgin materials with diversified supply chains for processing and marketing bio-based fuel products and renewable plastics in parallel CBMs, which emerged one after another during the 25-year long strategic development process of CE business. The radicality of the respective CBSs stems from the need to learn, unlearn, and teach the target market, suppliers, and regulators, and to fully renew the business logics and ecosystem to compete with the new CE businesses. Accordingly, collaborations with supply chain partners, both upstream and downstream, and national-level regulators play a key role in succeeding in the commercialization of bio-based products and enabling sourcing for them.	<i>Interviews*</i> (n = 7): <ul style="list-style-type: none"> • Research & technology, vice president • Renewables platform, top management • Head of strategy, operations and brand marketing • Sustainability and public affairs, senior vice president • Public affairs, feedstock regulation, top management • Head of communications • Key account manager, sales Nordics, top management <i>Group discussions*</i> (n = 2): one with the seven top management interviewees and one with members of the strategy team. <i>Secondary data*</i> : > 250 pieces of data from trade journal articles, magazine and newspaper articles, Finnish broadcasting company videos and podcasts, theses, company materials (annual reports, websites, presentations, blog posts and news, videos), interactive university lectures by managers, and stakeholder websites.
Soil circulation company III, IV	Finland, construction industry, >10,000 employees, >3,300 Me	Proactive incremental CBS development for competing with a slowing CBMI: Collection and transport of soil for reuse within and between different construction projects. CBS remains incremental, as it is an add-on to extant business and the way of competing in the markets is not changed. Minor improvements are made to build collaborations with customers to plan the reuse of soil more strategically.	<i>Interviews</i> (n = 12): <ul style="list-style-type: none"> • Retired head of environmental affairs in infrastructure construction* • Development engineer* • Ten project engineers and managers*** <i>Secondary data*</i> : company reports, news, and press releases.

Case company & publications	Country, industry, number of employees, and revenue (million euros, Me)	Description of how circularity manifests in the company's CBS development, CBMI, and collaborations for CE business	Data sources (*Collected by the author; **/***Collected by participating in an interview organized and led by research assistant; **Collected by co-author; ****Collected by a research assistant)
Ready-to-assemble furniture company III, IV	Italy, furniture manufacturing industry, >250 employees, >90 Me	Proactive radical CBS development for competing with a closing/slowing CBMI: Production of ready-to-assemble furniture designed ecologically and produced from recycled materials using processes with low environmental impacts. The radicality in CBS stems from developing novel competencies and both upstream and downstream supply chains to compete with a CE-updated product that largely differs from company's original business of supplying wood components for furniture producers. <i>Collaboration</i> enables connecting to new supply and forming a consortium of 40 wood producers who are willing to use and return their waste for further production of recycled wood panels in furniture manufacturing.	<i>Interviews** (n = 5):</i> <ul style="list-style-type: none"> • Chief executive officer • Head of marketing • Head of research & development (R&D) • Two members of the marketing team <i>Secondary data**</i> : company website, company reports, news, and press releases.
Coffee cups as a service company III, IV	Italy, food & beverage industry, >250 employees, >2,000 Me	Proactive and slightly radical CBS development for competing with a closing CBMI: Producing and distributing well-branded coffee cups as a service and collection of the exhausted coffee cups for recycling their technical and biological materials. The slight radicality of CBS stems from adopting a service-based view and competences to compete in a new way contrasted to market norms but within the same markets by creating new collaborations; <i>Collaborating</i> with dealers to ensure the collection and storage of waste material and with companies in the agricultural industry for composting.	<i>Interviews** (n = 8):</i> <ul style="list-style-type: none"> • Managing director • Head of sustainability • Head of marketing • Five members of the sustainability team <i>Secondary data**</i> : company reports, videos, news, and press releases.
Water packaging company III	Italy, food & beverage industry, >250 employees, >300 Me	Proactive, incremental CBS development for competing with a closing CBMI: Treatment of recycled plastics for input to a renewed manufacturing process. The incremental CBS builds on the same core business and product that is produced from recycled materials and with which to compete in the same	<i>Interviews** (n = 3):</i> <ul style="list-style-type: none"> • R&D manager, • Marketing manager • Product manager

Case company & publications	Country, industry, number of employees, and revenue (million euros, Me)	Description of how circularity manifests in the company's CBS development, CBMI, and collaborations for CE business	Data sources (*Collected by the author; */***/Collected by participating in an interview organized and led by research assistant; **Collected by co-author; ****Collected by a research assistant)
Textile re-processing company III	Finland, textile industry, >20 employees, >25 Me	markets as before the CBS. Extant supply chain <i>collaborations</i> enhanced innovating the internal recycling processes. Proactive radical <i>CBS development</i> for competing with closing/slowing/(narrowing) <i>CBMIs</i> : Offering workwear as a service and take-back service to collect material for reprocessing used textile into new eco-designed workwear products. Initially founded on sustainability principles, but integration of CE radically accelerated innovating multiple service-based <i>CBMIs</i> that changed its initial business logic. <i>Collaborating</i> particularly with customers to enable and innovate the take-back and service-based <i>CBMIs</i> .	<i>Secondary data</i> **: company website, press release, and product information package. <i>Group discussions</i> */***/** (n = 2) with the project & development manager and sales director, and with the company representatives in research project on customer value in CE. <i>Secondary data</i> *: company presentation, websites, news, and press releases, interactive university lectures by managers.
Appliances refurbishment company III	Italy, white appliances industry, >25 employees, <1 Me	Proactive incremental <i>CBS development</i> for competing with a slowing <i>CBMI</i> : Collection of discarded appliances from end customers and their refurbishing for extended lifetime. Incrementally developed CBS is built upon extant refurbishment service business and competes in extant markets. <i>Collaboration</i> for CE business focuses on engaging the downstream supply chain for collecting the discarded appliances.	<i>Interview</i> ** (n = 1) with the founder <i>Group discussion</i> ** (n = 1) with the R&D manager, the innovation manager, and the communication manager. <i>Secondary data</i> **: company website, company media releases, and interactive university lectures by managers.
Techno-polymers' lamp company III	Italy, Materials & polymers industry, >300 employees, >140 Me	Proactive and slightly radical <i>CBS development</i> for competing with a closing/(narrowing) <i>CBMI</i> : Use of additive manufacturing for producing novel products from manufacturing scrap and distributing them along novel downstream chains. The slight radicality in CBS stems from innovating a novel process and product for competing in fully new markets, in <i>collaboration</i> with new downstream networks to access the new markets.	<i>Interview</i> ** (n = 1) with the managing director. <i>Group discussion</i> ** (n = 1) with the R&D managers. <i>Secondary data</i> **: company website, press release, and recorded interviews of managers in CE-themed events.

Case company & publications	Country, industry, number of employees, and revenue (million euros, Me)	Description of how circularity manifests in the company's CBS development, CBMI, and collaborations for CE business	Data sources (*Collected by the author; **/***Collected by participating in an interview organized and led by research assistant; **Collected by co-author; ****Collected by a research assistant)
Marble-based textile company	Italy, textile industry, 2 employees, <1 Me	A start-up with proactive CBS development that is radical compared with industry norms. Closing CBMI: Design and production of textile products with marble scrap. Enabled by collaboration that combines two separate supply chains in marble manufacturing and textiles industries. (Exception against the sampling criteria of established companies.)	Interviews** (n = 2) with the founders. Group discussion** (n = 1) with CE entrepreneurs including company manager. Secondary data**: participation in exhibitions involving the company, company website, press releases, media coverage, and documentation of awards received by the product.
III			
Tools-as-a-service company	Finland, manufacturing industry, >230 employees, >65 Me	Proactive, slightly radical CBS development for competing with a slowing/closing CBMI: Monthly fee for renting industrial tools, including their repair and take-back for recycling. The slight radicality stems from offering services as a new way to support the core business and compete in the industry. Enhanced collaboration with extant customers enables the CBM.	Interview*/**** (n = 1) with the services and software area sales manager Group discussion*/**** (n = 1) with the company representatives who participated in the research project on customer value in the CE. Secondary data*: company websites.
III			
Wood-based product company	Finland, paper & forestry industry, >17,000 employees, >9,500 Me	Proactive, slightly radical CBS development for competing with a closing CBMI: Production of partly recycled wood-based label material and take-back of the label waste for reprocessing. The slight radicality stems from adopting a service-based view and new processes to compete in a new way that is contrasted to market norms. Novel collaborations are important part of the CBMI as they engage the entire downstream supply chain.	Interviews (n = 3): • Service director* • Vice president of Biomass Business Unit*** • Director of feedstock operations*** Secondary data*: company reports, news, and press releases.
IV			
Textile recycling company	Italy, textile industry, >60 Employees, >20 Me	Proactive and slightly radical CBS development for competing with a closing CBMI: Production of high-end fabric with recycled fabrics from acrylic curtains. The slight radicality of CBS stems from competing with a new product, which demands new competencies, in new markets but staying within the textile business, in collaboration with competitors to collect their waste and with a consortium of cross-industry customers.	Interviews** (n = 5): • Head of marketing • Head of R&D • Three R&D employees involved in the product development. Secondary data**: company website, company reports, news, and press releases.
IV			

Publications I and II shared a research context and followed a qualitative single-case study design with the same sampled case. In the theoretical sampling procedure (Flick, 2004; Patton, 2005), an extreme and critical case was considered suitable to study the development of CBS and CBMI, showcasing their full change processes from linear to circular with excellent access to primary data. In addition, in Publication I, a technology-based company was prioritized to gain insights into companies that conduct major strategic undertakings by re-inventing and developing technologies and products as an important area for effective corporate sustainability (Siebenhüner & Arnold, 2007; Wicki & Hansen, 2019). Finally, I selected an established large company in the oil and energy industry based in Finland and operating globally in 14 countries, i.e., the biofuel company. The company was founded in 1948. Since then, it has built technical competencies for processing chemicals to produce oil-based products. At the core of the development of the CE business in the biofuel company is a technological innovation that allows transforming renewable feedstocks, wastes, and residues into bio-based fuels in internationally certified production plants, resulting in a 90 per cent reduction of greenhouse gas emissions over its lifecycle compared with fossil fuels. Over time, the biofuel company has expanded its networks both from downstream and upstream to facilitate the CBMI and CBS development, and expanded from road transportation fuels to aviation fuels and bio-based plastics as novel CE business opportunities resulting from constant innovation, leading to an approximate 40 per cent share of the world's total renewable diesel production. Accordingly, the biofuel company satisfied the case sampling criteria as an extreme case by radically transforming from a traditional oil refiner to the world's largest renewable fuel producer.

Publications III and IV represent multiple-case studies with companies that have major CE business operations in Finland and Italy. For Publication III, the case sampling aimed at revealing the strategic variants between companies that implement CE business. With the goal of logical generalizability based on the illustrative cases (Patton, 1990), the purposeful sampling focused on CE pioneering manufacturing companies but considered a wide range of industries that share an environmentally burdensome context, from the oil & energy industry to retail and from the furniture industry to electronics. The chosen companies are headquartered in Italy (7), Finland (3), and Liechtenstein (1) and have major operations for their CBMs in Italy (7) or Finland (4). Ten companies were sampled to enable sufficient diversity in the illustration of the theoretically

assumed phenomena discovered in the empirical world. In this illustration, the marble-based textile company makes an exception to other cases of this dissertation by not having a history with established linear businesses, as this criterion was not definitely requested in Publication III. Although the case fills the other selection criteria, it is utilized only in contrasting purposes to better understand established companies in this dissertation.

For Publication IV, similarly as in Publication III, we sampled industrial CE pioneer companies with global operations and European headquarters. Theoretical variation sampling was employed (Flick, 2004; Patton, 2005) with the pre-understanding of the authors from various CE research projects. The sampling criteria included established companies that had successfully implemented circular changes in their businesses to innovate an industrial-scale CBM, with supply chain collaborations playing a significant role. The represented industries were process manufacturing (wood-based product company, biofuel company, and textile recycling company from the forest, oil, and textile industries, respectively) or product and project businesses (construction company, coffee cups as a service company, and ready-to-assemble furniture company from the construction, furniture, and food and beverage industries, respectively). The number of cases was set at six to enable sufficiently deep investigation of each case to identify and understand case characteristics and logically generalizable patterns (Patton, 1990) through the qualitative comparison of the cases over the industrial and regional contexts.

3.4 Data collection and analysis

In this section, I explain the data and its collection and analysis methods of each publication. The research approach, case sample and method, analysis approach, and purpose of data per publication are summarized in Table 11. As Publications I and II share a research approach, case sample, method, and purpose of data sources for analysis, they are separated only with a dashed line in Table 11.

Table 11. Methodological choices and data in publications

Publication; unit of analysis	Research approach; case sample & method	Purpose of data sources for analysis	Data analysis
Publication I; CBS	- Explorative, processual,	- Individual interviews (7) and group discussions (2) with top managers	- Abductive analysis approach - Thematic coding of the process, including its events, actions, and

Publication; unit of analysis	Research approach; case sample & method	Purpose of data sources for analysis	Data analysis
development process	longitudinal; - Single-case study with an extreme success case of an established CE pioneer in the oil & energy industry.	about the company's strategic development of CE business to deepen the understanding from other data sources. - Annual reports (16) to gain company perspectives and accurately track records. - Secondary data to complement and validate company-based data with complementary stakeholder and media perspectives.	actors, with the critical incident technique. - Classifying the incidents with thematic inductive analysis and temporal bracketing to distinguish stages and thematic patterns; comparing patterns deductively against strategy research for conceptualizing strategic cycles - Repetitive iterating back to theory for comparing the empirically emerged findings.
Publication II; Innovation process and strategy that leads to multiple CBMIs			- Abductive analysis approach - Thematic coding of the process including its events, actions, and actors, with critical incident technique and the ecosystem mapping software Kumu.io. - Classifying the empirically emerged incidents according to theory-based innovation process stages to distinguish process patterns.
Publication III; CBMI process extending to CSC collaborations	- Explorative, processual; - Instrumental, illustrative multiple-case study with four Finnish and six Italian manufacturing companies, which are CE pioneers from various industries.	- 1–4 primary interviews per case, often accompanied with group interviews and supplementary interviews (4.2 on average per case) for first-hand insights of the CE innovation induced into the business models and supply chains. - Secondary data to complement and validate the primary data insights.	- Analysis approach framed as deductive but entails abductive orientation. - Empirically-driven assumptions guided the development of the theoretical framework. - Deductive within-case analysis with theoretical framework in the spirit of synthetic process analysis - Cross-case abductive analysis to interpret the reasoning for emerging CBMI and CSC innovation patterns elaborated by the framework.
Publication IV; CBM extending to CSC collaborations	- Explorative, processual; - Multiple-case study with three Italian and three Finnish CE pioneer industrial-scale companies from various industries.	- Primary (18) and supplementary (26) interviews to understand the role of CSC collaborations in CBMI. - Secondary data to complement and validate primary data.	- Abductive analysis approach in the spirit of synthetic process analysis - Theory-based simplified loose framework guided the within-case part of abductive analysis. - Cross-case analysis with inductive orientation, which triggered additional iterative, thematic within- and cross case analysis rounds.

3.4.1 Data collection

The primary data (see also Table 10) in *Publications I and II* were obtained from seven semi-structured, retrospective interviews with top managers, two group discussions, and 16 annual reports published between 2006 and 2021. The interviews were conducted between 2019 and 2020 and on average lasted for 1.5 hours. Individual interviews and group discussions provided insight to the first-hand experiences of the managers (Martinsuo & Huemann, 2021) during the strategic development of CE business. Using non-probability expert sampling, we selected top managers purposefully from different departments and fields of expertise (sustainability, public affairs, research and technology, new feedstock, communications, sales, marketing, and regulation). The selected top managers had worked at the company for 5–25 years. Accordingly, they offered retrospective insights and a more diverse overview of the strategic development process toward a CE business than sampling solely sustainability managers would have provided. To access the interviewees, we applied a so-called snowball sampling based on referrals from already-accessed interviewees. I conducted the interviews at the company premises in a calm environment (except for one interview that was conducted online), most of the time accompanied by my co-author in a supportive role for enhanced researcher triangulation. The discussions were recorded and transcribed by a professional transcription service provider.

The key themes in the interviews covered the story of how the company had developed its CBS and CBMI, who was involved, and how to make the development of CE business possible (see Appendix A for interview guideline). Seven top management interviews were deemed sufficient to reach data saturation, as they represented the viewpoints of different departments to generate a profound understanding of the change process that the company was going through (see Van de Ven, 1992). With the referrals from individual interviews, we were also able to conduct two group discussions in 2021 to validate the preliminary findings and further deepen them: one for gathering together all the top management interviewees and one for the company's strategy team. In these group discussions, the visualized results of the preliminary timeline mapping and analysis were shown and discussed with sharpening questions to validate the preliminary findings and to deepen the understanding of the reasons and relationships between the events that occurred (see Appendix A for interview guideline). All these data collection activities benefited from the

rich information and cognitive access during interviews and group discussions, which allowed discussing openly also the difficulties during the company's strategic development of CE business.

In comparison with Publications I and II, in which I collected all the data, in Publications III and IV, part of the data were collected by my co-authors and other researchers in my research group at Tampere University who played a research assistant role regarding the publication, as they were not involved in the actual paper writing (see Table 10 for details). Regarding the latter, I could typically attend and ask questions in the interviews or group discussions organized and led by the research assistant (see data marked with */*** in Table 10). Such interviews allowed building sufficient first-hand understanding to the cases and their peculiarities regarding the illustrative purposes for Publication III. When it was not possible to attend interviews in person (soil circulation and wood-based product companies; Publication IV), I ensured my full first-hand understanding of the case by organizing additional interviews directly myself, to complement the data collected solely by a research assistant (see data marked with *** in Table 10).

In *Publication III*, primary data were collected from thematic interviews, which lasted 1 hour on average, and were conducted from 2019 to 2021. Similarly like in Publications I and II, we selected top managers and experts who all were able to provide a long-term understanding of CE implementation in their company from diverse perspectives. About 1–4 primary interviews were conducted per case, which in some cases were complemented by supplementary interviews (4.2 individual interviews in total per case on average) and group discussions. The interview themes covered retrospectively how the companies had innovated their CBMs, the consequences in their inter-organizational collaborations, and who and what were needed to succeed in the CBMI, among other emergent topics in the open-ended thematic interviews (see Appendix A for guideline of the thematic interviews). The number of interviews per case varied, because in some cases, data saturation for illustrative research purposes was reached with one individual interview and accompanying secondary data, whereas in other cases, such as the biofuel company, more data was available owing to other dissertation publications. Also, the durations of the retrospectively studied CBMI processes varied depending on the company and for how long it had managed its CBMI(s), varying from a few years up to 25 years.

Similarly, in *Publication IV*, for each of the studied cases, 2–4 thematic in-depth interviews acted as the primary data sources on CBM and CSC

collaborations. The primary interviews with managers and experts with long-term CE knowledge in their company were complemented with up to nine supplementary interviews per case to gain in-depth and triangulated understanding on how circularity invaded the companies' technical and business operations in the CBMI process, ranging from a few years up to 25 years. The ~1-h-long interviews were conducted from 2019 to 2021, and like in other publications, non-probability sampling logics were employed to reach out to companies' chief executive officers, top managers, and other experts with long-term understanding to how the company has approached and built its CE business. The thematic interviews covered how circularity manifests in the company's business, technologies, and operations for CBMI; how the CBMI was managed; with whom the collaboration was made and the rationale for collaboration; and the company's future aspirations, challenges, and expectations in relation to the changing business landscape with increasing CE requirements (see Appendix A for the guideline of thematic interviews). In the interviews that I conducted to complete the data collected by research assistants, I followed a semi-structured interview guideline to validate my preliminary analysis of the case and gain additional insights (see Appendix A for interview guideline). Owing to the COVID-19 pandemic, some of the interviews in Publications III and IV were conducted online, in contrast to the onsite interviews in Publications I and II. Nevertheless, we obtained exceptionally rich information and cognitive access to meaningful and even confidential data owing to the relationships of trust with interviewees developed in ongoing and prior research projects.

For all publications, in addition to the interviews and group discussions, a broad range of *secondary data* with a supportive role in the analysis was collected inside and outside the case companies. In Publications I and II, secondary data included company materials (blog posts, news, videos, presentations, marketing materials, and brochures); scientific publications and theses about the company; articles in trade journals, magazines, and newspapers; videos and podcasts of the Finnish broadcasting company; and other websites regarding the company's circular offering, collaborations, market development, or business environment. The secondary data sources were searched for in open databases for news releases and company materials (e.g., LexisNexis; Finnish broadcasting company's archives) and through publicly available search engines such as Google, and selected when they included insight to the company's strategic development of CE business. A key source of document-based data was annual reports, which provided a broad overview for building the timeline of the

company's strategic development of a CE business, hence considered as primary data in Publications I and II. In addition to document-based data, for example, interactive lectures delivered by the company managers during university courses were a useful source of data to learn and ask about the company and its CE business. Publications III and IV extended this variety of multisource secondary data with technical documents provided by the company. Such diverse secondary data allows for an improved understanding of the research context and offers consistency to the analysis (Martinsuo & Huemann, 2021). By combining data triangulation with informant triangulation, we ensured data saturation to achieve an objective, critical, and comprehensive understanding of the cases and their interpretation.

For all publications, the collected data are processual, as they deal with dynamics, a sequence of events and change (e.g., in relationships and interpretations) due to movement from linear to circular business, and are characterized as eclectic and by temporal embeddedness with varying durations and precisions (Langley, 1999). During data collection that I took directly part in, the interviews were recorded and recordings principally transcribed, typically using a professional transcription service, and field memos were written; data saturation was ensured with complementary follow-up questions in group discussions and through email correspondence and phone calls with the interviewees when needed. The multisource and partly longitudinal data from two main country contexts allowed to develop a broad overview and an in-depth understanding of how the companies had developed and managed their CBS, CBMI, and related collaborations in environmentally burdensome industries with institutional encouragement and pressure toward CE transition.

3.4.2 Data analysis

In the data analysis, I followed three analysis processes and roles depending on how the data were collected. First, for the data I collected myself (see Table 10 for the data marked with *) and the data from interviews organized and led by research assistants but where I participated (see Table 10 for the data marked with */***), I was involved through the full process from collection to analysis and analytical conceptualizing from the data. Second, for the data collected and empirically analyzed by my co-authors (see Table 10 for the data marked with **), I was actively involved with cross-case analysis and the identification of

empirical patterns to interpret, theorize, and conceptualize from them. Third, for the data collected solely by research assistants (see Table 10 for the data marked with ***), I had access to the interview recordings and transcriptions for empirical within-case analysis, from where I continued to cross-case analysis and conceptual theorizing. An exception here was for the soil circulation company: instead of the interview transcriptions I had access to the preliminary empirical analysis text written by the research assistant, so here the analysis process resembled that of the data collected by my co-authors. If all interview data of a case were originally collected only by the research assistants (wood-based product company and soil circulation company), I conducted additional interviews for ensuring my first-hand understanding to the case to analytically interpret and conceptualize from the data and to validate the early empirical analyses I did based on the data of research assistants.

In all publications, the data analysis involved thematic analysis for identifying, analyzing, and reporting patterns and themes within the qualitative data (Braun & Clarke, 2006). Although known to actualize through different procedures and practices (Braun & Clarke, 2006), in this research, thematic analysis manifested in multiple iterations to analytically identify event sequences and variables from processual data (Langley, 1999) and gain an in-depth understanding of the emerging process patterns: what happened, when it happened, and what consequences led to the multifaceted strategic development of CE business in the case companies.

To exploratively generate new discoveries and allow theory development, data are analyzed with abductive-oriented analysis approach (Dubois & Gadde, 2002). Abductive analysis is deemed suitable for explorative and discovery-oriented research to make sense of new phenomena, such as CE business, as it allows iterating between the inductive identification of emerging findings from the empirical world and the deductive approach for building on a theoretical background (Dubois & Gadde, 2002; Richardson & Kramer, 2006). Indeed, at its core, abductiveness aims for arriving at the best available explanation in reference to the current standards and values by taking all possible sources of information into account: the observations, the pre-understanding, previous theoretical explanations for the phenomenon, and all other available materials (Martela, 2015). Hence, to ensure the accuracy of empirical evidence and data saturation, I iterated back from the data analysis to the data collection. Meanwhile, the empirical evidence could also invite me to iterate back to the theory for augmenting my full understanding of the studied topic. In practice, in

the publications, the abductively-oriented analysis processes manifest varying emphases on inductiveness or deductiveness, reflecting the co-existence and varying emphases of these reasoning logics in the research processes (Järvensivu & Törnroos, 2010). Accordingly, this research follows an explorative approach that welcomes different types of research logics and employs a mix of them for enabling discoveries (Casula et al., 2021) under the abductive-oriented approach (Järvensivu & Törnroos, 2010). Putting together all these sources of insights in abductive analysis, the researcher takes a leap of imagination in a creative and iterative process to build a novel hypothesis and a harmonious picture that explains the evidence and has the most potential for practical results (Martela, 2015). Abductiveness has its roots in pragmatism; hence, its “way of working is best illustrated when it is embedded within a pragmatist notion of inquiry” (Martela, 2015, p. 4), making it suitable for this pragmatist research.

Publications I and II utilize theoretical pre-understanding as a starting point for the analysis but the inductive side of abductive analysis was emphasized when mapping the processes of business strategy development and CBMI onto a preliminary process timeline of a year-level detail with the critical incident technique (Bott & Tourish, 2016; Hughes et al., 2007) as a means of thematic coding. This allowed for constructing a detailed story from the raw data as in the narrative strategy, which is commonly suggested for early steps of process data analysis to make sense of the temporal embeddedness and eclecticism of the data, particularly for single-case studies (Langley, 1999). This preliminary process mapping of critical incidents included events, actions, actors, and the timings of actions relevant to the company’s strategic CE issues obtained from the annual reports and secondary data sources. Such events and actions could be, for example, launching of new CE products or initiating novel collaborations for CE business. The critical incidents were qualitatively coded and wrote down in an Excel file for further processing and grouping. Using annual reports and secondary data sources in the preliminary mapping covered both a corporate perspective and the perspectives of key organizations and collaborators in the company’s business ecosystem.

Next, the analyses of interview and group discussion data verified and complemented the findings from preliminary document-based mapping to cover a total of 122 critical incidents during years 1996-2021. All these critical incidents were further categorized to understand their nature, frequency, and patterns related to the studied phenomenon (Gremler, 2004; Hughes et al., 2007) in both Publications I and II. This categorization follows a similar logic as Gioia coding

or grounded theory -type of coding (Gioia et al., 2013; Langley, 1999) moving from critical incidents to wider process stages. As a result, I updated the preliminary timeline with five empirical process stages based on distinguishable, remarkable vision updates or similar strategic undertakings or milestones by the company, starting from the roots of renewal in the late 1990s, foreseeing and risk taking in 2000–2005, persistent base building in 2006–2010, turning profitable in 2011–2014, and accelerated growth in 2015–2021. The role of the interview and group discussion data was to provide deeper insights into the personal, subjective, and open perspectives of interviewed managers and experts, to identify the connections between what happened during the strategic development, why it happened, and what were the consequences.

In addition to categorizing critical incidents into process stages as in temporal bracketing (Langley, 1999), the critical incidents were categorized also thematically based on the different research foci of Publications I and II. In *Publication I*, the categorization of critical incidents was empirical-based and it evolved similarly as in grounded theory analysis strategy: from critical incidents as smallest units to systematically constructing categories and wider dimensions (Langley, 1999). This data-driven analysis resulted in the following themes: strategy and organization, investment, technology and research, regulation and society, programs, and strategic partners. As examples on the categorization, thematically coded critical incidents such as vision/goal updates and changes in the organizational structure were categorized under the strategy and organization category; decisions and openings of new production plants, under the investment category; applications of novel feedstocks and improvements in technical abilities, under the technology and research category; novel national and international regulations and partnerships with non-governmental organizations, under the regulation and society category; and mentions of new collaborations, under either programs or strategic partners categories, depending on their nature.

After associating each critical incident with a specific thematic category, I compared the findings against strategy literature with a more deductive orientation to examine and conceptualize that the critical incidents of the strategic development process unfold by following the sub-processes of strategic formulation, implementation, and evaluation. In practice, I identified repetitive patterns in the critical incidents of the CBS development process and compared them, taking into account their thematic category, against the extant business strategy process research during the iterative analysis rounds. The insights

derived from this analysis were aligned with the preliminary findings of the empirical process stages in CBS development and allowed conceptualizing them.

In *Publication II*, the preliminary mapping of the critical incidents and temporal bracketing of the empirical stages of the CBS and CBMI process timeline was a shared analysis step with *Publication I*. However, this time, the critical incidents of the process were further categorized into three stages based on theory-based innovation process activities (visioning and ideation, research and development, and acceleration and commercialization). For example, vision updates and regulative changes that shape the future direction of the company were categorized as visioning and ideation; practice-oriented programs, partnerships, and applications of novel feedstocks, as research and development; and launches of new products and certifications, as acceleration and commercialization. Next, related to each of the three innovation activities of the CBMI process, I distinguished and grouped the key challenges and the overcoming actions undertaken by the company and its ecosystem actors.

In addition, in *Publication II*, an ecosystem mapping software (kumu.io) was employed to obtain an overview of the company's ecosystem, including its key actors and relationships in the preliminary identified empirical process stages during the strategic development of CE business. Around 250 actors were mapped and categorized based on their role in the ecosystem. The all-encompassing ecosystem map was filtered based on the actors' roles and the year of activity to illustrate the overview of how the presence of key actors and collaborations evolved in each of the empirical stages throughout the process of strategic development of CE business. Ecosystem mapping supported analyzing the collaborations for overcoming the challenges in the case company's CBMI process.

In *Publications I and II*, the studied processes were visualized on timelines to simultaneously represent multiple dimensions, parallel events, and activity inside and outside the company, and the passage of time as means to benefit from the visual mapping strategy suggested for process analysis (Langley, 1999). Visualizing the studied processes—on a timeline and as a developing ecosystem—provided support for the analysis of emergent themes and repetitive patterns for the analytical conceptualization of the CBMI processes in *Publications I and II*.

In *Publications III and IV*, a preliminary understanding of the cases and how they innovated a CBM was built from the data with the narrative analysis strategy and analytically transformed into an understanding of the key qualitative

variables that synthesize the key events in the studied CBMI processes, similarly to the logic of synthetic analysis strategy (Langley, 1999). Thus, it was in the focus of the processual analysis and interpretation to understand the starting point, outcome, and change and dynamics in key variables that occurred in between as the CBMI process rather than its length or detailed critical incidents per se.

In *Publication III*, the analysis was framed as deductive because of its heavy deductive emphasis, but it also featured abductive orientation, manifesting the real-life interplay of reasoning logics (Casula et al., 2021; Järvensivu & Törnroos, 2010). In the major, deductive part of the analysis, a theory-based framework guided the within-case thematical analysis of ten cases. The development of the theory-based framework, however, was initially guided by an empirically driven assumption on the importance of CBMI and supply chains in companies' strategic development of CE business, which stemmed from prior research work with the case companies in Publications I, II, and IV. Being illustrative, the deductively oriented part of the case analysis elaborated on the adequateness and applicability of the proposed theory-based framework in reflecting the real-life diversity of the strategic variants of CE business. In the analysis, the data was thematically grouped according to the case company's focus on CBMI and the radicality of simultaneous CSC innovation following the theory-based framework. Regarding CBMI, the analysis focused on the changes in the processes, products, and services that the company introduced to innovate its CBM. For example, the tools-as-a-service company adopted a service-based CBMI with its monthly fee for tool rental. Regarding CSC innovation, the degree of innovation was examined: innovation was considered radical if it demanded designing both upstream and downstream supply chain collaborations with major impacts on the business ecosystem, and incremental if it modified only either upstream or downstream or both in a moderate way. If no changes to the supply chains were induced by the CBMI, no CSC innovation was reported. As an example, the appliances refurbishment company was only harnessing its extant supply chains by adding a new service-based CBMI to its service portfolio, hence reflecting no CSC innovation, whereas the ready-to-assemble furniture company innovated both the downstream chain to source exhausted furniture and the downstream chain to engage novel customers into a consortium. Next, in the light of the theory-based framework, the cross-case interpretation allowed room for empirically driven reasoning to explain the common patterns distinguished from the results of the framework-based analysis. Accordingly, empiric discoveries about the nature and characteristics of the strategic variants

were enabled by moving flexibly between the theoretical and empirical worlds in an abductively-oriented manner, where a heavy deductive emphasis served as a strength (Casula et al., 2021).

An abductive approach was also applied in *Publication IV*, similarly from Publication III, to understand the overall change and dynamics in the companies' CBMI processes and collaborations instead of conceptualizing specific stages of this process. Using a theory-based simplified loose framework as the starting point, sufficient theoretical support and structure was generated for analysis. The empirical, thematic analysis (see e.g., Braun & Clarke, 2006) and conceptual mapping unfolded first with a more deductive angle of the abductive analysis approach, focusing on the value elements in companies' CBM and related CSC collaborations, yet allowed the inductive emergence of empirical findings. For example, when the interviewee referred to not having to pay for the waste material, we interpreted that as explaining the value capture of the CBM, whereas when the interviewee referred to closer engagement with customers due to the CBMI, that was interpreted as changes in downstream supply chain collaborations. In this within-case analysis, a narrative strategy allowed understanding the story and underlying mechanisms (Langley, 1999) on how the companies succeeded in their industrial-scale CBMI with supply chain collaborations. A within-case analysis was followed by a cross-case analysis, where inductive insights invited us to not only compare the cases, but also to return to theory for further insights on surprising findings. Accordingly, the abductive way of taking advantage of all possible evidence was followed (Martela, 2015). Thus, when comparing the cases and differences in the identified CSC collaborations, new rounds of within-case analyses were triggered to find shared patterns between cases, their industries, and countries. For example, once we detected that regulation influences the collaborations for CBMI development in the biofuel company, we conducted an additional analysis for other cases to detect and report other regulation-related insights from them.

3.5 Evaluation of the research quality

I adopt conventional quality assessment concepts suitable for qualitative research (Yin, 2014), namely reliability and validity. *Reliability*, sometimes called as dependability (Lincoln & Guba, 1985), refers to the degree of consistency of the research if repeated in other independent research projects despite changes in

time, researchers, and methods (Miles & Hubermann, 1994; Yin, 2014). Reliability is more challenging in qualitative than in quantitative research, as the data analysis is based on the subjective interpretation of the researchers, and flexibility is typically involved in the data collection (LeCompte & Goetz, 1982), as is true of the publications of this dissertation, which employed an abductively-oriented approach that occasionally involved additional data collection after preliminary rounds of analysis. To increase reliability, all the publications relied on researcher triangulation (Flick, 2004), where the interpretations from theory, empirical findings, compiled frameworks, and procedures were shared, comprehensively discussed, and compared among co-authors and other researchers to ensure that the interpretations of data were not influenced by the subjective views of individual researchers. This was a necessary measure to ensure that we arrived at the same interpretations and analytical conclusions even when the data was collected by an individual researcher. The research processes and conducting of the case study were also described in a transparent way, with additional detail in the introductory part of the dissertation, and the real name of the case company in Publications I and II was given to allow replication of the research (Gibbert et al., 2008). Despite these measures for increasing reliability, this qualitative case research is inherently context-specific, as it is conducted at a certain moment of time and studies a phenomenon rooted in a social, constantly developing setting (LeCompte & Goetz, 1982). As such, the findings may differ if the empirical research was repeated in the future with companies that have implemented CE business and experienced CE transition over a different period of time.

Validity is of three types: construct, internal, and external. Identifying the correct operational measures for the studied concepts refers to *construct validity* (Yin, 2014). In this dissertation, this issue is addressed with a combination of measures, including multiple sources of evidence that allow for data triangulation, validation of the preliminary findings by key interviewees, review of draft by peer researchers (both co-authors and external ones in seminars and conferences), and a purposeful aim for a traceable chain of evidence from data to findings (Yin, 2014; Gibbert et al., 2008). The chain of evidence is established as a clear style of reporting the research procedures (Gibbert et al., 2008)—including additional level of detail in the introductory part of the dissertation to complement the word-limited descriptions of research procedures in the publications—and the use of illustrative quotations when applicable. However, abductive analysis entails a leap of imagination in putting together the evidence,

which cannot always be fully explained owing to its creative nature and limits the transparency of reporting (see Martela, 2015). Moreover, the pragmatist stance validates the RQs based on “what works” (Kelly & Cordeiro, 2020); this functionality of RQs in addressing the objective of the research was ensured through discussions with other researchers at the time of designing and carrying out the case studies (see Gibbert et al., 2008).

Internal validity, an analogue to credibility (Lincoln & Guba, 1985; Tracy, 2010), refers to the extent to which causal relationships between the studied variables can be interpreted (Aguinis & Edwards, 2014). Causal relationships often point to quantitative research and have even been claimed inapplicable for exploratory case research (Yin, 2014). From a fully opposing viewpoint, qualitative process data have been recently claimed to uncover causal relationships that quantitative data could not reveal (Jensen, 2022). Also, longitudinal qualitative research has been suggested to have high internal validity (Arnold & Hockerts, 2011). Thus, even in the exploratory case study setting, I argue that the research can establish logical, possibly causal relationships between studied phenomena and concepts through the active participation, interactions, and embeddedness in CE business ecosystems and CE research projects, through research and practitioner work as well as through preliminary expert interviews for facilitating case sampling. Continuous and manifold discussions with researchers and practitioners at various events, such as scientific conferences and workshops, allowed to build trust to allow collection of confidential processual data and to gain feedback during the research process for increasing internal validity. Besides, pattern matching to extant research and theory triangulation allowed for different lenses to interpret the findings and reveal underlying conceptual relationships (Gibbert et al., 2008).

The generalizability of the findings outside the study setting in terms of context, sample, and timing indicates their *external validity* (Aguinis & Edwards, 2014; Yin, 2014), called also as transferability (Lincoln & Guba, 1985). This, in qualitative case study research, means logical generalization (Patton, 1990) rather than a statistical one based on quantitative research. The logical generalization is aided with a cross-case analysis in multiple case study settings (Gibbert et al., 2008). Here, the logical generalization is strengthened by grounding the research, case sampling and its rationale, and discussion of limitations and applicability in extant literature (Patton, 1990). The transferability of qualitative findings to other study settings was also supported by transparency in data collection, data sources, methods, analysis, and contexts (Lincoln & Guba, 1990). Adopting a replication

logic (Yin, 1994) and covering diverse industries with contextual details in the case sampling further support the research's ability to make logical generalizations (Gibbert et al., 2008; Patton, 1990). However, the more the context differs from the case study settings investigated in the dissertation publications, the less the transferability to other contexts can be fully ensured.

The partly overlapping tactics for addressing reliability and validity for improved rigor and trustworthiness in each publication are summarized below in Table 12. Besides this somewhat classical research evaluation criteria, in evaluating the quality of this pragmatist-based research, it is also critical to consider and ensure that the topic is relevant, timely, and significant (Tracy, 2010) and has the potential for high pragmatic impact. To ensure this, I conducted group discussions to validate the pragmatic value of preliminary interpretations, and was strongly embedded in the CE ecosystems and CE research projects to actively seek feedback for the research plan and its individual publications from practitioners and scholars.

Table 12. Evaluation of the reliability and validity in publications

Research quality criteria	Tactic adopted from prior literature	Publications
Reliability The degree of consistency and repeatability despite changes in time, researchers, and methods.	Researcher triangulation	I, II, III, IV
	Reporting the research processes and how the case study was conducted	I, II, (III), IV
	Transparency with case naming	I, II
Construct validity The extent to which the research studies what it claims to study.	Data triangulation with multiple data sources	I, II, III, IV
	Validation of the preliminary findings by key interviewees	I, II, IV
	Discussions with peer researchers to validate the fit of RQs and operational measures	I, II, III, IV
	Review of the draft by peer researchers	I, II, III, IV
	Traceable chain of evidence from data to findings: achieved by using a clear style of reporting the research procedures and illustrative quotations	I, II, IV
Internal validity The extent to which causal relationships between the studied variables can be interpreted.	Active participation, interactions, and embeddedness in CE business ecosystems and CE research projects	I, II, III, IV
	Building trust with interviewees to allow the collection of confidential data and to gain feedback	I, II, III, IV
	Pattern matching and triangulation to prior theory through abductive orientation	I, II, III, IV
External validity Generalizability outside the study setting in terms of context, sample, and timing.	Cross-case analysis in multiple-case study settings	III, IV
	Explaining the rationale in case sampling and research design, grounded in the extant research	I, II, III, IV
	Covering diverse industries with contextual details	III, IV

4 FINDINGS

This chapter discusses the background, findings, and contributions of each of the publications in this dissertation (summarized in Table 13). Publication I develops a five-stage process model for managing established companies' CBS development, and Publication II reveals the challenges and the actions for overcoming them in a concurrent CBMI process. Publication III unveils the strategic variants for CE business resulting from different combinations of innovation for CBMs and supply chains. Publication IV examines how CSC collaborations enable CBMIs.

Table 13. Summary of the findings and contributions of the publications in this dissertation

	Publication I	Publication II	Publication III	Publication IV
Findings	Develops a five-stage process model for established companies' sustainable CBS development.	Reveals the challenges and actions to overcome them by the company and its ecosystem actors during the CBMI process.	Elaborates upon a theory-based framework with empirical evidence of the strategic variants for CE business resulting from different combinations of innovations for CBMs and supply chains.	Theorizes a conceptual framework and a synthesis of how CSC collaborations support companies' CBMI and presents future research agenda.
Contributions	Contributes to environmental business strategy research with empirical insights into developing CBS in practice, as a process, by addressing management issues in five main stages that comprise repetitive sub-processes.	Contributes to CE and innovation management research with understanding on the overlapping nature and importance of collaboration in the CBMI process.	Contributes to CBM, CSC, and related innovation management research with insights into the interplay of business model innovation and supply chain innovation in the CE context, by elaborating on the diversity and dynamics of the innovation types in CE business, and by distinguishing between the levels of radicality in CBMIs.	Contributes to CE research by extending focus from the company level to CBM's collaborations for connecting across CSCs and industries, and by integrating CBM and CSC research and providing empirical examples of implementing this integration into supply chain collaborations with required applications, success factors, best practices, and company-specific variables in different industries and geographic areas.

4.1 Publication I: Circular business strategy development is a process intertwined with circular business model innovation and collaborations

In Publication I, we conduct a longitudinal single-case study of an established technology company operating in the oil and energy industry to explore a successful CBS development process and the strategic development of sustainable CE business. Building on the research on strategy processes and business strategies for environmental sustainability, this publication presents an in-depth empirical exploration of a proactive and radical type of CBS development and strategic development of CE business, referred in the publication as strategic renewal. Despite the widespread cross-sectional investigations of CBMs, research on updating business strategies to circular as a process unfolding over time is lacking. Thus, the publication investigated *what constitutes incumbents' strategic renewal for sustainable CE, and how to manage each stage of this process.*

For this dissertation, Publication I revealed how a radical CBS is developed and managed as a process. As the key findings from the analysis of multi-source interview- and document-based data in a longitudinal case study that captures 25-year strategic development of CE business, we develop a process model of radical CBS development. The process entails large-scale changes in the company's operations and collaborations and constitutes strategic cycles with consecutive focus areas, labelled as sustainable technology innovation, investment decisions, competence building, unifying the strategic direction, and strategic collaboration. We find that each cycle follows the sub-processes of strategic formulation, implementation, and evaluation.

The key critical incidents, rationale for the CBS development process, and key strategic management issues are analyzed per strategic cycle. The analysis reveals specific strategic management issues that are internal and external to the company per strategic cycle of the CBS development process. To enable radical CBS development and successfully overcome the emerging strategic management issues, the company needed to learn new and unlearn old ways of doing business, resulting in circular changes into the company's competences, technologies, production, products, business models, relationships, and supply

chains. Inside the company, the management needs to enable an explorative and innovative atmosphere, recognize and take strategic risks on tech innovation prospects, build sustainability-related competences and apply them on an ongoing basis for new business line creation, make continuous investments and updates to the vision and brand marketing, and strengthen supply chain management and tech capabilities. Outside the company, the key focus areas for management are related to engaging others in the CBS and CE vision of the company, thus requiring ecosystem development in an environmentally burdensome industrial context. Therefore, companies need to pay attention to following industry developments regarding markets and regulations; participating in dialogue for proactively developing the regulative environment, industry, and public discourse on sustainability; to the global expansion of supply chain operations and collaborations; and to collaborating for competence-building, legitimacy-building and business opportunities, particularly with sustainability-valuing customers.

The findings indicate that in an environmentally burdensome context, which lacks regulations that would otherwise guide sustainable transformation (Banerjee, 2002), a company needs to take a proactive approach to harnessing CE business opportunities in its strategic development of CE business. However, such proactivity is enabled by financing the CBS development with parallel linear business, which in turn can be diminished over time and even replaced with the CBMI. To accelerate this proactive process, we find that feedback—both positive and negative—from prior CE endeavors and from collaborations plays an important role and allows companies to proactively advance from one strategic cycle to another during CBS development. Here, partly overlapping evaluation and formulation of CBS may result in emergent spin-off CBSs and CBMs that need to be managed under a circularity-driven corporate strategy.

The findings and the process model extend the theoretical understanding of sustainable CE by positioning it as an important strategic concern for companies that must be integrated into established companies' business through CBS development and continuous strategic development of the company's business. The findings extend from prior static CBM-focused studies (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019) with empirical and process-based insights into developing CBS in practice as a proactive and radical process by addressing management issues in strategic cycles with different focus areas. These findings demonstrated that CBS development is interlinked with sustainable development and that instead of developing a separate

sustainability strategy (Santa-Maria et al., 2021b), the findings encourage companies to integrate sustainability and CE practices into the core of business strategy (Da Silva & Teixeira, 2008; Engert et al., 2016) to develop CBS(s). Finally, the findings show that although CBMI is an integral part of implementing CBS development, the strategic management of not only CBMI but also other types of innovations is needed over time to strategically develop new CE business that is aligned with the renewed CBS. The findings encourage managers to proactively initiate strategic development of CE business with new CBS(s), drive change by strengthening innovative organizational culture and experimentation with sufficient resources, and build multidisciplinary competences inside and outside company boundaries, among other efforts.

4.2 Publication II: Dynamically interlinked innovations and collaborations underlie circular business model innovation

In Publication II, we analyze the challenges, overcoming actions, and diverse actors during a 25-year CE innovation process and strategy that leads to multiple CBMIs. Innovation per se is deemed necessary for companies to develop new solutions for CE business. Publication II assumes from prior research on innovation processes in multi-actor systems that CE innovation process is typically either discrete or iterative and calls upon various actors in the company's ecosystem to bring expertise and support the innovation activities with resources and creativity (Driessen & Hillebrand, 2013). A radical CE innovation process is particularly difficult to manage because the radicality demands learning on the part of the target market, value chain, and customers (Chiesa & Fratini, 2011), and the dynamics between actors in a CE ecosystem may evolve and interact with CE innovation during its development.

To respond to the lack of understanding of the concept and management of radical CE innovation as a process, we chose a longitudinal process approach to derive understanding from an empirical success case from the oil and energy industry. The selected case demonstrates a radical, even disruptive innovation process for renewable energy business that allows answering the question: *How can a firm, together with its ecosystem actors, realize sustainable innovating despite the challenges of the CE innovation process?* The analyzed radical innovation process results in new business lines (Aarikka-Stenroos et al., 2014) of multiple CBMs over time and is approached as a process, therefore corresponding in this dissertation to the

notion of a CBMI process. Thus, for this dissertation, the findings of the CE innovation process can be translated into new understandings of managing a CBMI process from visioning to R&D and finally to commercialization.

Through the analysis, we elaborate on the CBMI process activities and the key challenges. The findings show that CBMI is a result of overlapping, interlinked innovations (such as technology, process, and product) that emerge and interact with each other over time. Key challenges in the vision and ideation stages of the CBMI process relate to inventing the technology innovation and gaining internal support for the CE idea with adequate resources to enforce exploration and an organizational culture that cherishes past successes in innovation and environmental issues. In the R&D stage, the key challenges include scaling the invention to industrial production, ecosystem actors questioning the product, and ensuring continuous innovation. Finally, the challenges in the commercialization and acceleration stage relate to regulation prohibiting commercialization, facilitating the adoption of launched products, and ensuring business sustainment. We also reveal a set of actions that established companies need to internally implement and how they can involve ecosystem actors in overcoming different challenges in the CBMI process and its stages in a timely manner.

The findings show that collaboration in the CBMI process mostly facilitates the stages of R&D and commercialization. In the R&D stage, collaboration, particularly with knowledge-production-oriented actors, allows scaling to industrial production, expanding from technology innovation to CBMI, and gaining the trust of ecosystem actors questioning the product/solution. Collaboration with subsidiaries can accelerate the scale up of production. Credibility for the innovation and new competences are built through collaboration and open discussions with research-oriented partners, third-party auditors, technical testing programs, non-governmental organizations, customers, and regulators. Technical and sustainability-related competence-building is supported particularly by collaboration with research partners, customers, and suppliers: for example, customer collaboration allows piloting new feedstocks and finding new business opportunities.

In the commercialization and acceleration stage, collaboration is particularly focused on overcoming regulatory commercialization barriers, facilitating the customer adoption of the launched products, and ensuring the continuous tapping on new business opportunities. To overcome regulatory barriers, collaboration is targeted toward industry associations, regulators, competitors,

non-governmental organizations, the media, and the public. Collaborating with industry associations that also involve competitors increases the awareness of the progress of regulation and competitors, helping to stay ahead of competition and pressurize regulators together with competitors for allowing the products in new markets. Further, non-governmental organizations, the media, and public discussion increase regulator attention and regulatory development in the topics relevant for CBMI process. The media, together with public audiences, share experiences and information that encourage customers to look for and finally purchase sustainable products. Increasing public interest in the sustainability megatrend also facilitates finding new suppliers. Collaborations to establish strategic partnerships with customers, research partners, and suppliers allow to expand existing businesses and explore new CE business openings over time.

In contrast, in the early stages of visioning and ideating CBMI, the company was not found to directly collaborate with other organizations. However, the company focused on following the development of competitors, regulators, and potential customers in the markets to proactively invent circular technologies and develop them to serve as a basis for CBMI as well as to justify the internal strategic choices for proceeding with the innovation process. Despite the lack of direct collaborations in the early CBMI process, the company needs to communicate the value of CE innovations to the ecosystem actors to engage them in strategic partnerships in the later stages of the CBMI process, when collaboration becomes more crucial.

The increased importance of collaboration over time is attributable to the environmentally burdensome temporal context and its underdeveloped CE ecosystems, where the company tries to proactively innovate its CBMs. In such a context, the number of CE-minded collaborators is typically limited; thus, they are found to take on different, parallel roles during the CBMI process. To develop the extant business ecosystem to align with a company's CE vision and overcome CBMI challenges, in addition to engaging existing collaborators, proactive companies need to establish new collaborations in a dynamic process, as suggested by Brown et al. (2021), beyond existing ecosystem boundaries. Finally, because innovation may alter the strategic frames and value propositions of a company (Möller & Svahn, 2009; O'Connor & Rice, 2013), the CBMI process and ecosystem development need to be aligned with not only each other but also the company's related business strategy.

The findings enrich innovation management and CE literature with better understanding of how proactive CE-innovating companies can implement and

accelerate CBMI processes over time in a particularly challenging context. This culminates in two key contributions. First, by taking a longitudinal process approach and adopting a lacking yet fruitful innovation management lens in analyzing CE business (de Jesus & Mendonça, 2018), we find that the CBMI process comprises interlinked innovation, particularly building from technology/process and product innovations and bringing clarity to the nature of CE innovation (Brown et al., 2021). Second, the findings strengthen the strategic importance of collaboration for CE business and CBMI processes, aligned with prior studies on collaboration in CE business (Brown et al., 2021). Collaborations extend beyond the traditional and demand early actor engagement in the CBMI process, particularly in established companies proactively pursuing strategic development of CE business in CE-neglecting industries. In terms of managerial implications, the findings advice managers in identifying and predicting challenges in the CBMI process and selecting consequent responses and actors to collaborate with in a timely manner. Managers are encouraged to establish early on strategic partnerships with others that share sustainability-oriented values, also beyond traditional industry boundaries, to facilitate the commercial scale-up of the CBMIs.

4.3 Publication III: Interplay of innovating business models and supply chains promises varying circular business strategies

Publication III investigates the interplay of innovating CBMs and supply chains. Owing to the systemic nature of CE business, companies are required to innovate not only the internal operations and processes of their business models but also their supply chain collaborations. Prior research has largely focused on CBMs and CSCs separately; only recently has their interplay become a subject of interest (Geissdoerfer et al., 2018a), pinpointing to the need to bring these two perspectives together for comprehensively understanding innovation and strategic development of CE business. Focusing on this interplay, we ask the following: *How companies innovate their business models and supply chains for implementing CE?* The findings provide insights into the diversity of CBMI that indicates various strategies for circular business and innovation.

To answer the RQ, Publication III builds on CBM and CSC literature and the management of business model innovation and supply chains. The literature serves as the basis for developing a framework in which companies make

strategic decisions on implementing circular innovation into their products/processes/services at the company level and for innovating their supply chains (align with existing chains/incremental or radical change) at the level of inter-organizational collaborations. By conducting an empirical multiple-case study and positioning its cases into the framework, we elaborate that the theory-based framework conceptualizes the real-world interplay between CBM and CSC innovation. The study investigates manufacturing companies that are challenged with balancing their daily business and resource scarcity under the light of environmentally driven regulative changes and United-Nations-level goals for sustainable consumption and production (Sustainable development goal 12) (Kristoffersen et al., 2020; Lieder & Rashid, 2016). By interpreting the positioning of the cases in the framework, we captured empirical evidence of the different strategic variants of CE innovation and business that were theoretically assumed in the interplay of innovation in the CBM and related CSCs. The identified strategic variants are expected to reflect into diverse CBSs.

In the findings, CBMI appears more focused on products and processes, whereas service-focused CBMIs are scarce in our sample. The innovation of processes, products, and services is interlinked, with one innovation type leading to another over time in strategic development of CE business. For example, we found that process-oriented innovation may trigger product- and service-oriented business model innovations. Hence, CBMI is not dichotomous in terms of what kind of circularity or circular innovation it entails. Looking beyond company boundaries, we find the diverse ways in which companies innovated their supply chains to support their CBMI, including reverse logistics, supply chain transparency systems, and cross-industry collaboration. Radical supply chain innovation appears more restricted in our empirical sample and typically occurs in combination with, or results from, product-oriented CBMI.

Our framework and findings contribute to research on CBMs, CSCs, and innovation management. We capture the diversity of real-world CE business, manifested through theoretically assumed variations in CE innovation and its degree of radicality in simultaneously innovating CBMs and supply chains. We theorized this from CBM and CSC perspectives and found empirical evidence of strategic variants for different circular innovation and related business strategies. We strengthen the understanding of innovation management through insights on the major innovation types in the CE context (Brown et al., 2021) and extend prior CE business research that has only begun to identify the variation in circular innovation types (Engez et al., 2021) and their radicality (Bocken, 2021; Ranta et

al., 2021). In particular, for CBM research, the empirically elaborated framework generates novel understanding of how CE can manifest in the innovating processes, products, and services when companies create, transfer, and capture value in a CE (Franco, 2017; Ranta et al., 2021; Urbinati et al., 2017). For CSCs, identifying the axes of the framework reveals that companies can achieve CE goals through collaborative innovation that simultaneously changes business models and supply chains (De Angelis et al., 2018). The findings encourage managers to explore innovation in both business models and supply chains when managing strategic development of CE business.

4.4 Publication IV: Established companies harness supply chain collaborations for circular business model innovation and strategic development of CE business

Publication IV follows Publication III in extending the research focus from a single company to its CSC collaborations. The collaborations for CSCs play a key role in enabling CE implementation beyond the company boundaries of the CBM (Geissdoerfer et al., 2018a; Hazen et al., 2020) and are an urgent and critically impactful research topic (Farooque et al., 2019). However, CSC research is still young and focused on conceptual syntheses, leaving room for further empirical studies on success cases (Bressanelli et al., 2021; De Angelis et al., 2018; Geissdoerfer et al., 2018a; Govindan & Hasanagic, 2018; Lahane et al., 2020; Masi et al., 2017; Sehnem et al., 2019). Such cases are needed to learn how collaborations in supply chains can enable CBMs, particularly in industrial-scale business characterized by physical circular resource flows. To address these gaps in CBM and CSC research, we ask the following: *When industrial companies design and implement a CBM, how is this reflected in their supply chain collaborations? How do such collaborations support companies in the design and implementation of their CBMs?* The findings of Publication IV provide insights into how industrial companies' CBMI is interlinked with and, more specifically, enabled via supply chain collaborations.

Based on the findings, as our first contribution, we develop a conceptual framework that shows the practices for CSC collaboration in different combinations of CBM value elements (creating, transferring, and capturing value) and closing, slowing, and narrowing of material loops. For value creation, the closing of material loops occurs through collaboration for reverse logistics, industrial symbiosis, and biological materials; slowing occurs through

collaborations for the design for X (e.g., disassembly, standardization) and upgradation of products through R&D activities; and narrowing occurs through collaborations for resource efficiency strategies. For value transfer, the closing of material loops occurs through collaborations for customer engagement/communication and for validating value propositions for closed-loop products; slowing occurs through collaborations for customer/supplier engagement/communication and for sharing platforms (i.e., from producer to producer); and narrowing occurs through collaborations for sharing platforms (i.e., from producer to user). Finally, for value capture, the closing of material loops is facilitated by collaboration for take-back systems; slowing occurs through collaborations for pay-per-use (use-oriented product service systems); and narrowing occurs through collaborations for pay-per-performance (result-oriented product-service systems). In the CE pioneer cases, value creation through closing and slowing material flows was practiced, whereas dematerialization and services were rarely realized via CSC collaborations.

Second, we synthesize broader themes on how supply chain collaborations support companies' CBMI. Accordingly, companies need to focus on managerial practices harnessing CSC collaborations for improving CBMI, product/service development, strategic development, and strategic partnerships. CBMI demands adopting digital technologies and tools that enable and advance CSCs and CBM feasibility; novel CSC collaborations and changes in existing relationships to promote CSCs; and collaborative development of industry and markets, strengthening how companies' CBMs are positioned in the market and in society.

As the third key finding and contribution, a research agenda manifests seven management themes for further studies on CBMs and related collaborations: collaborative managerial practices, business model innovation through CSCs, innovation in CSCs, strategic development via CSCs, digital technologies and tools enabling CSC, novel collaborations for CSCs, and collaborative sustainability- and circularity-oriented industry and market development.

The framework, synthesis, and agenda offer conceptual guidance to scholars and pragmatic guidance to managers. For CE business research, the findings shed light on the understudied intersection between CBM and CSC management (De Angelis et al., 2018; Govindan & Hasanagic, 2018) and the role of collaboration in connecting across supply chains and industries as an important strategic consideration for companies developing CE business. Finally, the findings from success cases help understand company-specific variables, success factors, and best practices in different industrial and geographical contexts.

5 DISCUSSION

Based on the key findings and highlights of each publication, I now synthesize, discuss, and build propositions on how companies can manage their strategic development of CE business. I follow the order of the dissertation RQs, starting from CBS development, moving to innovation of CBMs, and finally to collaboration for CE business. The key findings build a process model, which is introduced at the end of this chapter.

5.1 Developing a circular business strategy in an established company

The first RQ of this dissertation asked the following: *How can established companies develop circular business strategies?* The dissertation findings regarding RQ1 develop an understanding of what CBS development is and how it processually constitutes iterative and overlapping strategic cycles with varying focus areas and intertemporal decision-making as the process unfolds over time (Publication I). This process is influenced by the environmentally burdensome temporal context, initiating a proactive, often radical type of CBS development (Publications I and II). In addition, variation is possible in CBSs depending particularly on the company's strategic choices to innovate CBMs and CSC collaborations (Publication III). Eventually, as CBS development unfolds, it may spill over to other CBSs, pointing to the need of circularity-driven corporate strategy that supports the development and management of co-existing CBSs and other possible linear business strategies (Publication I).

The empirical findings of the dissertation indicate that *CBS development evolves as a process* that needs to be managed in a company over time. This finding brings empirical evidence to CBS development evolving in a similar manner as presented in previous strategic management research for linear business strategies, involving similar key areas of strategic interest like business models and collaborations (Foss & Saebi, 2017; Furrer et al., 2008; Richardson, 2008). Emphasizing the unexamined processuality of CBS development, I build upon

the definition of CBS by Bui et al. (2022) and define CBS development as *a process that describes how a company develops its approach to competing while dealing with sustainability issues through understanding, harnessing, and integrating circular economy principles*. To my knowledge, this is the first research-based definition provided for CBS development. Therefore, it brings clarity to the scattered and narrow CBS research (Bui et al., 2022): discussion and future theory building on CBS and CBS development can be facilitated by a uniformed terminology that distinguishes between the process and the outcome. Furthermore, a definition of CBS development in contrast to linear business strategy development is needed to highlight the integration of CE into business strategy as a holistic business endeavor, in contrast to the development of separate sustainability or environmental strategies, as suggested previously (Papagiannakis et al., 2014; Santa-Maria et al., 2021b). Therefore, circularity inherently manifests at each cycle of strategic decision-making throughout the CBS development, as was particularly well visible in the longitudinal examination of the biofuel company's CBS development.

Indeed, the findings explain *CBS development process to unfold in strategic cycles*, which follow one another and frequently repeat the formulation, implementation, and evaluation of the current CBS. Aligning with prior strategic management research focused on strategy processes (see e.g., Cohen & Cyert, 1973), this finding provides a novel understanding through empirical evidence on the process of business strategy development in the CE context. Nevertheless, these activities inside strategic cycles may not have clear boundaries, as the CBS development process is found to be iterative and overlapping in nature particularly in the longitudinally analyzed biofuel company case. In particular, the end of evaluation and beginning of formulation for a new strategic cycle is rather blurred and characterized by intertemporal decision-making. For example, the biofuel company case simultaneously examined the outcomes of past decisions and extrapolated them into perceived future goals and strategies (Publications I and II). Accordingly, in addition to CE vision and forward-looking practices that resemble dynamic capabilities from prior literature (Bocken & Geradts, 2020; Brown et al., 2021; Köhler et al., 2022), the findings emphasize that the past, including, for example, the organizational culture, creates antecedents and influences for each moment of strategic decision-making, as assumed from environmental strategy research (Papagiannakis et al., 2014) but less discussed within the nascent CBS research. The feedback loops of learning, unlearning, and reflection to past decisions and

perceived future opportunities characterize the CBS development process and highlight its temporal aspects. These findings on feedback loops invite companies to strategically facilitate learning and adopt a strategic learning orientation (Hakala, 2011), which has also been highlighted in prior literature as critical to developing CE business but lacked deeper insights (Brown et al., 2019; Franco, 2017; Santa-Maria et al., 2021a) that they have an important, repetitive role specifically in CBS development.

The findings also show that *strategic cycles have different focus areas* depending on the level of CE integration in the company at a certain moment in time. A critical prerequisite for initiating a proactive CBS development process is experimentation-friendly, innovative pioneering culture and leadership in the established company, which manifested in all the CE pioneer cases. In the first strategic cycles of the CBS development process, the CE pioneer company needs to focus on inventing and developing new technology and process innovations with commercialization potential and on gaining the commitment of top management for large-scale investments as strategic lock-in decisions. As such, both technological and entrepreneurial strategic orientations that focus on the inside of the company (Hakala, 2011) are highlighted in the early steps of CBS development. This was witnessed in major parts of the cases, as also those with more incremental approach to CBS development found it feasible to start with their internal processes. Interestingly, emphasizing the internal strategic orientation in the early steps of CBS development, the insights from biofuel company contrast prior research that considers shared CE visions as a starting point for collaborative CE innovation (Brown et al., 2019; Kaipainen et al., 2023b) and show that an established company with a proactive CBS approach can start with an internal CE vision, enabled and even initiated by internal technology/process innovation, and only after compel the business ecosystem to follow it. In this case, in addition to top management (Govindan & Hasanagic, 2018; Tura et al., 2019), the company needs to actively engage all its employees to its CE vision during the CBS development. Once CE principles are already integrated in the business strategy to some extent, the next strategic cycles emphasize learning, unlearning, and strengthening the company's competences in circularity and leveraging a broad range of collaborations with a particularly strategic scope, aligned with the learning and market orientations recognized in prior strategic management research (Hakala, 2011). Also, prior CE business research has identified similar topics as important indicators for companies' strategic development of CE business (Brown et al., 2021; Bui et al., 2022; Dubey

et al., 2018), which the present findings corroborate with a previously lacking empirical, longitudinal overview and details of their timings during the CBS development process.

Next, the findings indicate that the *context may push established companies to seek a particularly proactive and radical type of CBS*, which has specific characteristics, benefits, and challenges. This was apparent across the cases embedded in particularly environmentally burdensome, diverse industries in CE-driven countries: roughly, the higher the pressure toward environmental action, whether existent or anticipated, in the industry at a specific moment of time due to the combination of environmental impacts and institutional demands from advanced CE-country context, the more radical and proactive the CBS applied. These findings extend prior CE business research that pointed to the need for companies to employ proactive management actions with a long-term perspective (Geissdoerfer et al., 2018a) and introduce novel insights to the business context where such proactiveness in strategic decision-making is particularly important for companies (Jørgensen & Remmen, 2018; Tura et al., 2019). Moreover, the findings strengthen the prior literature that highlighted nurturing organizational culture, leadership, and CE visions as particularly important for the long-term horizon and strategic intention (Santa-Maria et al., 2021b) and emphasized the need for their proactive adoption, particularly in environmentally burdensome industrial and temporal contexts. Even if proactiveness can appear by improving internal processes similarly to what the water packaging company did in exploiting its existing business, a high level of proactivity typically accompanies radicality, which stems from the exploration of novel business opportunities and new competences to propose circular solutions with high novelty for the markets at a certain moment of time in relation to the current status of the embedded context and its perceived future (see Gilbert, 1994; Jarzabkowski, 2004). This finding points to the importance of time and temporality in understanding the context that demands proactive strategic development of CE business, and in being a step ahead of competitors in developing the industry, markets, regulation, and ecosystems to support the CE vision and CBS of the pioneering company. For example, coffee cups as a service company proactively developed new competences, the markets and the ecosystem to support its take-back service of the exhausted coffee cups.

Although the findings focus on proactive CBS development, the multiple-case studies (Publications III and IV) evidence that *different types of CBSs exist in different companies*. The variation in CBSs is manifested through different strategic

decision-making patterns and orientations that companies can follow for innovating CBMs and their supply chains with different practices and degrees of radicality (Publication III; see also Table 10). For example, some companies such as the water packaging and appliances refurbishment companies focused on internal changes with an incremental approach, whereas others such as the ready-to-assemble furniture company and wood-based product company directly innovated not just their internal processes, but also their supply chains with a more radical and external strategic orientation. In addition, the empirical findings point to different strategic approaches for diversifying and transforming the extant business models. Accordingly, the main CBMI types (diversification, transformation, start-up, and acquisition) can be expected to have a corresponding CBS development process (Geissdoerfer et al., 2018b). The variation in CBS development expected based on these findings extends significantly from, for example, the three business strategies proposed for CE business by Puglieri et al. (2022).

The findings reveal that a company may realize a need to separate new CBSs from the existing one and *simultaneously develop co-existing CBSs in one company, possibly alongside linear business strategies under a CE-driven corporate strategy*. In the strategic cycles and particularly during the evaluation of a current CBS and its adequate implementation through a CBM, a company may eventually realize multiple CBSs and corresponding CBMs to be managed internally or separately as spin-off ventures. Indeed, the introduction of CE business offers companies multiple business opportunities through different combinations of innovation, calling for the simultaneous reflection of circular innovation and business strategies (Publications II and III). This was witnessed repeatedly in the biofuel company case, which started with the CBS development process for the transportation fuel business, which spilled over to renewable aviation fuel and plastics with their own CBMs and CBSs (Publications I and II). In established companies, the development of consecutive and parallel CBSs and the piloting of their CBMs can be enabled by parallel linear business which provide resources, finances, and risk reduction, acting as a corporate-level solution for ensuring environmental and economic sustainability successfully yet temporally until the CBSs become self-sustained in the long term. This finding shows that CE implementation offers diverse economic business incentives despite higher risk levels (Linder & Williander, 2017), and is able to balance environmental sustainability and economic development, which has been questioned to date (Kirchherr et al., 2023b). Therefore, at both the corporate strategy (Prieto-

Sandoval et al., 2019; Stewart & Niero, 2018) and the business strategy levels (Bui et al., 2022; Tseng et al., 2022), established companies need to consider CE as an important strategic concern.

The key findings on the CBS development process, including its structuring of strategic cycles with frequent, intertemporal and overlapping strategic decision-making and varying focus areas; temporal and industrial context; ability to generate spin-off CBS; and need for circularity-driven corporate strategy are highlighted in the empirical-based process model in section 5.4. (Figure 3). Given that the process approach to CBS was virtually non-existent in prior literature, the empirical findings on the CBS development process offer novel insights into its meaning as well as the role and timing of previously identified important CBS indicators, such as internal awareness, intertemporal decision-making, and CE visions (Bocken et al., 2016; Bui et al., 2022; Santa-Maria et al., 2021b; Takacs et al., 2022), which emphasize the impact of temporal contextuality (Jørgensen & Remmen, 2018; Tura et al., 2019) and corporate strategy in CBS development (Prieto-Sandoval et al., 2019; Stewart & Niero, 2018). Based on the discussed key findings with case examples, I develop and put forward the following three propositions on CBS development (1.1.-1.3.; see also Figure 3):

- 1.1. Circular business strategy is developed through a complex process that involves iterative and overlapping strategic cycles with varying focus areas and frequent, intertemporal strategic decision-making.
- 1.2. The development of a circular business strategy is largely influenced by the company's strategic decisions in innovating circular business models and supply chains and its embeddedness in different temporal contexts with varying degrees of pressure for CE transition.
- 1.3. Circular business strategy generates new CE business opportunities over time, which may be managed together with other business strategies under a circularity-driven corporate strategy or as spin-off ventures.

5.2 Innovating a circular business model aligned with the circular business strategy

The second RQ focused on innovating a CBM and asked the following: *How can established companies innovate circular business models over time aligned with their circular*

business strategy development? The first step in understanding how CBMs are innovated is to deepen the empirical understanding of the relationship between CBM and CBS, conceptualizing CBMI as a subordinate process mirroring the implementation of CBS development process (Publications I and II). Second, established companies might need to target a radical type of CBMI owing to their environmentally burdensome industrial and temporal contexts (Publications II and I). In practice, innovating a radical CBM is facilitated by selecting and managing a combination of diverse, dynamically interlinked innovations (Publications II and III), and by considering the temporal interlinkages in extant CBMI process types (Publications I and II). Companies can enhance their CBMI processes by recognizing and harnessing the different roles that interlinked innovations take over time also in the CBS development (Publications II and I).

To innovate CBMs in line with CBS, understanding how their relationship manifests in the empirical business world is an evident but under-researched first step for answering the RQ. Here, as a key finding, the dissertation empirically confirms the theoretically assumed relationship between CBM and CBS (see section 2.4.), viewing the business model to mirror the implementation of the business strategy (Richardson, 2008) also within the context of CE business. Thus, I argue *CBMI to be a process corresponding principally to the implementation part in the strategic cycles of the CBS development process*. In other words, according to the findings, CBMI is a process that enables a company to implement its CBS in practice, reflecting the strategic decisions into the activities of the business model. Accordingly, the findings highlight the need for the management of CBMI as a critical part of the CBS development process, emphasizing its strategic role, which in turn underscores the need to integrate strategic considerations into the CBMI process (Puglieri et al., 2022) and consider strategic agility as its success factor (Hofmann & Jaeger-Erben, 2020). The findings also highlight the co-evolving, intertwined nature of the CBMI and CBS development processes and thus the need to adopt a holistic view to CBMI, as part of a company's strategic development of CE business, instead of seeing it as isolated from strategies or from the other businesses of the company. Understanding this relationship between CBM and CBS complements the extant CBM research, which lacks consideration of the strategic aspects in extant CBMI process models (Lopes de Sousa Jabbour et al., 2017; Pieroni et al., 2021).

The identified intertwined relationship between CBS and CBM also explains why many of the managerial practices found to be important in supporting CBMI (Publications II and IV) could enable tackling the management issues also in CBS

development (Publication I) and vice versa. Such practices highlight, for example, the need for multidisciplinary teams to enable learning and competence-building, emotional brand marketing, and supply chain collaborations and provoking industry- and society-wide discussions on sustainability (Publications I, II, and IV). This finding indicates that the rather mature literature on CBM strategies, practices, drivers, and barriers (e.g., Bocken & Geradts, 2020; Geissdoerfer et al., 2022; Urbinati et al., 2021) has knowledge that can be transferred into CBS development. The empirical-based conceptualizing of the two-way relationship between CBS and CBM assumes that this link may be different in different contexts; for example, the multiple-case study findings on e.g., techno-polymers' lamp company allows us to assume that CBMI itself may drive CBS, whereas the findings of the biofuel case and prior research (Gajanayake et al., 2023; Pollard et al., 2021) principally suggest that CBMI was initially guided by CBS.

Next, the findings highlight that especially when an established company operates in an environmentally burdensome industrial and temporal context with institutional pressure for change, *circular pioneers need to adopt a proactive approach to its CBMI, aligned with the related proactive CBS development*. The findings suggest that instead of proactively developing an entirely novel radical CBMI, which is a time-consuming and risky endeavor (Linder & Williander, 2017; Santa-Maria et al., 2021a), established companies can pursue a proactive and radical CBMI by first diversifying their business models. In the same way that CBS development leads to spin-off CBSs, the CBMI process can also lead to spillover CBMs over time. Interestingly, the company can harness the diversified CBMs in the long term to eventually transform the original linear business model. For instance, in the biofuel company case, the company first developed renewable fuel for road transportation in addition to the fossil transportation fuel, which it aims to fully replace in the long run. This finding shows that diversified CBMI may act as a temporal step for CBMI transformation. Accordingly, the findings expand the understanding of the CBMI types recognized in prior literature, which have been considered as standalone processes for transformation, diversification, start-up or acquisition of CBMI (Geissdoerfer et al., 2018a; Santa-Maria et al., 2021b), with insights into the interlinkages in their development over time.

To arrive at a radical CBMI, the case companies often nurtured and pursued different types of complementary innovation. Hence, it appears that particularly *a radical CBMI is characterized by the diversity and interlinkages of innovation types* with overlapping innovation activities within a CBMI. By identifying and exploring

the variation of such innovations in terms of technology, process, product, service, and/or supply chain in the publications, the research complements the understanding on the diversity of CE innovation types, their role, and temporalities in inducing radical CBMI (see Bocken & Antikainen, 2019; Brown et al., 2020; Engez et al., 2021). Depending on the observed time span, the interlinking of diverse innovations in the proactive CBMI process may appear incremental, but in the long run, it results in a CBMI that is radical in comparison with the traditional, linear business models of the industry. Interlinking innovations allows for the temporal context to co-develop with the CBMI process, and as such, enables the balancing of the perceived radicality and the pace of change inside the company and in its business ecosystem. This was apparent in the long-term strategic development in the e.g., biofuel and ready-to-assemble furniture companies, which both needed to first innovate processes to enable product innovation, leading to supply chain and business model innovations.

In practice, the findings show that the companies pioneering in CE business have several ways to initiate CBMI with different innovation types. One is to favor starting from products, as did the techno-polymers' lamp company. Other typical innovation types at the beginning of the CBMI process occur at the material level, including process and technology innovations in the empirical findings, as seen in the soil circulation and textile reprocessing companies (Publications III and IV). These findings could be explained by the work of Bocken et al. (2021), who suggest CBMIs at the material and product levels to be less radical than service-oriented business models (Bocken, 2021), seemingly because they are easier to achieve as they may align with companies' extant business logics and may not require external collaboration. In contrast, companies can directly arrive at a radical CBM by innovating service-oriented CBMs (Publication III), with, for example, rental and subscription models and product–service systems (Bocken, 2021; Tukker & Tischner, 2006; Yang et al., 2018). However, although services are a viable and effective option to enhance the value proposition and redesign the value chains of a business model (Velamuri et al., 2013), they appear more restricted in the empirical findings, as observed in Publication III with few examples such as product as a service business models in manufacturing tools and coffee industries. When an innovation at company-level processes, products, and/or services is paired with an innovation at the supply chain level, the findings indicate that supply chain collaborations enable a more radical CBMI with varying possibilities and

practices in developing value creation, transfer, and capture of the business model (Publications III and IV). This finding facilitates a deeper understanding that motivates sustainable innovations in supply chains, as requested by prior research (Gandolfo & Lupi, 2021). However, supply chain innovation alone is not necessarily radical, as in the case of the construction company circulating surplus soil land masses (Publications III and IV), but rather a catalyst for radical CBMI.

In addition to finding diverse interlinked innovations that co-develop for CBMI, I find temporal insights into *circular innovations interacting not only with CBMI but also with CBS development in different roles over time*. The innovations that constitute the CBMI process and CBS development can support one another with timely actions: in Publications I and II, the proactive development of technology innovation by the biofuel company catalyzes the development process of CBS and its CBM. Over time, the technology innovation shifts to support the developing CBS and its CBM, and the possible spin-off CE businesses. This finding on the importance of technology innovation, in particular, is attributable to choosing a technology company case in Publications I and II; however, it is aligned with prior research that emphasizes technology innovation for CBMI and considers it as a key challenge (Antikainen & Bocken, 2019; Gandolfo & Lupi, 2021). Yet, this finding does not imply excluding the importance of other types of innovation in not only initiating a CBMI but also CBS development. Thus, rethinking companies' innovation approaches is indeed a major strategic undertaking for companies pursuing circularity, as indicated also for sustainable business (Seebode et al., 2012). Accordingly, the findings emphasize that co-developing circular (business model) innovations and CBSs is necessary in companies' strategic development of CE business. This co-development and its challenges and management actions can be supported by collaboration for CE business (see section 5.3).

The key insights to answering how to innovate a CBM aligned with CBS development focus on the radical type of CBMI, which is found to mirror the implementation of radical CBS development, highlighted in the process model in section 5.4. (Figure 3). The findings extend the previous, largely static CBM research (Frishammar & Parida, 2019; Hofmann & Jaeger-Erben, 2020; Pieroni et al., 2019) with the understanding that CBMI is a process that involves diverse interlinked innovations, which allow for balancing the radicality of change in the company and its ecosystem. CBMI leads to different degrees of circularity in the CBM unlike prior dichotomously-oriented CBM discussions and it may evolve

from one CBMI type to another. The key findings and provided case examples support the following three propositions on CBMI (2.1.-2.3.):

- 2.1. In successful strategic development for CE business, circular business model innovation mirrors the implementation of circular business strategy development as its subordinate and closely intertwined process with an aligned degree of radicality.
- 2.2. Innovating a radical circular business model can be facilitated by selecting and managing a combination of diverse, dynamically interlinked innovations, which can play different roles over time in supporting the concurrent circular business strategy development and facilitating temporal alignment with the ecosystem development.
- 2.3. Diversification can act as a temporary stage in the long-term transformation of circular business model, suggesting temporal interlinkages for the extant circular business model innovation types.

5.3 Collaboration supports circular business strategy development and related circular business model innovation

The third RQ addressed the following: *How can collaboration support established companies in their strategic development of CE business*, referring to both CBMI and CBS development. As already expected based on prior literature that highlights collaboration for CE business (see e.g., Bloise, 2019; Brown et al., 2018), the criticality of collaboration for strategically developing CE business manifested in all of the publications, even the ones that did not frame collaboration as their central concept. Prior research has identified that collaborations, particularly in the supply chain, are part of company strategy for a CE (Govindan & Hasanagic, 2018; Hazen et al., 2020); this research explored the role of collaboration in the strategic development of CE in the following intertwined key findings answering RQ3. First, to fully leverage collaboration in the strategic development of CE business, it must be considered as a strategic issue that directly supports not only CBMI but also CBS development (Publication I). Collaboration provides access to feedback loops that strengthen the CBS development process (Publication I) and accelerates radical CBMIs (Publication III) when harnessed with collaborative managerial practices for CBMI (Publication IV). Collaboration

allows other organizations to be engaged with the company's CE visions in long-term strategic partnerships (Publications I, II, and IV), where collaborators can hold multiple roles during strategic development of CE business over time (Publication II). Consequently, collaboration allows timely ecosystem development aligned with CBS development (Publications I and II) through, for example, new collaborations and changes in the CSC relationships and collaborative industry, market, and regulation development (Publications I, II, and IV). The identified extensive sets of collaborative managerial practices, actions, and issues (Publications I, II, and IV) provide tools for harnessing the abovementioned strategic benefits of collaboration.

First, I argue that *managing collaboration for CE business needs to be considered as a strategic issue that directly impacts CBS development*. Beyond the identified collaboration practices for CBM's value creation, delivery, and capture (Publication IV), companies need to consider collaboration as a key strategic tool supporting CBS development to broadly innovate, strategize, digitalize, and shape regulative institutions and markets (Publications I–IV). These findings highlight the strategic role of collaboration, which has attracted surprisingly little attention even though CE is recognized to require particularly long-term relationships based on mutual trust, opportunities, and shared CE visions (Brown et al., 2021). The findings highlight the need for managers to adopt a more systemic perspective (Fehrer & Wieland, 2021; Konietzko et al., 2020; Rovanto & Bask, 2020): to not only start and remain within their internal boundaries when focusing on CBS development and CBMI but also expand their view into their existing and potential collaborations. Indeed, building on the extant research that promotes the importance of collaborations for CE business, this research finds collaborations to bring along fundamental strategic decisions in established companies' innovation and business management, reflecting and enabling their business strategies and overall strategic development of CE business (Publication III and IV).

Second, prior research suggests that positive feedback on sustainability endeavors is critical for accelerating sustainable strategic development in companies (Papagiannakis et al., 2014). Based on the empirical evidence obtained in this research, this finding is also applicable for circularity. The findings deepen the insights related to RQ1 by signaling that *collaboration is a useful way to generate feedback loops for the intertemporal strategic decision-making* regarding circular endeavors in a company. Repetitive positive feedbacks collected through collaboration in the strategic cycles of CBS development create feedback loops, which encourage

companies and accelerate their efforts in pursuing strategic development of CE business. Accelerated efforts may lead to more radical CBMs being pursued, particularly if the focus is on collaborations and innovated upstream and downstream supply chains (see also section 5.2.). For example, increased customer engagement with collaborative circular take-back service of label material waste motivated the wood-based product company to continue its CBS development and expand the CE business (Publication IV). Collaboration can also facilitate the turning of negative feedback into a source of CE knowledge and learning from critics, as the biofuel company did with resistance faced by non-governmental organizations (Publications I and II). This finding indicates a new way for collaboration to support joint learning and co-development, which is particularly important to reveal for facilitating CE business (Brown et al., 2018). Thus, negative feedback does not cease the strategic development of CE business (Franco, 2017) if it is harnessed through collaboration. Instead, it can enable an increased level of CE integration into business strategies. This finding allows us to expect that the manifold barriers and challenges in developing CE business identified in prior research (see e.g., Guldmann & Huulgaard, 2020; Urbinati et al., 2021) are not only an inherent but also an important and even beneficial part of a company's journey to CE if harnessed through collaborative feedback loops.

Prior research indicates that shared CE visions are an important foundation for collaboration in CE business (Brown et al., 2021; Leising et al., 2018). However, the findings show that companies can struggle with finding collaborators with shared CE visions owing to their underdeveloped business contexts in terms of CE (Publications I and II). Hence, it seems particularly relevant to CE business, as opposed to the linear economy, that *limited available CE-visioning actors take different yet parallel roles and are engaged in strategic partnerships* to overcome multiple challenges in the CBMI process stages; by doing so, they can also strengthen CBS development. Parallel roles mean that the same actors that are important in early stages of CBMI and CBS development can play varying roles in later stages of these processes. For example, customers may allow piloting the circular offerings when they are still being developed, and later they may collaborate in long-term partnerships and act as references for marketing the circular offerings, as in the wood-based product company and biofuel company cases. Thus, it is important to engage existing and new partners over time in collaborative CE innovation and shared CE visions in line with the CBS, as already suggested for the CBMI process (Brown et al., 2021).

Finally, collaboration is found to be a strong means for companies to take strategic action in *developing their CE business ecosystems toward the direction that fits with their CBSs and CE visions*. To achieve this, the findings highlight *the importance of timing and temporality of collaboration for CE business*. By playing a proactive role in collaboration, the company can capture a central position in orchestrating not only supply chains and networks (Saccani et al., 2023; Zucchella & Previtali, 2019) but entire business ecosystems toward a shared CE vision that fits with its own. Here, well-timed collaboration is needed at different stages of the CBMI and CBS development processes to proactively follow and drive the collaborative industry, market, and regulative development, which are key concerns for CE business (Bressanelli et al., 2022; Urbinati et al., 2021). In practice, collaboration allows the company to over time overcome the challenges, related to, for example, gaining trust and credibility to the CE vision, shaping the industry norms, and ensuring the continuity of the CE business (Publications I, II, and IV). The findings show that by harnessing the parallel roles of its collaborators early on, companies can engage strategic partners and facilitate coordination between them within the business ecosystem practically (Santa-Maria et al., 2021b) and in a timely manner. This allows collaboration to align other organizations with the company's own CE vision, supports CBS development, and matches the pace of change in the company with that of the ecosystem as a key strategic consideration of the company (Ben-Menahem et al., 2013). Moreover, the findings align with the consensus in extant CE business research that collaboration plays an important role in building partner networks beyond the existing and traditional ecosystem boundaries—for example, to access geographically and/or industry-wise new markets, feedstocks, and knowledge related to circularity, as in the biofuel company case.

In conclusion, these findings complement prior research that identified collaboration as important for CE business but lacked practical examples or empirical insights to its strategical roles. The empirical findings show that timely, proactive collaboration, as a strategic means to engage strategic partners and orchestrate ecosystems (Santa-Maria et al., 2021b; Zucchella & Previtali, 2019), ensures that companies' CBMs and related CBSs are legitimate and supported outside the company at any given time. Based on the case examples and the derived findings on collaboration for CE business, I suggest the following three propositions (3.1.-3.3.):

- 3.1. Collaboration for CE business is a key strategic consideration for established companies that enables not only circular business model innovation but also circular business strategy development through, for example, generation of feedback loops.
- 3.2. To pursue its own CE vision, a company can harness collaboration for engaging new and aligning existing partners, who can hold possibly parallel roles over time.
- 3.3. Collaboration enables companies to align their business ecosystems with their CE visions and circular business strategies, through the development of industry, markets, and regulation.

5.4 Synthesis of key findings: Process model on proactive strategic development of circular economy business in established companies

Prior research has only opened the door and taken the first steps in understanding the strategic aspects of designing a circular business, often looking at CBMs as a standalone concept (Zucchella & Previtoli, 2019) without explicit connection with related CBSs. The findings of this dissertation show that CBS development and CBMI not only intertwine inside a company that is strategically developing CE business but are also always embedded in the company's industrial and temporal context, and need to interact with this context via collaborations for CE business. When embedded contexts, characterized by their time-bound institutional and market logics, urgently necessitate CE transition due to environmental burdens, established companies need to act proactively and often radically to strategically develop CE business. Practically, the success cases evidence that the more environmentally burdensome and unaligned the current business of established companies is temporarily perceived under the light of industrial, institutional, and market-based norms, the more proactive and radical the approach typically needed to strategic development of CE business. Therefore, CBS development in a pioneer company is characterized by proactivity that implies certain focus areas and challenges identified in this research, such as the need for early collaborations for ecosystem development that align with the company's own CE visions and CBS development.

Synthesizing the empirical findings on the simultaneous and intertwined processes of CBS development (RQ1) and CBMI (RQ2) and the continuous

collaborations needed to support them (RQ3), I build a conceptual process model (Figure 3). The process model represents the strategic development for a profitable business in an established company that wants to become a CE pioneer in an environmentally burdensome industry. This process is characterized by the need for proactivity and radicality, leading to specific timely challenges and their management. The visualization of the process model focuses on simplifying established companies' proactive strategic development of CE business, and its more detailed description is provided in the following text. This conceptual process model is valuable for answering the calls for a comprehensive strategic framework that allows companies to implement CE in practice (Halonen et al., 2019; Hofmann & Jaeger-Erben, 2020; Urbinati et al., 2017) in the key areas of the multifaceted strategic development for CE business.

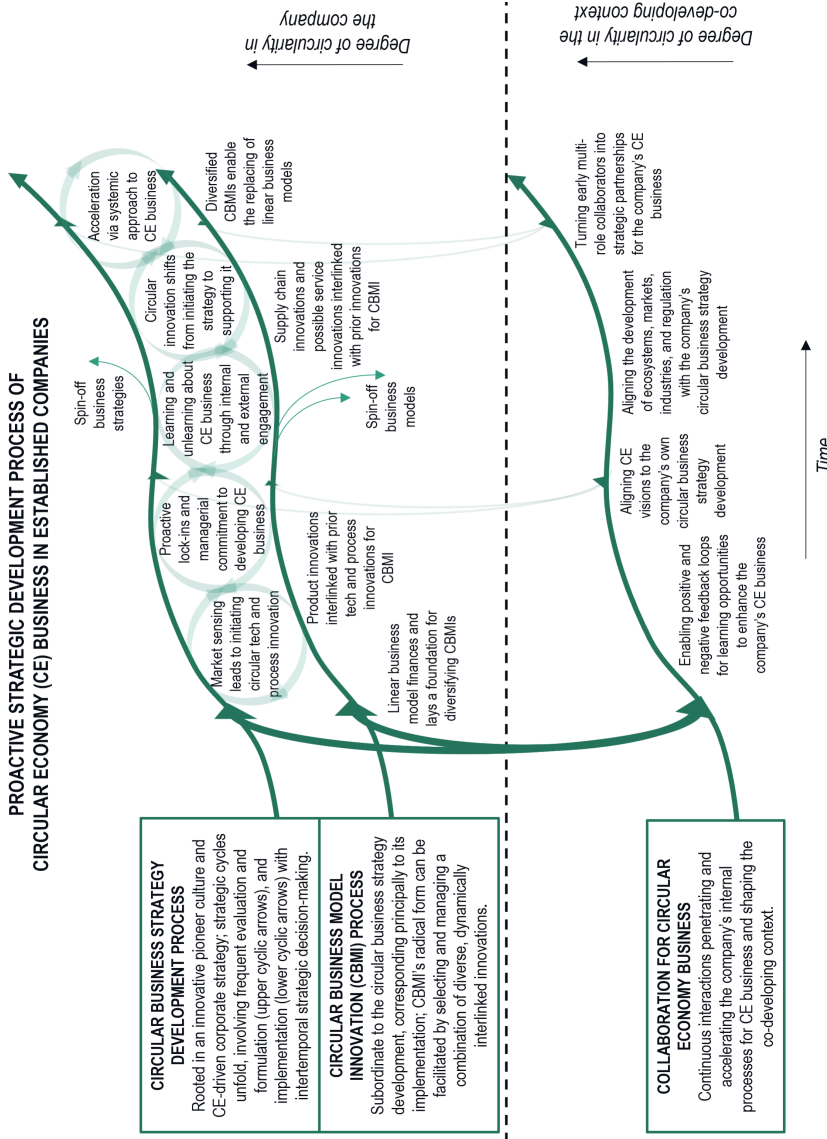


Figure 3. Process model on proactive strategic development of CE business in established companies: Synthesis of the empirical findings on circular business strategy development, circular business model innovation, and collaboration for CE business

In the process model, the curves display that proactive strategic development of CE business initially progresses fast, through innovating, sensing the markets, engaging top management, making important lock-in decisions, and leaning on the extant linear business model and the innovative pioneer culture of the company prior to CE transition. However, the often-radical changes for learning new competences and exploring new business opportunities (Jarzabkowski 2004) caused by circularity bring different challenges and even conflicts, which might temporarily hinder progress, as indicated in the more horizontal than vertical progress of the curves over time in relation to the degree of circularity in the company and in the co-developing context. By solving challenges through the knowledge and engagement of own employees and key external collaborators, among other managerial actions found in the publications, the company eventually accelerates the intertwined curves in the process model that together represent the strategic development of CE business that occurs inside the company. This shape of the intertwined curves emphasizes that although the company can progress fast with early top management commitment and internal action, CE-related challenges can significantly hinder the progress even in a relatively late stage before finally accelerating the strategic development of CE business, in contrast to seminal process frameworks in linear economy, such as the innovation S curve (Rogers, 2010). Moreover, although the process model could potentially be applied to understanding other types of strategic development, the specific CE-related focus of each strategic cycle and the highlighted role of collaboration throughout the process make it distinctive for strategic development of CE business.

In reality, the process is iterative; throughout the CBS development process, strategic cycles repeat themselves, much like the strategy processes in a linear economy (Van de Ven, 1992). During each strategic cycle, a company formulates, implements, and evaluates its CBS. In the process model, these cycles are simplified into two cyclic arrows: the upper one represents the overlapping evaluation and formulation of CBS and the other below represents the implementation of CBS through CBMI. These cycles symbolize the constant interplay between CBMI and CBS. A company conducts intertemporal strategic decision-making throughout the process, but particularly at each intersection of the strategic cycles when shifting to a new strategic cycle, by looking forward and estimating its perceived future business opportunities, and by considering the success of past sustainability and circularity endeavors. Here, the frequent

positive and negative feedback particularly from collaborations plays a central role; positive feedback enabling encouragement, and negative feedback providing learning opportunities. These findings paint a comprehensive picture of what CBS development entails and how it is constituted over time as a process.

As a key part of strategy implementation (Richardson, 2008), a CBM is a time-bound reflection of the implementation of the current CBS. Therefore, in the process model, CBMI is displayed as subordinate to the CBS development process. The more proactive the company is in driving CBS development, the more radical are the related CBMIs in the empirical research, vis-à-vis the temporal development stage of the ecosystem regarding CE transition; vice versa, companies with a more incremental approach to CBS development showcased more incremental CBMI. The empirical findings regarding RQ2 show that companies favor managing a radical type of CBMI process by linking diverse innovations, starting with technological/process innovation within their internal processes, which translates over time into product innovation and a radical CBMI, combined with innovation in collaboration with supply chain actors. This, in turn, implies the need for innovation management in CBMI aligned with CBS development. Among the identified innovations that contribute to CBMI, no one is claimed to be more valuable than the other, but certain innovation types (e.g., service, supply chain) seem to be more challenging and radical for established companies to pursue directly than other ones displayed in the process model (e.g., process, technology, product). Established companies appear well positioned to manage various types of innovations owing to their resources, but face many other challenges, including internal resistance to the new strategic direction and lack of legitimacy in the business ecosystem for their CBMI.

Managing the intertwined processes of CBS development and CBMI demands the consideration of not only innovation inside company boundaries but also how innovation reflects into collaborations. Diverse collaborations play important and varying roles over time during the strategic development of CE business, which can be visualized as a continuous curve of a processual nature below the curve of CBMI and the dashed line that indicates company boundaries in Figure 3. Collaborative and repetitive interactions continuously provide inputs to the internal processes in an established company's strategic development of CE business, as presented with a few illustrative arrows penetrating the processes of CBMI and CBS development in Figure 3. Collaborative innovation in the supply chains is found to be particularly important for accelerating established companies' radical CBMI. Through harnessing various managerial practices,

collaboration allows the engagement of strategic partners who can provide resources, knowledge, and feedback for supporting the concurrent CBS development and CBMI processes in a timely manner. Strategic partnership is highlighted in the findings in the later stages of CBS development, but interestingly, it results from early collaboration, at the beginning of the CBS development and CBMI processes that receives strategic importance over time. Collaborators take on different roles over time in supporting the company's strategic development of CE business—for example, initially providing legitimacy and learning opportunities, later facilitating collaborative business exploration and the scale-up, which is evidenced challenging for established companies, and not only for start-ups as reported in prior literature (Han et al., 2023). Moreover, as circularity is yet an emerging theme in the business world, collaboration allows timely business ecosystem, industry, market, and regulation development because it engages other critical actors in the company's own CE vision and CBS. This is illustrated with two-sided arrows that indicate collaboration not only providing inputs to the internal processes of the company but also influencing the external business ecosystem.

The process model shows that although linear business model serves as a foundation for first diversifying CBMIs and finances them, the innovated CBMs may eventually replace them. Along strategic development of CE, companies may develop spin-off CBSs and CBMs to be managed within the company or outside of it in spin-off ventures, as displayed in the small arrows departing from the main curves in Figure 3. Empirical evidence suggests spin-off CE business opportunities to be characteristic of a long and multifaceted strategic development process toward CE business in established companies, as CE business provides many new ways of rethinking the business. Interestingly, spin-off business opportunities may present discontinuities or even disruption in the other business strategies of the company. Simultaneous CBSs, together with other possible business strategies of an established company, need to be managed under a circularity-driven corporate strategy, which is presented as the starting point for CBS development in the Figure 3.

Finally, in developing the process model, I initially assumed that companies' strategic development process starts from linear business strategy and its linear business model, which over time is changed into a CBS and the related CBM (see also Figure 2). This assumption simplifies real-life situations where established companies may already have CE principles integrated to their business logics, even subconsciously. Such companies may position themselves to a later point

of time in the curve based on their status of business. For example, the textile re-processing company benefitted from its initially sustainable business logics and could fast advance to developing service-based CBMIs. Indeed, during the process, companies may find themselves at different standpoints: although all studied case companies are CE pioneers in their industries, some of them have already arrived at radical CBM(s) by exploring novel opportunities and competencies (e.g., biofuel company) that differ from and even shape the current industry standards, in contrast to the ones still in the early steps of the process model with an incremental and internally focused approach to leveraging on existing competences and business opportunities in their CBS development (e.g., soil circulation and water packaging companies). However, interestingly, the findings on strategic development of CE business do not seem to have a clear ending, which may be expected based on literature that discusses CE business as an outcome or an end goal and served as the initial ontological assumption of this research. Thus, the findings emphasize a need for continuous, processual iteration of strategic development for improved circularity over time, which is displayed by the main curves in the process model.

6 CONCLUSIONS

This research employed a process approach to explore how established companies can manage their strategic development of CE business by focusing on CBS development, CBMI, and collaborations for CE business. The findings contribute to not only research on the CE business field but also practitioners’ work. Finally, the research is concluded with limitations and avenues for future research.

6.1 Theoretical contributions

This research makes multiple contributions that advance research on CE business, particularly on established companies’ strategic development of CE business. The theoretical implications of the findings are relevant particularly to the streams of environmental sustainability in business strategies, with a particular focus on CBS; CBM; and collaboration for CE business. Next, I summarize the theoretical implications per dissertation RQ and the overall objective in Table 14. followed by their detailed discussion.

Table 14. Research gaps and theoretical implications of the findings

Literature	Research gaps	Theoretical implications of this research
Stream of environmental sustainability in business strategy, and particularly the emergent sub-stream of CBS Bui et al., 2022; Engert et al., 2016; Gajanayake et al., 2023; Nielsen & Hakala, 2022; Papagiannakis et	<ul style="list-style-type: none"> - Lack of understanding on how CBS development is conceptualized. - Lack of knowledge on managing CBS development over time in practice and building competitive advantage by integrating environmental sustainability into business strategy. 	<ul style="list-style-type: none"> - Defines CBS development and puts forward related propositions to understand and promote the conceptual and pragmatic importance of the concept. - Conceptualizes this process as unfolding through strategic cycles—involving intertemporal strategic decision-making; different strategic focus areas and orientations; and CBMI, which is a key element mirroring its implementation—and accordingly generating insights on anticipating real-life CBS development and accelerating it as a continuous business endeavor. - Provides insights into and develops a process model for a proactive, often radical type of CBS in established companies, which is critical in understanding company-centric yet collaborative CE transition in environmentally burdensome temporal contexts.

Literature	Research gaps	Theoretical implications of this research
al., 2014; Tseng et al., 2020		- Identifies different strategic variants for CE business, anticipating the emergence of different types of CBSs.
Stream of circular business models Bocken & Konietzko, 2022; Geissdoerfer et al., 2020; Ferasso et al., 2020; Pollard et al., 2021; Ritala et al., 2023; Santa-Maria et al., 2021b; Urbinati et al., 2017	- Lack of understanding of CBM's role and relationship with CBS and companies' overall strategic development of CE business. - Limited processual views, empirical evidence, and frameworks to understand how CBMI can be managed in established companies over time.	- Provides empirical understanding and develops propositions of CBMI as a subordinate process and key component for implementing CBS, which highlights the importance of frequent evaluation and innovation of the CBM, resulting in either its alignment with CBS or separation into spin-off CBMs. - Extends CBM research with the understanding of CBM as not a dichotomously circular concept, in which diverse innovations with varying degrees of radicality dynamically interlink and enable particularly established companies to continuously approach and manage a radical CBMI over time aligned with the ecosystem development. - Suggests temporal interlinkages between extant CBMI types, specifically diversification to facilitate CBMI transformation in the long-term.
Stream of collaboration for CE business Brown et al., 2018, 2020, 2021; Konietzko et al., 2020; Köhler et al., 2022; Mishra et al., 2019; Zucchella & Previtali, 2019	- Under-researched how to manage collaboration, with whom, and for what purpose as a strategic issue contributing timely to companies' strategic development of CE business. - Overlooked role of collaboration for CBS development. - Underexplored empirical cases to dive deeper into the emergence and contexts of collaboration for CE business.	- Puts forward propositions that contribute to the empirical understanding of collaborations directly supporting not only CBMI but also CBS development with varying roles over time. - Highlights the importance of recognizing that collaborators' roles may change over time from early engagement for strategic collaboration to later stages of the strategic development of CE business. - Builds new understanding to harnessing timely collaboration to align the pace of development in CBS and in the surrounding business ecosystem. - Provides an extensive set of collaborative managerial practices for different organizations and purposes to facilitate harnessing the benefits of collaboration.
Field of CE business research focused on established companies Bocken et al., 2016; Centobelli et al., 2020; Ferasso et al., 2020; Gandolfo & Lupi, 2021; Halonen et al., 2019; Ritala et al., 2023; Urbinati et al., 2017	- Limited company-centric understanding on implementing CE as a strategic phenomenon with long-term implications for business. - Under-researched process approach in understanding the strategic change of business for circularity through comprehensive, strategic framework(s). - Need for further empirical evidence of successful cases ensuring economic and environmental sustainability through	- Integrates research on CBS, CBM, and collaboration for CE business in a novel way to compose propositions and an empirical process model as a strategic management framework that acknowledges the temporality of change for CE in established companies and connects the key areas of strategic development of CE business. - Highlights CE as a key strategic concern not only at the CBS level but also at the corporate strategy level, building theory toward considering CE within the established company's corporate strategy to efficiently manage CBS(s) and other business strategies over time. - Theorizes contextuality beyond specific industries to understand how established companies can manage strategic development of CE in environmentally burdensome temporal contexts. - Extends current company-level CE business research to investigate a company's interactions with chain- and ecosystem-level CE transition, and methodologically

Literature	Research gaps	Theoretical implications of this research
	strategic development of CE business.	advances the use of processual approach in CE business research with various tactics.

First, the findings put forward an important message on positioning CBS as a theoretically and pragmatically critical concept that is only recently emerging in the *stream of environmental sustainability in business strategy and particularly within its sub-stream on CBS*. The findings shed light on the ambiguous concept of CBS, indicating what CBS actually means in contrast to other similarly utilized concepts, such as circular design strategies and CBM strategies (Bocken et al., 2016; Franco, 2017) or environmental sustainability strategies (Engert et al., 2016; Papagiannakis et al., 2014). Based on the dissertation findings and building on the work of Bui et al. (2022), I propose the definition of CBS development: *CBS development is a process that describes how a company develops its approach to competing while dealing with sustainability issues through understanding, harnessing, and integrating CE principles*. The adopted process approach challenges the static conventions of CE business research and more realistically captures the dynamics of CBS development, revealing it to be characterized by iterative strategic cycles with intertemporal strategic decision-making that can define the success or failure of the business. The CBS stream is extended with manifold, timely managerial issues and practices both inside and outside the company boundaries, leveraging on collaboration throughout CBS development. A novel conceptualization of the CBS development process that links across CE business and strategic management fields is an important step in theory development (see Lindgreen et al., 2021), and it allows for further building the theoretical understanding of the development of CBS, similarly to recent CBMI process studies in the literature (Pieroni et al., 2021; Pollard et al., 2021; Puglieri et al., 2022).

In particular, the findings provide insights into the proactive CBS development process, which is critical for environmentally burdensome temporal contexts. These insights allow researchers to understand the contextuality of CE business (Castro-Lopez et al., 2023; Jørgensen & Remmen, 2018; Tura et al., 2019) and facilitate the CE transition where this is most crucially needed. As an implication of the strengthened understanding of CBS, the findings argue that the following are vital to proactive CBS development: circular-oriented innovation management, strategic lock-ins with investments to CE business, sustainability- and CE-oriented competence building and unlearning of old practices, engagement of top managers and employees with a CE vision, and strategic partnerships for CE business. Moreover, the findings indicate that different alternatives exist for developing CBSs

beyond those already suggested (Puglieri et al., 2022), with different combinations of innovation and different degrees of radicality at their core. This shows the CBS research the existence of different CBSs, which portray varying degrees of radicality, thus warranting further investigation on their impacts on the different types of companies and under different conditions.

Second, for *CBM research*, the theorized insights from the empirical success cases extend beyond prior static research that investigated “what” are CBMs and what are their drivers and barriers (Geissdoerfer et al., 2022; Pieroni et al., 2019; Urbinati et al., 2021; Zucchella & Previtoli, 2019) by adopting a novel ontological process approach and showing through empirical examples “how” strategic development of CE business unfolds as a continuous process of intertwined CBMI and CBS development. Showcasing this in a process model (Figure 3) provides a previously missing, empirical CE framework that guides companies in taking CBMs systematically as part of their strategy and into development actions (Geissdoerfer et al., 2020; Halonen et al., 2019; Hofmann & Jaeger-Erben, 2020; Urbinati et al., 2021). The findings particularly contribute to the CBMI process stream with new understandings of CBMI as a process that subordinately interplays with CBS as a key vehicle for strategy implementation, demanding frequent evaluation and updates to properly mirror the CBS over time or otherwise create spin-off CBMs. Hence, the findings suggest that CBMs alone will not solve the issues of implementing efficient CE business if they lack strategic orientation and alignment with the CBS, complementing extant CBMI process models with strategic aspects (Lopes de Sousa Jabbour et al., 2017; Pieroni et al., 2021; Ünal et al., 2019).

The longitudinal findings on CBMI showcase that diversifying a CBMI may lead over time not only to spin-off CBMs but also possibly to transformation of the linear business model, which provides temporal insights into the interlinkages of CBMI types previously considered as standalone concepts (Geissdoerfer et al., 2018a) and augments the limited research on the integration of CE into the existing business models in established companies (Franco, 2017; Gandolfo & Lupi, 2021; Lewandowski, 2016). Moreover, as highlighted in the most recent CBM research (Ranta et al., 2021; Urbinati et al., 2017), CBMs appear not dichotomously circular but can involve varying degrees of circular change implemented through diverse innovation and managerial practices for innovating CBM’s value delivery, creation, and capture (e.g., Publication IV); this has been called for in prior CBM research (Geissdoerfer et al., 2020). The findings extend CBMI research focusing on established companies, claiming that they can succeed in their proactive strategic development of CE business by gradually starting with incremental improvements

and innovation at the material and product levels, as already suggested by Bocken (2021), and proceed to more radical CBM through combinations of diverse innovation, particularly paired with supply chain innovations as the CBMI progresses. This way, a company can balance the perceived radicality of its CBMI process temporally and match its pace with that of the co-developing business ecosystem, which is a key insight into managing CE business with ecosystem orchestration in a practical manner (Santa-Maria et al., 2021b).

Third, for the stream on *collaborations for CE business*, the findings strengthen the recognized importance of looking beyond the company boundaries in CE business (Brown et al., 2018; Köhler et al., 2022) and particularly investigating the intersection of CBM and CSCs (Geissdoerfer et al., 2018a) to gain resources, knowledge, feedback, and other support for the intertwined CBS development and CBMI processes. Insights on collaboration as a means to turn negative feedback into opportunities for learning contribute to understanding how to harness CE challenges for strategic CE integration (see e.g., Guldmann & Huulgaard, 2020; Urbinati et al., 2021) instead of letting negative feedback to cease CE business development (Franco, 2017). In particular, the findings provide new insights into the direct, timely impact and roles of collaboration on CBS development, which were lacking in prior research suggesting that collaborations principally, even solely, enable CBMs (Bocken et al., 2021; Brown et al., 2018; Fehrer & Wieland, 2021). In understanding collaborations in CBS development, owing to the process approach, empirical findings reveal that collaborations have significant, often varying, and parallel roles during companies' strategic development of CE business. Hence, early collaborators need to be engaged for strategic partnerships so that they can support the strategic development of CE business with increasing importance over time in parallel roles activated in different stages of the process. Here, the findings provide new insights into the roles and importance of collaborators for CE business (Lüdeke-Freund et al., 2019). This adds novelty to prior research, which has considered co-evolution between actors over time at a conceptual level (Aarikka-Stenroos et al., 2021) but rarely adopted a process approach to understanding the real-life dynamics involved in collaborating for CE business. The new insights suggest harnessing collaboration in a timely manner with an extensive set of collaborative managerial practices, adding to prior research on CBM's managerial practices (Ünal et al., 2019; Urbinati et al., 2017) from a collaborative perspective.

Collaborations allow companies to take proactive measures in balancing the pace of change toward circularity between the company and its business ecosystems, industry, regulation, and markets. These insights add to prior studies that highlight

the systemic nature of CE business (Fehrer & Wieland, 2021; Rovanto & Bask, 2020) and orchestration of networks and supply chains (Saccani et al., 2023; Zucchella & Previtali, 2019) while considering collaboration as an important, concrete means for companies to proactively shape the context where they are temporally and systematically embedded. Overall, the findings promote the strategic importance of collaboration for CE business, which has already been referred to in the literature (Hazen et al., 2020; van Tilburg et al., 2022), but rarely considering its temporal angle, which enables companies' to harness collaboration timely in the business ecosystem and accelerate their strategic development of CE.

Finally, this dissertation contributes to the *CE business research field* with broad insights, propositions, and a process model, going beyond particular subject matters in different streams for more comprehensive and influential theory development in established companies' strategic development of CE business (see Alvesson & Sandberg, 2011). The findings theorize the impact of contextuality in companies' strategic development of CE business, going beyond specific industries (Pollard et al., 2021) and toward understanding environmentally burdensome temporal contexts with added institutional pressures. Notably, the findings uncover in a novel, integrative way how established companies' CBS development, CBMI process, and collaborations can interactively be managed when proactively turning the business to circular over time. As such, the current assumptions of CBMs to be sufficient and lead to a fully circular end goal in CE business development are challenged and need to be further challenged to understand the continuous improvement in strategic development of CE with more CE business research from process and strategic management perspectives. Through this research, companies can understand their critical role in proactively applying CE through strategic development as a long-term business endeavor that reconciles the ever-present need for corporate profitability to stay economically sustainable while driving sustainable development in their own operations, collaborations, and the society (Chen et al., 2020; Rovanto & Bask, 2020).

Importantly, a process approach (Langley et al., 2013) allowed the novel, comprehensive insights to be conceptualized in a process model. It provides much-needed clarity and understanding on how CE can be implemented in companies with a strategic approach, which has been called for in prior research (Halonen et al., 2019; Trigkas et al., 2020; Urbinati et al., 2017). Here, considerations of temporality are stressed, as everything is time-bound in business: even how CE is perceived and how radical circular actions are considered at a certain moment in time in the company and within its institutional context, both of which have their own paces of change to be aligned. Recognizing the temporal embeddedness of business contexts

and adopting a first-mover mentality—with the help of the process model and the propositions—enables established companies to match the temporalities for their advantage (see Guldmann & Huulgaard, 2020). This processual and temporal view has remained underexplored in prior research, with only emerging expectations without business strategy considerations mainly in the CBMI process sub-stream (Pieroni et al., 2019; Pollard et al., 2021), but is recognized to have potential for understanding, for example, the innovation processes for circularity (Brown et al., 2021). Application of a processual approach and findings on the impacts of temporality are valuable for CE business research particularly because they provide insights into how CBSs and CBMIs are interactively developed over time and how the role of innovation and collaboration manifests and changes during these processes. To advance the processual understanding on strategically developing CE business, this research contributes also with methodological understanding to the use of various tactics compatible with a process approach, such as employing an ecosystem mapping software for tracking the development of business ecosystems over time (Publication II).

The findings contribute to understanding CE as a key strategic, holistic concern for companies not only at the CBM level and in the related CBS but also at the corporate strategy level. As different CBSs are found to co-exist in a company with linear business strategies, similar to diversification CBMIs co-exist with linear business models (Geissdoerfer et al., 2018a, 2020, 2022), the findings show that they need to be not only managed in the corporate sustainability strategy (Stewart & Niero, 2018) but also holistically embedded into corporate strategies (Kuhlmann et al., 2022). Here, linear business can finance and reduce the risks of developing new CE business (Linder & Williander, 2017). These insights emphasize the importance of the limited corporate strategy research in CE. Beyond company boundaries, the findings suggest CE business research to bridge companies and their CBMs to the chain and ecosystem levels, in line with previous studies (Fehrer & Wieland, 2021; Rovanto & Bask, 2020) that highlight this systemic approach as the prominent direction for further company-centric research in the CE business field.

6.2 Practical contributions

In addition to theoretical contributions, this research puts forward multiple implications for company managers, policymakers, and managers in other types of organizations. Aligned with its pragmatist worldview and the company-centric focus

on the strategic development of CE businesses, the emphasis of the practical contributions of this research is on managerial contributions, which are discussed first.

The findings encourage and advise *managers* particularly in the strategy, business, and innovation domains, across industries, to combat the critical environmental crises of our days with the means of business and economy. The propositions, process model, and other findings developed in this dissertation proudly offer guidance and inspiration for established companies to not only to survive but also build competitive advantage through strategic development of CE business. The key managerial guidelines for approaching, managing, and becoming inspired by the strategic development of CE business are summarized below, followed by a brief discussion with empirical examples:

- Acknowledge that the strategic development of CE business is a challenging process with an iterative and overlapping nature that intertwines CBS development, CBMI, and collaboration for CE business.
- Be proactive in managerial actions and strategic decisions, as the change starts with you and your company; once the strategic development of CE business has started, it results over time in manifold novel business opportunities.
- Nurture an organizational culture that embraces and enables proactive experimentation and innovation through encouraging leadership; it acts as an antecedent to the strategic development of CE business.
- Prepare for learning and unlearning when overcoming the CE challenges throughout the company-wide change process with the support of multidisciplinary teams and inter-organizational collaborations.
- Recognize what strategic paths suit your company in its particular temporal context with the help of tools and frameworks, such as the process model (Figure 3) to think what can be done, when, and with whom and apply managerial practices accordingly.
- Establish a CE vision for your CBS(s) and corporate strategy, engage top managers, employees, and key collaborators to the CE visions, and involve them in frequently updating the CE visions.
- Harness collaborations for engaging others in the development of business ecosystems with markets, regulation, and industries that align with your CE visions and CBSs.

- Adopt a collaborative and systemic mindset early on in the strategic development of CE business to turn collaborations into strategic assets.

These managerial guidelines suggest that managers must acknowledge that the strategic development of CE business is a manifold process with an iterative and overlapping nature. The process model can guide managers to gradually abandon the linear economy and boldly pursue a first-mover position by proactively repeating and accelerating the anticipated strategic cycles of CBS development. For example, by anticipating the need for competence-building and strategic collaboration in later stages of the strategic development process, managers can seek related collaborations already in the early stages of the process. As the case examples showed, the shift to circularity does not occur overnight: it takes time, has to be integrated into the businesses instead of being managed as a separate sustainability unit, is challenged, and is sometimes challenging, until it accelerates after reaching a tipping point. The change simultaneously occurs in multiple corners of the company, including CBS development, CBMI, and collaborations for CE business. However, this does not mean that all changes must be implemented at once. These features were particularly well illustrated in the biofuel company case, whose strategic development of CE business accelerated only after around fifteen years, with multiple CBMIs diversifying the business and eventually replacing the linear business models. CE is not dichotomous; for example, managers can pilot CE business in one business branch while a linear business model may finance it, or managers may notice that they have already achieved the first steps of strategic development toward CE, consciously or unconsciously, and place themselves in a more advanced position when adopting the process model to further accelerate strategic development of CE business.

The role of internal action is particularly important in the early stages of the process; *although the business context involves pressure, proactive action originates from managerial decisions*. Hence, within company boundaries, managers have a long laundry list: in the early stages of strategic development of CE business, managers need to nurture an organizational culture that embraces and enables proactive experimentation and innovation. Innovation was at the core of case companies' strategic development of CE business in the examined cases. In such a culture, leadership must encourage both employees and managers to find new circular business opportunities. For example, the tools-as-a-service company initiated service-based CBMI before CE transition started to change the business environments, owing to their innovative approach. Managers need to also become

engaged with strategic CE goals by visioning future circular business opportunities based on the current business status compared with the perceived future facilitated with, for example, workshops, and creating strategic lock-ins with resource-intensive investments. For example, the soil circulation company built its circular business upon its existing business model to address the anticipated and inevitable regulative changes in the construction industry. Further, instead of settling on a specialized sustainability team, managers need to build sustainability-oriented competences in multi-disciplinary teams and across company boundaries already in the beginning of the CBMI process. For example, for the biofuel company, reaching out to non-governmental organizations was a way to learn new perspectives to business sustainability. During strategic development of CE business, managers also need to pay particular attention to strategic business and innovation management and their interactions so as to align the CBS and its CBMI at all times during the iterative process. In addition to engaging the top management in the CE vision and CBS, employees need to become engaged, for example, through company-wide surveys for CE vision development, such as those conducted by the biofuel company.

All dissertation publications clarify that circularity not only changes companies' internal operations and values but also their collaborations with other organizations. Therefore, this research strongly encourages managers to *adopt a collaborative and systemic mindset early on in strategic development of CE business*. This means that when seeking business opportunities in a CE, managers should not start from designing a CBM alone but instead think in a holistic and systemic way to establish potential collaborations for CBMI and for influencing the encompassing business ecosystem, starting particularly with their supply chains and with sustainability-minded organizations. For example, the marble-based textile company has creatively connected across different supply chains from an unconventional combination of industries. Adopting a collaborative mindset, managers need to acknowledge that collaborations will become increasingly important over time during the strategic development of CE business and therefore will turn into a strategic asset. This does not imply that collaborations are not needed in the early stages but rather that their strategic importance can be detected and emphasized later in the strategic development process of CE business. For example, the wood-based product company's CBMI engages both direct and end-customers in the downstream CSC through strategic collaboration. The strategic value of collaboration culminates in its power to align key organizations with CE visions: *managers need to harness collaboration to develop favorable business ecosystems, markets, regulation and industrial development that go along with their CE vision and business strategies*.

The complexity in strategic development of CE business showcases through the multiple areas that need to be focused on inside and outside the company during the process. With different combinations of business and innovation strategies, extending to their business models, supply chains, and beyond, managers can pursue multiple strategic paths to CE business. For example, the strategic development of CE business has been more incremental in the water packaging company and the textile reprocessing company who focused on developing their internal processes. On the other hand, a more radical approach has been taken by the coffee cups as a service company and the tools-as-a-service company through servitization. To identify such possible strategic directions, managers can start by positioning themselves with their current CBM and supply chains in the framework presented in Publication III and considering the presented strategic alternatives. The findings indicate the importance of *recognizing what circular business strategies suit the company in its specific context; thinking what can be done, when, and with whom; and accordingly applying managerial practices*. Such managerial practices are comprehensively presented in the publications of this dissertation, including the internal and external management actions during the CBS and CBMI processes in proactive strategic development of CE business (Publications I and II) and the managerial practices for harnessing supply chain collaborations by integrating CE principles with business models (Publication IV). The pragmatic support from the frameworks and findings of this research informs and guides managers regarding what actions to take, with whom, and when during the strategic development of CE business. For example, value propositions can be validated in collaboration with supply chain actors early on in the process, as seen in the textile recycling company case, whereas strategically developing the regulation and market with competitors via industry associations becomes relevant if the circular offering faces regulative barriers in its commercialization, as in the biofuel and soil circulation company cases.

Particularly policymakers play an important role in companies' strategic development of CE business. Therefore, in addition to managerial contributions, this research proposes *policy implications*. First and foremost, this research joins other researchers in demanding regulative attention to CE and particularly CE business as a key enabler for CE transition (see, e.g., Tura et al., 2019; Urbinati et al., 2021). *Policymakers must recognize the benefits of CE in the economy at regional, national, and global levels*, ensuring for the security of supply, and, accordingly, drive the CE transition from their standpoint. For policymakers to be aware of the benefits and challenges in CE transition and their role in it, they must be constantly in collaboration with various organizations. For example, collaboration with local authorities and

regulators is a key enabler for soil circulation company to ensure that as much soil as possible can be reused instead of becoming “waste” in its storing process because of the regulation. *Collaboration is a valuable source of support for policymakers and regulators to understand what is expected from them to accelerate the CE transition.* For example, companies can provide policymakers insight from industries and opportunities to build cross-industry CE ecosystems, whereas researchers can enable an objective view to how the policy could best support the CE transition and tackle the contradictory issues related to it. Currently, policymaking appears to lag pioneering companies, indicating the critical need for rapidly advancing the regulative work in the field, as well as listening to and learning from the CE pioneer organizations.

The findings of this research show that policies and regulations influenced not only how companies innovated their CBMs in present but also how the companies evaluated and formulated their CBS. Accordingly, it is important that policymakers *aim for the clarity and predictivity of the changes in regulative landscape* so that companies can take these into account in their strategy work and address the changes in the regulation, policies, and taxation in a strategic manner with long-term implications to their businesses. For example, in the biofuel case, regulators played a key role in enabling the commercialization in new markets, first hindering and challenging the company to prove the product safety, but eventually allowing the commercialization and allowing the company to predict and ensure strategically important positioning in new markets.

It is critical that not only companies, but also policymakers see CE as a systemic transition; that is, rather than supporting individual companies, they should create regulation, policies, taxation, and funding instruments that promote the development of entire CE ecosystems and industries. As such, policymakers could support not only companies to engage in CE but also other organizations that have been found important for companies’ strategic development of CE businesses, such as research institutions and non-governmental organizations.

Indeed, as companies play a critical role in enabling CE as a novel, sustainable economic system, the success of companies’ strategic development of CE business is of interest to many: Not only policymakers, but also *other organizations and their managers willing to drive the CE transition are encouraged to support companies’ strategic development of CE business from their own standpoints in the CE ecosystems.* This is possible by encouraging diverse collaboration between different organizations at different levels of society to ensure each organization identifies and implements its role in achieving shared goals of circularity. Most importantly, like companies and policymakers, organizations more broadly need to adopt a collaborative mindset to

enable CE business development. The research therefore reveals the roles of other collaborative-minded organizations, such as customers, industry associations, research institutions, and non-governmental organizations, in supporting companies to strategically develop CE business at different stages of this process. For example, companies in the downstream of supply and value chains can support their providers in early piloting and later in reference marketing of CBMIs; and non-governmental organizations and research institutions are a valuable source of sustainability-related knowledge, as was witnessed, for example, in the biofuel company case. Hence, the findings provide implications also for managers in different organizations that want to support companies in introducing feasible CE solutions, eventually leading to a more sustainable industrial and economic life and society.

6.3 Limitations and avenues for future research

Despite the manifold contributions of this research, it is no different from any other research project: it has limitations owing to the choices in research scope, methods, and available resources. In addition to the limitations brought to light in the reliability and validity evaluation in section 3.5, another main limitation was the limited time available for research. Hence, the research is limited to exploring established companies in environmentally burdensome contexts with qualitative case studies, with a focus on their strategic development of CE business through CBS development, CBMI, and collaboration for CE business. A longer research period would have enabled me to expand the selected scope or methods. For example, I could have considered to conduct longitudinal studies on more cases to follow companies' progresses in the strategic development of CE business for longer periods of time, or expand the theoretical positioning from CE business research to a more broad involvement of strategic management research.

Due to language barriers, the data was collected in Finland by Finnish researchers and in Italy by Italian researchers. Moreover, I did not collect all Finnish data directly. Even if I conducted additional interviews for cases that had been previously addressed only by research assistants, and researcher triangulation was applied in multiple stages of the research process for coherent and shared understanding of the cases, there might have been differences in the way interviews were practically carried out or the data were analyzed and interpreted. Moreover, the number of qualitatively studied cases and hence the findings are limited to logical generalizability, which leaves room for further quantitative testing of the findings of this research.

Future research is invited to go beyond these limitations. Building on the limitations and the findings, I suggest various, partly overlapping future research topics on strategic development of CE business, levels of analysis, methodological choices, and context, as summarized in Table 15.

Table 15. Identified themes, sub-topics, and exemplary research questions for future research

Theme	Sub-topics	Examples of research questions
Strategic viewpoint to CE business research	Variation in CBS types	- What types of CBS and CBS development can be identified, for example, deriving from the already identified CBMI types?
		- What differences and similarities do CBSs have, and how do they impact the management of CBSs and their development processes?
		- Is any CBS better than the other, and if yes, why?
		- What motivations and company-specific factors underlie the choice of CBS and the decision-making in CBS development?
		- How does the level of radicality in CBS development impact the success of implemented CE business?
		- How can CBS development processes be understood through alternative, established theoretical lenses, such as the strategic orientations or path dependency theory?
	Circular corporate strategy	- What is the role of circular corporate strategy in developing CE business in different types of companies?
		- How do and should companies make strategic decisions related to the spin-off CBS/CBMs, including their management in-house or as separate ventures?
	CBM and its relationship with CBS	- What differences in the CBS development processes can be distinguished for the different types of CBMIs (e.g., ones focusing on closing, slowing, or narrowing)?
		- Should CBS or CBM have primary focus when a company wants to start implementing CE business or manages a spin-off CE business opportunity?
- What are the dynamics in the emergence, motivations, capabilities, innovation, collaborations, and other relevant features for simultaneous CBS development and CBMI?		
- What combinations of interlinked innovations build up to CBMIs, and are certain combinations of innovation for CBMs more prominent than others in the strategic development of CE business? If so, why?		
- What interlinkages manifest in the development of CBMI types over time?		
Collaboration for CE-driven strategies	- How can existing CBM tools and practices, such as those in CBM experimentation, be harnessed in CBS development?	
	- What types of collaboration are needed, and how are they managed to support different CBS types?	
Measure of the level of	- How can collaboration facilitate CE-driven corporate strategy development?	
		- How to measure the level of circularity in a company's business model, business strategy, and corporate strategy?

	circularity in company strategies	- What goals can a company's business model, business strategy, and corporate strategy set based on different measurements and key performance indicators?
	Strategic CE development perspectives	- What other areas need to be considered besides CBS, CBM, and collaboration in the strategic CE business development? - What are the key domains of strategic development of CE in a company besides business, and how they can be managed over time?
Level of analysis extended from CBM	Chain level	- How does CBM influence its surrounding chain-level changes over time? - How can CBMI be developed by harnessing supply and value chains?
	System level	- How do the characteristics of ecosystems impact companies' CBMIs? - How does CBM influence ecosystem-level changes over time? - Why do companies choose to join certain CE ecosystems?
Methodological choices	Process research	- How does cross-level processual analysis reveal the alignment of companies' internal development with that of their business ecosystem? - How can strong process ontology benefit the studies on companies' strategic development of CE business?
	Quantitative research	- To what extent do broader case sets reflect the explorative, qualitative findings on companies' strategic development of CE business?
	Ethnographic research	- What insights can an action research-based/ other ethnographical research setting bring to understanding strategic development of CE business?
Context	Industrial and market context	- How does the process model fit in different industrial and market contexts? - What distinctive features separate CE business from linear business in different industry and market contexts? - What cross-industry characteristics can be useful for CE business? - How and why do the industry and market contexts change along companies' strategic development of CE business over time?
	Geographical context	- How does the process model fit in different geographical contexts? - How and why do the geography-based and institutional differences impact strategic development of CE business in established companies?
	Temporal context	- How can companies effectively manage intertemporal strategic decision-making given their contexts?

First, I present multiple interesting avenues for *deepening the research on strategic viewpoints to CE business research*. Although limited to focusing on proactive strategic development of CE business, we can assume that the developed process model may take different shapes with different degrees of radicality in different companies embedded in different contexts. Thus, I expect the variation in CBS attributable to, for example, start-ups owing to their different characteristics and resources compared with established companies (Henry et al., 2020). As this research was limited to producing the first-hand understanding of CBS development in established companies of different sizes, further exploration of different CBS types is critical to support different types of companies in pursuing CE business. For example, a deeper analysis of the impacts of company specific factors, such as the company size, on CBS development and consequent CBMI and collaborations

would be interesting. Although the key contributions of the dissertation are aimed at the business strategy level rather than corporate strategy level, the identified ambidextrous co-existence of CBSs and linear business strategies is suggested for further research at the corporate strategy level (Prieto-Sandoval et al., 2019). To facilitate the development of a CE-driven corporate strategy, further focus on the collaboration's impacts and mechanisms not only at the business level, as in this research, but also at the corporate level are encouraged.

This research investigated CBMs with different circular logics to achieve a more transferable, overall understanding of the strategic development of CE business. However, as the case sample was low on cases implementing a narrowing or regenerating CBM, the propositions and process model are biased toward companies focusing on closing and slowing loops. Further research is needed to distinguish possible differences that closing, slowing, narrowing, and regenerating CBMs (Bocken et al., 2016), or another CBM classification may reflect into CBS development.

The identified intertwined relationship between CBS development and CBMI would also be an interesting avenue for further research to examine whether the transformation, diversification, start-up, and acquisition CBMI types (Geissdoerfer et al., 2020) could directly be translated into different CBSs. Future research could continue to explore not only the CBS types but also their implications for efficient collaboration. Moreover, prior research has considered CBS to initiate CBMI but the explorative findings consider possible that CBMI could also initiate a CBS. This chicken–egg question is to be further explored. Toward the end of CBMI and its CBS development, the findings and process model do not clarify when these intertwined processes are “ready.” Hence, future research is needed on the measurement of circularity, including its economic, environmental, and social impacts (Bocken & Konietzko, 2022; Bressanelli et al., 2019a) in strategies and the related goal-setting of the CBM, to verify under which conditions CBMs meet the requirements set for sustainable business models, and to what extent are business models and strategies that integrate CE principles truly contributing to CE as a regenerative system.

This research is limited to theoretical positioning in CE business field and its specific streams. In the quest for understanding CBS typologies, alternative research fields and streams could be approached for different perspectives. For example, deeper investigation with the different lenses from CE business, such as CBM experimentation research (Bocken et al., 2021; Bocken & Antikainen, 2019) and CE innovation (Konietzko et al., 2020; Kuhlmann et al., 2022) could add new viewpoints

to the findings. Besides CE business research, established strategic and innovation management theories could deepen the understanding of companies' strategic development of CE and allow to more carefully distinguish between findings that are general for any kind of business and those that are specific for CE business. For example, deepening into companies' strategic orientations would allow further insights, as the findings already indicated their varying (co-)presence in the strategic cycles of CBS development (Hakala, 2011) in the forerunner companies' strategic development of CE business. Moreover, seminal strategic management works on path dependency and path creation (Garud et al., 2010) or on emergent and deliberate strategies (Mintzberg & Waters, 1985) could support further theorizing the studied processes.

Second, the *level of analysis* offers considerations for further research. This company-centric research adopts and strongly points to the need for a systemic approach and collaboration to support both CBS and CBMI. The much-needed system-level understanding of CE business can be deepened by conducting case studies that span the level of analysis from companies to the intersection of CBMs and inter-organizational relationships and collaborations (like in Publications III and IV) and examining multi-actor-based data from the chain and ecosystem levels (Aarikka-Stenroos et al., 2021) and in cross-level analysis. Moreover, although not the focus of this research, collaboration inside the company was found a prominent research avenue for exploring competence-building and -sharing and the management of cross-disciplinary teams for initiating CE business.

Third theme of future research relates to *methodological choices*. This research found the process approach to be highly relevant and suitable for exploring strategic development of CE business. On the one hand, regarding CBMI, further process-based research is needed to determine how CBMI builds up from complementary innovations, what are the other combinations of subsequent and complementary innovations beyond those found in this research, and which of them are more effective or prominent than others. It also appears possible that one CBMI type may develop into another over time, requiring further processual and longitudinal exploration on the temporal interlinkages of the previously identified CBMI processes (Geissdoerfer et al., 2020). On the other hand, for CBS research, understanding the differences in CBS development dynamics allows the conceptualization of other types of CBS and theorization of their typologies. As this research was able to investigate these processes particularly in in-depth, longitudinal single-case study settings of a large, technology-based company (Publications I and II), I strongly encourage further research into the processuality and temporality of

CBS and CBMI to draw deeper conclusions on each one of them and into the dynamics between these closely intertwined processes, including the dynamics in their emergence, motivations, capabilities, innovations, collaborations, and other relevant features in different types of companies. I also recommend processual studies accompanied with a longitudinal approach and/or cross-level analysis, which could effectively elaborate on how companies can align their internal development with that of the business ecosystem. The metaphysics process ontology applied in this research was the first step to explore the utility of process research. However, the studied process of strategic development of CE business appeared likely continuous in nature and to build up from various sub-processes, calling for exploring an ontological expansion to the strong process ontology to examine if it allows further deepening the scale and scope of the presented findings in future process research.

This research limited to analyzing selected single- and multiple-case settings with a limited number of qualitative, explorative cases. Here, the rigorous sampling of pioneer cases may cause a bias similar to survivor bias (Santa-Maria et al., 2021a). Although the cases represented different sizes and industries, improved generalizability could be pursued not only with extended data collection, analysis and additional cases but also with quantitative methods. After obtaining first-hand understanding of strategic development of CE business through exploration, the developed propositions can be tested with quantitative research and larger case and data samples to ensure statistical generalization. As another methodological consideration, an ethnographical touch with action research methods would enable access to extensive real-time data from the managerial interface, complementing the retrospective emphasis in this research's processual data sets. It could also allow building a trustworthy relationship with the interviewees in future studies, which was critical in accessing the sensitive data in this research.

As the fourth key research theme, I invite future researchers to increase the naturally limited external validity of the qualitative empirical findings by investigating with additional explorative case studies (see also, e.g., Lüdeke-Freund et al., 2019) how the findings would apply across *industries, markets, geographical, and temporal contexts* where companies' strategic development of CE can look different. The institutional and geographical context of the research is limited to Finland and Italy, which are both recognized as pioneering countries pursuing CE (Alcalde-Calonge et al., 2022; Finnish Ministry of Environment, 2018). The selected case companies principally operate in environmentally burdensome industrial contexts, which were chosen to maximize the pragmatic impacts with transferability to other businesses facing the

visible need to implement a shift from linear to circular. If the findings are transferred to a context without an environmentally burdensome status, less pressure for proactive and radical actions is exposed to companies. Thus, instead of acting proactively, companies in such contexts could choose to wait and adopt CBSs and CBMs once they are already validated in the industries where the movement in CE transition is more pressured. Hence, the strategic development process of CE businesses would likely look different in this context due to different temporalities and needs further research. Meanwhile, the companies included in this research operated in countries that institutionally, politically, and even economically drive the CE transition. As the research was conducted principally during the global COVID-19 pandemic, which challenged the companies and industries in many ways and thus possibly hindered the focus on environmental issues in the business life, it was even more important that the consistent CE-driven institutional support remained for companies pioneering in CE business, so that they could make strategic decisions based on trust for CE-driven policies and business environment. It will be interesting to follow how the companies that already pioneer in CE business continue their strategic development in their changing temporal context, co-developing with the institutional and regulatory environment.

In geographical contexts with less institutional support (or pressure), originating from different regulations and the sociocultural norms and attitudes toward CE themes that can significantly vary in different corners of the globe. In such a context, on the one hand, strategically developing a CE business might be more difficult or at least less incentivized, and strategic CE pioneering in this context might demand different actions, for example a stronger entrepreneurial orientation of the company for proactivity (Hakala, 2011) or more focused actions e.g., through education for shaping the way CE is generally perceived. On the other hand, for companies with inherent drive for CE, lacking regulation might enable faster progress in strategic development of CE business in contrast to e.g., biofuel company, which faced challenges with commercialization due to national regulation barriers. Meanwhile, advanced CE-driven contexts such as Europe have already a strong grounding in CE research (Alcalde-Calonge et al., 2022), and have already developed regulations that help companies to preview the direction that their strategies should consider and pursue. This may not be the case in other countries or geographical areas, and thus needs further research attention. Moreover, the case selection was biased by reflecting the characteristic industrial foci of Finland and Italy, where the former focuses typically on technology-oriented businesses or for example wood industry, whereas the latter emphasizes high value added in, for example, high-quality textile

and food industries. As these industries are material-intensive, processes and technologies may have received biased attention. The cases also focus on business-to-business contexts and might miss potential differences that business-to-customer business can imply in the strategic development of CE businesses. As apparent from this elaboration, further comparison of other geographical and temporal contexts with different institutional settings and approaches to CE transition is strongly recommended.

To increase transferability, further research validating the applicability of the findings, particularly the propositions, frameworks proposed in the publications, and the process model (Figure 3), in disruptive industrial transformations other than CE would be interesting. I consider it likely that on a general level, the process model is transferable to other contexts that follow a similar logic of disruptive transitions. The key exception in transferability to other disruptive transitions is that each of the strategic cycles in Figure 3 inherently consider circularity in the strategic decision-making and would thus likely need to be replaced by addressing the specific type of transition at hand, whether it is digitalization, social sustainability, or something else. If future research does not confirm this assumption on transferability, the next research step would be to more carefully distinguish the features that separate the CE context from the other transitions, and particularly from linear business contexts.

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APPENDIX A: INTERVIEW GUIDELINES PER PUBLICATION

Publications I and II

Semi-structured interview guidelines for individual interviews conducted by the author and often supported by the presence of the other co-author:

Warm-up

- Introduction to the research project and permission to record
- Background of the interviewee before and after joining the company

The story of the company: Journey to CE business

- What milestones or turning points the company has faced during its story towards a more sustainable and circular strategies?
- Who have been the most impactful persons and/or organizations in those moments you mentioned?
- What kind of inter-organizational collaborations there have been during the company's story? How is the management of these collaborations approached at the company?

The drivers of the company's strategy and innovation

- What has enabled the growth of the company?
- What kind of innovations have played an important role in the strategic development of the company's CE business?
- Who have enabled the strategic development of the company and its sustainable and circular business?
- What has encouraged the company to choose sustainable and circular approaches to its strategy?
- How strategic sustainability and CE themes are visible in the inter-organizational cooperation?
- Has there been changes over time in the way that the themes of sustainability and CE are taken into account in the inter-organizational collaboration?

- How impactful [insert: the specialty of the interviewee, e.g., regulation, marketing, etc.] has been in the development of the company's strategy?

Closing

- Is there anything you would like to add?
- Who else would be a suitable person to be interviewed among the company managers and experts?

The group discussions were organized around a visual presentation of preliminary findings with the following group discussion guideline:

- Brief introduction to the research project
- The identified empiric stages, timeline, and patterns for the strategic development of CE business
- Ecosystem evolution during the strategic development of CE business
- Conclusions of what catalyzed the strategic development of CE business inside and outside the company

Publication III

Following themes were covered in the thematic interviews conducted either by the author, the co-authors, or researcher assistants:

- How had the company innovated its CBMs: the story?
- What were the consequences of the CBMI to the inter-organizational collaborations?
- Who and what was needed to succeed in the CBMI?
- Other possible topics that stemmed from the open-ended thematic interviews

Publication IV

Thematic interviews conducted by co-authors and research assistants covered the following themes:

- How circularity manifests in the company's business, technologies, and operations for CBMI?
- How the CBMI is managed, with whom and what is the rationale for collaboration?

- What are the company's future aspirations, challenges and expectations in relation to the changing business landscape with increasing CE requirements?

Semi-structured interview guideline in the interviews that the author conducted to complement the data collected by research assistants and to validate the preliminary analysis:

Warm-up

- Introduction to the research project and permission to record
- Introduction and background of the interviewee

Understanding the company and its path to the sustainable CE

- How have the company and its industry developed from the perspective of sustainability and CE?
- What big steps the company has taken, what new sustainability-advancing practices have been invented and implemented?
- What changes have taken place inside the company? (E.g., business logics and model, technology, value proposition, values, human resources, management, structure...)
- What implications have the internal changes had on collaborations with other organizations?
- In the meantime, what kind of changes have occurred in the big picture in the industry, regulation, and how have you reacted and/or tried influencing them?

Diving deeper into the business model: making sure to verify the preliminary findings and all areas of the frameworks in Publication IV by asking, e.g.,

- What is the logic of the business model and upon which innovations it is built?
- Who are the key collaborators and how does the collaboration work? What motivates to collaborate?
- How do you find and build novel collaborations? How do you manage communications and branding of the business model?
- What is the role of regulation in the success of the business model?

Closing

- Is there anything you would like to add?
- Who could you recommend for interviewing next on these topics?

PUBLICATIONS

- Publication I Kaipainen, J., & Aarikka-Stenroos, L. (2022). How to renew business strategy to achieve sustainability and circularity? A process model of strategic development in incumbent technology companies. *Business Strategy and the Environment*, 31(5), 1947-1963. <https://doi.org/10.1002/bse.2992>
- Publication II Kaipainen, J., & Aarikka-Stenroos, L. (2021). From vision to commercialization of a circular economy innovation: a longitudinal study of overcoming challenges throughout the full innovation process. In S. Jakobsen, T. A. Lauvås, M. T. Steinmo, E. A. Rasmussen, & F. Quatraro (Eds.), *Research handbook of innovation for a circular economy* (pp. 59–71). Cheltenham, UK: Edgar Elgar Publishing. <https://doi.org/10.4337/9781800373099.00013>
- Publication III Kaipainen, J., Urbinati, A., Aarikka-Stenroos, L. & Chiaroni, D. (2022). How companies innovate business models and supply chains for a circular economy: a multiple-case study and framework. *International Journal of Innovation Management*, 26(9), 2240024. <https://doi.org/10.1142/S1363919622400242>
- Publication IV Aarikka-Stenroos, L., Chiaroni, D., Kaipainen, J., & Urbinati, A. (2022). Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda. *Industrial Marketing Management*, 105, 322-339. <https://doi.org/10.1016/j.indmarman.2022.06.015>

PUBLICATION

I

How to renew business strategy to achieve sustainability and circularity? A process model of strategic development in incumbent technology companies

Kaipainen, J. & Aarikka-Stenroos, L.

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RESEARCH ARTICLE

How to renew business strategy to achieve sustainability and circularity? A process model of strategic development in incumbent technology companies

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Abstract

Strategic development to promote sustainability and circularity challenges incumbents to fundamentally renew their way of doing business. However, the management of this type of strategic development process, that is, strategic renewal aiming at achieving sustainability, remains largely unknown. Therefore, we investigated what constitutes incumbents' strategic renewal aimed at achieving sustainability and how to manage each stage of this process. We conducted a single-case study of the incumbent tech company, Neste Oyj, which is renewing from a fossil-based business to a sustainable and circular business. We analyzed multisourced interview- and document-based data collected from a 25-year longitudinal case study by applying a processual approach and the critical incident technique. We proposed an empirically based process model of business strategy renewal comprising five stages, each of which follows the subprocesses of strategic formulation, implementation, and evaluation. The findings and the process model extend the theoretical understanding of incumbents' business strategy development to achieve sustainability and circularity. The proposed model will enable managers to understand what management issues to focus on and what actions are needed at each stage of the strategic renewal process.

KEYWORDS

business strategy, circular economy, environmental sustainability, longitudinal case study, strategic development, strategic renewal, strategy process, sustainable development

1 | INTRODUCTION

The transition to environmental sustainability—particularly through the implementation of circular economy (CE) principles—challenges companies to rethink their strategic development and long-term

business practices (Gandolfo & Lupi, 2021; Rovanto & Bask, 2020). Although this topic has been discussed since the 1990s (Roome, 1992; Starik et al., 1996), it has become more timely than ever, and research in this field has increased significantly in recent years (see, e.g., Farrukh et al., 2020). The business strategy literature on environmental sustainability has focused on sustainability and CE strategies, as well as sustainable and circular business models (Liu & Kong, 2020; Rovanto & Bask, 2020; Santa-Maria et al., 2021). In

Abbreviations: CE, circular economy; CIT, critical incident technique; NGO, nongovernmental organization.

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contrast, the sustainability and CE literature has approached the topic by indicating how sustainability and CE transition demand changes in companies' operations, innovative practices, and stakeholder relationships (Brown et al., 2021; Mousavi & Bossink, 2017), which impacts companies' strategic development in the long run. Although both research streams have fundamentally agreed that companies' roles and actions are critical in achieving sustainable development (Bertassini et al., 2021; Chen et al., 2020; Loorbach et al., 2010), there has been no consensus on whether and how a business strategy advances companies' quests for sustainable development (Liu & Kong, 2020), or how business strategies are developed and implemented in practice to achieve sustainability (Engert et al., 2016; Papagiannakis et al., 2014; Rodrigues & Franco, 2019). Therefore, it is critical to investigate how sustainability is integrated into companies' business strategies.

Although managing business strategy development to promote sustainability is critical, it is extremely challenging for incumbent companies. The reason is that sustainability demands that incumbents drastically rethink and renew their existing operations, competences, organizational culture, and stakeholder relationships (Bertassini et al., 2021; Gandolfo & Lupi, 2021; Hofmann & Jaeger-Erben, 2020; Kaipainen & Aarikka-Stenroos, 2021). Therefore, for incumbents, strategic development for sustainability is a complicated process that fundamentally shifts their way of doing business (Engert et al., 2016; Gandolfo & Lupi, 2021; Keijzers, 2002); hence, this type of strategic development is called "strategic renewal" (Agarwal & Helfat, 2009). Prior research has focused on how sustainability and circularity change incumbents' business logics and demand that incumbents reshape their established business models (Frishammar & Parida, 2019; Gandolfo & Lupi, 2021; Ranta et al., 2020; Rovanto & Bask, 2020). Furthermore, previous studies have recognized that sustainability strategy development is a key practice in successfully updating incumbent business models (Santa-Maria et al., 2021). However, prior research has not considered how incumbent companies should renew their business strategies to promote sustainability in alignment with their changing business models. Therefore, it is crucial to investigate the strategic renewal process of incumbent companies aimed at achieving sustainability.

Strategic development for sustainability has been recognized as a dynamic, iterative, and time-consuming process (Fowler & Hope, 2007; Keijzers, 2002; Papagiannakis et al., 2014). Therefore, we used a process approach (Langley et al., 2013) to investigate how incumbents could renew their strategic direction and capabilities over time (Schmitt et al., 2018). Because the renewal process does not happen overnight, strategic development for sustainability is often considered to consist of different stages, each of which has specific characteristics (see e.g., Eccles et al., 2021; Frishammar & Parida, 2019). It is critical to investigate the renewal process, its stages, and assumingly emerging processual patterns to understand the management issues that emerge throughout the process as well as how incumbents could address these issues in a timely manner to succeed in renewing their business. However, further processual research is needed to gain this new understanding (Bertassini

et al., 2021; Rovanto & Bask, 2020), particularly based on longitudinal data and analysis (Bertassini et al., 2021; Fowler & Hope, 2007; Madsen & Ulhøi, 2016; Zollo et al., 2013). Accordingly, we apply the process approach to examine incumbents' strategic renewal processes, which are expected to consist of different stages with differing management issues.

In examining the integration of sustainability into a business strategy and following the process approach, sustainability can be understood as a "continual process of organizational innovation and development on all fronts" (Fowler & Hope, 2007, p. 36), which meets the environmental, economic, and social needs of present and future generations (World Commission on Environment and Development [WCED], 1987). For incumbents, reconciling the environmental and economic dimensions of sustainability in this process is strategically attractive because the improved use of energy, resources, and waste (i.e., environmental sustainability) allows incumbents to generate profits and positive returns on assets and equity (i.e., economic sustainability) (Bryson & Lombardi, 2009; Bassetti et al., 2020; Gandolfo & Lupi, 2021; Gimenez et al., 2012; Porter & Van Der Linde, 1995). One of the key solutions applied to achieve this goal is for companies to implement a circular economy (CE) in which material and energy loops are slowed, closed, and narrowed (Geissdoerfer et al., 2017). However, we still lack an understanding of how companies in real life can manage their strategic development, such that it generates both environmental and economic sustainability over time. Therefore, in this study, we examine the ways in which an incumbent's strategic renewal process addresses the environmental and economic aspects of sustainability (herein after "sustainability").

Although sustainability and circularity have crucial effects on companies and thus are increasingly being studied to advance sustainable development (Santa-Maria et al., 2021), we still lack an understanding of how companies can best manage their business strategy development to achieve both environmental and economic sustainability (Engert et al., 2016; Liu & Kong, 2020). It has remained unclear how to manage such strategic development as a process (Rovanto & Bask, 2020) that consists of multiple stages, each of which has different management issues (Frishammar & Parida, 2019). In particular, the process of strategic development in incumbents' renewal situations demands investigation (Gandolfo & Lupi, 2021).

Motivated by increasing theoretical and managerial needs to overcome sustainability challenges for incumbents (Schrettle et al., 2014; Sharma, 2020; Scherrer et al., 2007), we focus on incumbents' strategic development process toward sustainability, that is, "strategic renewal," through which the company intentionally changes its strategy and related operations (Agarwal & Helfat, 2009). By applying this focus, we intend to contribute to filling a major gap in understanding and managing extreme strategic development situations faced by incumbent companies, such as a renewal process to achieve sustainability. We address the existing gap in the literature by answering the following two research questions: (RQ1) *What constitutes an incumbent's strategic renewal process aimed at achieving sustainability?* and (RQ2) *How can this process be managed?* In answering the first research question, we empirically

analyzed the process of strategic development, including the stages and processual patterns that allow incumbent tech companies to renew their business strategies to achieve sustainability and circularity. When we understood what constituted the renewal process, we could answer the second research question. We did so by identifying the key management issues at each stage of the renewal process, which enabled the entire strategic renewal process to be successfully managed. By identifying the business strategy renewal process and its management issues in the incumbent tech companies, we gained insights into the ways in which their management could facilitate implementing the strategic development processes stage by stage, culminating in the renewal of the business strategy to achieve sustainability and circularity.

To examine a strategic renewal process applied to achieve sustainability, we conducted a qualitative, longitudinal, historical, single-case study of the strategic development process applied by the incumbent tech company, Neste Oyj, which has operated in the oil and energy industry and undergone an arduous strategic renewal over decades. By developing high-level chemical process technologies that allow for turning waste, residue, and vegetable oils into fuel, the company has managed an extreme strategic renewal from a fossil-based business to a sustainable and circular business in a 25-year process. We analyzed data collected from semi-structured interviews, annual reports, and over 250 pieces of secondary data with the critical incident technique to identify process stages, processual patterns, and management issues throughout the strategic renewal. As our key contribution, we developed a process model that indicates the key management issues in incumbents' strategic renewal to achieve sustainability stage by stage. This model contributes to research at the intersection of strategic management, environmental sustainability, and CE, and it supports business managers in implementing and accelerating strategic renewal to achieve sustainability in incumbent companies, particularly in the tech business.

This paper is organized as follows. In Section 2, we review the literature on the management of strategic development processes, particularly those aimed at achieving sustainability and circularity, and discuss them from the perspectives of incumbent companies. In Section 3, we present the methodology and describe the case study. In Section 4, we present the findings of the strategic renewal process. In Section 5, we discuss the findings, propose a process model, discuss the implications for theory and practice, consider the limitations of our study, and recommend avenues for future research.

2 | THEORETICAL BACKGROUND

Drawing on the strategic management literature, we first discuss the processual dimension of strategies, their development, and the extreme strategic development of incumbents, that is, strategic renewal. We then apply this processual approach to the integration of environmental sustainability and circularity into business strategies, emphasizing the perspective of incumbent tech companies.

2.1 | Strategy as a process: Strategic development and renewal of incumbent companies

A strategy is often conceptualized and theorized as a process in various models (Burgelman et al., 2018). The process is deeply rooted in the concepts of strategy and strategic development. Strategic alignment of change both inside and outside a company occurs in a continuous process of adaptation to establish a strategic fit (Ben-Menahem et al., 2013; Fainshmidt et al., 2019; Mintzberg et al., 2003) through a combination of activities (Agarwal & Helfat, 2009), choices (Langley et al., 2013), and chance events that occur over time (Mackay & Chia, 2013). According to the classical concept, the process of strategic development consists of three subprocesses: formulation, implementation, and evaluation (Cohen & Cyert, 1973; Mintzberg et al., 2003; de Wit & Meyer, 2010, pp. 42–45). However, this conventional view has been expanded as more non-linear process models have been developed, which have increasingly considered strategic development repetitive, cyclic (Cohen & Cyert, 1973) and interrelated (Nicholas, 2009) and thus likely to develop emergent processual patterns and stages as the company develops its strategy over time.

Strategic renewal is a specific type of processual strategy development through which an established company modifies or replaces its core competences to ensure long-term performance (Schmitt et al., 2016, 2018). The intentional replacement, or refreshment, of a company's attributes with the aim of affecting the long-term opportunities of the company is what makes strategic renewal different from other conceptualizations of strategic development or strategic change, such as strategic additions or deletions (Agarwal & Helfat, 2009; Schmitt et al., 2018). Accordingly, the concept of strategic renewal applies particularly to incumbent companies that already have an established core business, market position, and core business practices and competencies, which need to be replaced and refreshed to secure competitiveness with the support of complex relationships involving stakeholders in the encompassing business ecosystem (Gandolfo & Lupi, 2021; Kaipainen & Aarikka-Stenroos, 2021).

In this study, we adapted the definition of strategic renewal that emphasizes its processual nature: "Strategic renewal describes the process that allows organizations to alter their path dependence by transforming their strategic intent and capabilities" (Schmitt et al., 2018, p. 85). According to this definition, strategic renewal requires a company to break free from its past strategic paths by actively and intentionally creating new paths over time based on the combination of past and future visions (Garud et al., 2010). Two types of strategic renewal can lead to major changes in a company's attributes: discontinuous or incremental (Agarwal & Helfat, 2009; Riviere & Suder, 2016). Discontinuous strategic renewal deals directly with major changes, whereas proactively executed incremental renewal is a continuous process intended to keep pace with a changing external business environment. Incremental renewal may reduce discontinuities over time, allowing for experimental new business opportunities in addition to mature business activities. However, discontinuous strategic renewal may be necessary when

changes in the environment are difficult to anticipate or when it is difficult to effectively organize a continuous adaptation (Agarwal & Helfat, 2009).

2.2 | Strategic development processes to achieve sustainability, particularly in incumbent technology companies

Sustainable development has become a key issue in business strategy development (Engert et al., 2016; Martin & Rice, 2010). Becoming sustainable involves a continual process of organizational innovation and cross-cutting development (Fowler & Hope, 2007) that are aligned with both the present and future generations' economic, environmental, and social needs (World Commission on Environment and Development [WCED], 1987). This process is reflected in companies with an inherent accumulation and development of innovation (Doluca et al., 2018; Kaipainen & Aarikka-Stenroos, 2021), learning (Siebenhüner & Arnold, 2007), managerial views (Madsen & Ulhøi, 2016), environmental knowledge, and sustainable decision-making patterns (Papagiannakis et al., 2014; Schaltegger & Wagner, 2011).

The process of integrating sustainability into business strategy varies according to company, but it is particularly challenging in incumbent companies that struggle to renew their linear business models to achieve sustainability and circularity (Frishammar & Parida, 2019; Rovanto & Bask, 2020; Kaipainen et al., 2020). For incumbents, adapting the principles of sustainability and circularity means a fundamental yet under-researched shift in logics for value creation, delivery, and capture (Frishammar & Parida, 2019; Gandolfo & Lupi, 2021; Ranta et al., 2018, 2020), reflecting changes and updates needed in the development of business strategies (Gandolfo & Lupi, 2021; Ranta et al., 2018, 2020). Sustainability fundamentally challenges incumbents' conventional operations because it requires the development of new knowledge and the unlearning of old business practices (Mousavi & Bossink, 2017; Shrivastava & Scott, 1992; Siebenhüner & Arnold, 2007). Renewal for sustainability has been found to require incumbents to redesign their business model and value creation (Hofmann & Jaeger-Erben, 2020; Ranta et al., 2020), business and technical operations (Albino et al., 2009; Shrivastava & Scott, 1992), as well as stakeholder relationships, networks, and business ecosystems (Aarikka-Stenroos et al., 2021; Kaipainen & Aarikka-Stenroos, 2021). In practice, incumbents often attempt renewal through incremental innovations and circular extensions to their linear business models, such as the usage of recycled materials, extended product lifecycles, and improved waste management (Rovanto & Bask, 2020; Schaltegger & Wagner, 2011). However, because of the challenges and incremental implementation of strategic renewal, incumbents are often criticized for being slow to act or for purposely hindering the spread of sustainable innovations to maintain their strategic position (Smink et al., 2015).

Thus far, incumbents' renewal to achieve environmental sustainability has been considered from a process perspective derived from

organizational learning (Banerjee, 2002; Siebenhüner & Arnold, 2007) and driven by dynamic feedback from inside and outside the company (Papagiannakis et al., 2014). Because sustainability and circularity challenge conventional ways of doing business, organizational learning is considered a key element in their effective implementation (Hofmann & Jaeger-Erben, 2020; Siebenhüner & Arnold, 2007). Environmental action is typically initiated by the sustainability demands of key stakeholders and the outcomes of previous environmental decisions (Papagiannakis et al., 2014). In the short term, environmental changes to a company's strategies remain incremental (Siebenhüner & Arnold, 2007), as the strategy is adjusted in a "single-loop" learning process. This is done to follow environmental legislation and maintain support for environmental issues and employee training (Banerjee, 2002). When the original goals are compared with environmental outcomes, the emerging feedback can affect both future expectations of the strategy's success and the company's level of commitment to environmental goals. Consequently, increasing levels of environmental activity have been integrated into business strategies (Papagiannakis et al., 2014). Integrating environmental concerns both functionally and holistically throughout the entire corporation exemplifies "double-loop" learning (Banerjee, 2002), which involves radical strategic renewal, including renewal actions such as sustainability communications and stakeholder involvement (Siebenhüner & Arnold, 2007).

For incumbents operating in technology businesses, strategic renewal to achieve environmental sustainability requires securing growth and competitiveness by developing and aligning business and technology strategies to be sustainable and circular (Kaipainen & Aarikka-Stenroos, 2021). Technology development, as a part of strategic management, is time consuming and necessitates changes in capabilities, products, business strategies, and processes (Bharadwaj et al., 2013). Therefore, it needs to be anticipated before the realization of new business demands. To ensure competitiveness (Avison et al., 2004) and the efficient utilization of technology (Luftman et al., 1993) in their strategic renewal, technology incumbents need to take advantage of their existing core competencies (Wicki & Hansen, 2019) and improve them by applying new knowledge, learning, and competence-renewing activities that make their business sustainable (Mousavi & Bossink, 2017; Riviere & Suder, 2016; Siebenhüner & Arnold, 2007). In practice, it appears that technology and business strategies are intertwined (Chiesa & Manzini, 1998; Kaipainen & Aarikka-Stenroos, 2021). Technological competences can either be developed to support an established business strategy (Vernet & Arasti, 1999) or to elaborate and fundamentally renew a business strategy (Chiesa & Manzini, 1998). This is assumed to be a key issue in the strategic development of technology incumbents who update their strategies to enhance sustainability and circularity.

By integrating our theoretical approaches into a framework, we considered strategic renewal for sustainability to be a purposively directed process that continuously seeks organizational innovation and development (Fowler & Hope, 2007; Schmitt et al., 2018). This process comprises learning (Banerjee, 2002; Siebenhüner & Arnold, 2007) and feedback (Papagiannakis et al., 2014) on processes

that develop over time in repetitive loops with incremental and/or radical consequences (Agarwal & Helfat, 2009). Such processes in incumbent tech companies imply the need for interlinked technology and innovation, as well as business strategies that are developed through dynamic interactions over time (Kaipainen & Aarikka-Stenroos, 2021). Thus, in investigating strategic renewal for sustainability and circularity among incumbent tech companies, we considered sustainable development interlinked with technological innovation and management, as well as business strategy and management. In the following section, we explain how this process approach and framework were used to empirically analyze one incumbent tech company's strategic renewal to achieve sustainability.

3 | METHODOLOGY

3.1 | Research design and case selection

To explore how the process of strategic renewal toward sustainability and circularity developed over time, we applied a qualitative research methodology based on a historical, longitudinal, single-case study. We utilized purposeful and theoretical single-case sampling to identify a revelatory and extreme exemplar that allowed excellent research access (Eisenhardt & Graebner, 2007; Yin, 1994), which allowed for the exploration of successful strategic renewal under extreme circumstances. A single-case study is an established method for exploring continuing progress toward sustainability (Fowler & Hope, 2007; Gandolfo & Lupi, 2021; Wicki & Hansen, 2019) and for identifying a company's sustainability-focused change process (Arnold & Hockerts, 2011; Brown et al., 2021; Wicki & Hansen, 2019). By adding the process approach, we were able to focus on determining how and why the strategic renewal process emerged, developed, and grew over time (Langley et al., 2013).

In the theoretical sampling procedure (Eisenhardt & Graebner, 2007; Yin, 1994), we sought a case that represented the entire strategic renewal process of an incumbent company that renewed its core business into one that was sustainable and circular. Additionally, because the goal of effective sustainability demands that incumbents conduct major strategic undertakings by re-inventing and developing technologies and products (Siebenhüner & Arnold, 2007; Wicki & Hansen, 2019), we selected a company that operated a technology-based business. Based on these criteria, we selected Neste Oyj, an incumbent in the oil and energy industry. Both the scarcity of fossil resources and the emissions from oil production challenge this industry, in which traditional incumbent oil companies search for ways to do their business sustainably. Hence, they have sought to develop sustainable and circular innovations, such as bio-based fuels, with the aim of changing their product portfolio and eventually their entire strategy to achieve environmental sustainability. Neste has been a pioneer in conducting this exceptionally radical strategic development, from a fossil-based business to one based on sustainability and circularity. Therefore, it is an example of successful strategic renewal in an industry that has traditionally been considered

harmful to the environment and to be challenged by conflicting pressure by stakeholders (Kolk & Levy, 2001). Furthermore, this case was revelatory because it enabled a longitudinal, retrospective investigation of a renewal process toward sustainability (Wicki & Hansen, 2019). The selected company was able to provide open access to data that allowed for gaining insights into the mechanisms and processes that facilitated the renewal. These insights were gained by examining the incidents and stages that occurred throughout the strategy process (Van de Ven, 1992).

The selected company—Neste Oyj (shortened to Neste)—is a Finnish oil refinery founded in 1948. In 2021, the company employed over 5000 people, had revenues of 11,750 million euros per annum, and operated in 14 countries across the globe. As an innovative technology forerunner, Neste has managed its strategic renewal from a traditional fossil-based oil refinery to a sustainable business, becoming the global market leader in the renewable fuel industry through a 25-year strategic renewal process. Because 25% of Neste's employees work in innovation and technology, the core of Neste's competences and strategy is a strong technological understanding of high-tech chemicals and polymers, allowing for the production of fuels and other chemical products from non-traditional sources, such as waste and residue, using the latest chemistry processing technologies with the support of digital solutions. Although Neste's capacity for renewable products in 2020 was approximately one-third of the capacity for oil production (Neste Oyj, 2020), the comparable operating profit in renewable business (including renewable transportation and jet fuels, renewable polymers, and chemicals) in 2021 was 1,334 million, in contrast to 50 million in oil products (Neste Oyj, 2021).

3.2 | Data collection

We multisourced longitudinal data during the research period 1996–2021, including data collected in semi-structured, retrospective interviews with top managers, which were followed by two group discussions, one with the top management interviewees and the other with Neste's strategy team, to validate preliminary mapping results and gain deeper insights into the results of our analysis. Another key data source comprised all available annual reports from 2005 to 2021. To support and triangulate the main data, we collected more than 250 pieces of secondary document-based data. These data sources and their utilization are presented in Table 1.

Regarding the interviews, nonprobability expert sampling was used to recruit top managers with a good overview and understanding of Neste's longitudinal strategy development. These managers were targeted across departments to gain a broad understanding of managerial perspectives throughout the renewal process (Van de Ven, 1992). Gaining such access can be difficult, especially in large corporations, as top managers value their time highly (Okumus et al., 2007). Consequently, we applied snowball sampling based on referrals from already-accessed interviewees to reach a wider target sample. Seven interviewees from different departments met our criteria based on their seniority. The interviewees ranged from top

TABLE 1 Data sources and their utilization

Data type	Data (amount of data)	Utilization in analysis and reporting
Interviews & group discussions	Top management interviews (1.5 h on average, $n = 7$): <ul style="list-style-type: none"> • Research & technology, vice president • Renewables platform, top management • Head of strategy, operations and brand marketing • Sustainability and public affairs, senior vice president • Public affairs, feedstock regulation, top management • Head of communications • Key account manager, sales Nordics, top management 	Principal use in deepening, complementing, and verifying the preliminary mapping Provides the company managers' perspective on causal connections throughout strategic renewal with personal, subjective, and open perceptions
	Group discussion with the seven top management interviewees Group discussion with 12 members of the Neste strategy team	
Annual reports	Company's annual reports from 2005 to 2021 ($n = 16$)	Principal use in allowing a full overview of the record of events with precise dates in preliminary process mapping Provides a corporate perspective for analysis
Secondary data	Over 250 documents and other material comprising: <ul style="list-style-type: none"> • Trade journal articles ($n \geq 15$) • Magazine and newspaper articles ($n \geq 10$) • Finnish broadcasting company videos and podcasts (1 h on average, $n = 6$) • Theses about the case company ($n = 4$) • Scientific articles about the case company/its technology ($n = 7$) • Company blog posts and news ($n \geq 150$) • Company videos ($n = 21$) • Company presentations ($n = 4$) • Company interactive lecture (1.5 h) • Stakeholder websites ($n \geq 35$) 	Principal use in complementing and validating information from other data sources and allows supportive analysis Provides complementary stakeholder and media perspectives throughout the strategic renewal process

managers to senior executives with 5–25 years of work experience at Neste. The data collected from these interviewees allowed for gaining in-depth insights into the retrospective case history over time. In addition to interviewee access, information access and cognitive access were also available during the interviews, despite the sensitivity of some events that occurred during the strategic renewal process under discussion.

3.3 | Data analysis and research quality

Remaining open to unexpected empirical findings, we applied an abductive analysis to move flexibly between the theory and the empirical data (Dubois & Gadde, 2002). This approach enabled us to identify and explore the findings, partly based on the theoretical background and partly on an inductive analysis of the phenomena emerging from the case study. This inductive analysis played a major role, particularly in mapping the longitudinal strategic renewal process by applying the critical incident technique (CIT) (Bott & Tourish, 2016; Gremler, 2004; Hughes et al., 2007). The CIT was suitable for our purpose because it provided a rich data set that generated an accurate

record of events (Gremler, 2004), while remaining flexible in accommodating new discoveries (Bott & Tourish, 2016; Hughes et al., 2007). In practice, we mapped critical incidents related to Neste's strategic sustainability issues, which principally concerned renewable fuel technology (NEXBTL), to a timeline of year-level detail.

The preliminary mapping was based on data collected from the annual reports and secondary material, which yielded a full overview of the record of events during Neste's strategic renewal, including precise dates and the corporate perspective. The preliminary mapping was verified and then complemented by data collected in the interviews and group discussions, which provided wider perspectives on the personal, subjective, and open perceptions of company managers, enabling us to make causal connections between the events and their effects on the company's strategic renewal to achieve sustainability. The diversity of data sources, including secondary data collected from external sources, allowed for data triangulation and examination of multiple viewpoints during the analysis.

To generate insights into the nature, frequency, and processual patterns of the mapped critical incidents, we applied a classification process (Gremler, 2004; Hughes et al., 2007) based on the following strategic themes: strategy and organization, investment, technology

and research, regulation and society, programs, and strategic partners. The insights gained from the critical incidents and the classification process enabled us to distinguish stages and processual patterns throughout the timeline of the strategic renewal process, which were distinctly identified because of key incidents that visibly changed the path of the company's strategy. In the theoretical analysis and conceptualization phase of this research, the empirical findings from the process stages (see Figures 1 and 2) were conceptualized and integrated into the five-stage process model (see Figure 3).

Longitudinal studies are considered highly reliable and have high internal validity (Arnold & Hockerts, 2011). Moreover, the quality of our research was ensured by applying various tactics. Data triangulation was applied to determine whether data saturation had been reached, and researcher triangulation was applied to ensure that the interpretations of the data were valid. The results of the data analysis were validated in follow-up group discussions and according to interviewees' comments on the preliminary results via email. The compilation of longitudinal and multisource data enabled us to form a deep critical understanding of the case, which enabled us to derive reliable results. Thus, the research quality was supported by methodological transparency and informative documentation of the studied phenomena and context.

4 | RESULTS

4.1 | Case overview

After having refined fossil fuels since 1948, the Neste company started to renew toward sustainability to overcome the long-term unsustainability of the fossil-based business. Based on the continuous high-tech innovation of new chemistry processing methods, Neste developed a new renewable fuel technology (NExBTL). This technology enabled the strategic renewal of and long-term changes in Neste's business model, from supplying Russian low-quality raw oil to distributing it to Northern Europe by expanding both its supply and commercialization networks. However, the strategic renewal process was

time consuming: it took 15 years from the technological invention in 1996 to the profitable commercialization of renewable fuels in 2011. Today, Neste has moved its successful strategic development away from a fossil-based business by applying the chemical and polymer competences learned from NExBTL technology to new business openings in aviation and renewable plastics businesses.

Based on our analysis of critical incidents, Neste's strategic renewal process was divided into four stages that occurred between 2000 and 2021. Figure 1 presents an overview of these stages and of the preceding period in the late 1990s before concrete strategic development action was taken. A detailed discussion of the stages, management issues, and business and technology innovation strategies throughout the process is presented in Section 4.2. The conclusion is presented in Table 2.

4.2 | Stages and management issues during Neste's strategic renewal process

4.2.1 | The roots of renewal (late 1990s)

Although the strategic renewal process began in the early 21st century, significant issues related to the success of this process were found in Neste's history. Neste was traditionally known for its strong technology-based competences in chemistry processing and fuel refining. Since its founding in 1948, Neste has used these competences to innovate technologies for processing low-quality raw oil into high-quality fuel. Thus, even in its early history, the company's strategic management was challenged to encourage innovation, and accordingly, it allocated resources to R&D to enable exploration.

By the 1990s, Neste had been investigating traditional biodiesel technologies, similar to many of its competitors. It was necessary for strategic management to be aware of this technological development in the industry to maintain the company's pioneering status, reputation, and long-term competitive advantage. However, not satisfied with the quality of biofuel trials at that time, the company sought to explore other technological solutions to produce sustainable fuels. In

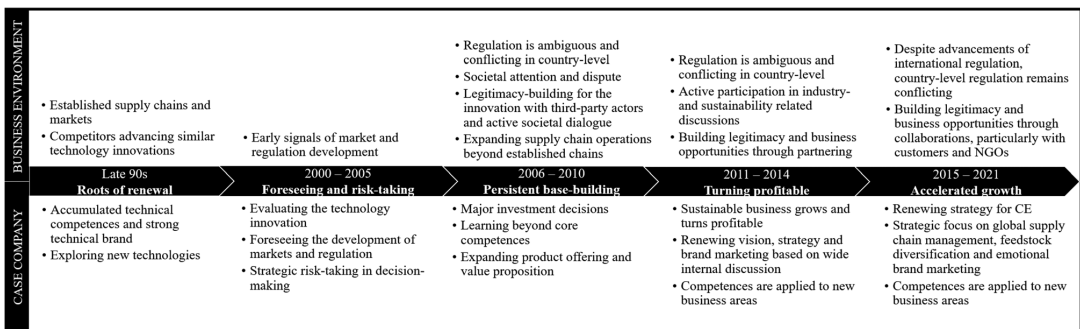


FIGURE 1 Overview of Neste's strategic renewal process toward sustainability and circularity

1996, Neste invented a new technology for renewable fuel production, NExBTL. Unlike traditional biofuel esterification, NExBTL technology enables the use of vegetable oils, waste, and residues as feedstock in the renewable fuel hydrogenation process, which resulted in a fuel with higher quality than traditional biofuel. This technological invention was the core component of Neste's strategic renewal, as it enabled the company to circulate carbon from bio-based feedstock in a sustainable way, thus reducing the greenhouse gas emissions that traditionally result from the production and use of fossil fuels. However, as neither markets nor regulations existed for fuels produced by this technology, the invention was only patented and not considered for commercialization yet.

4.2.2 | Foreseeing the prospects of innovation and strategic risk-taking (2000–2005)

The first official, distinguishable stage of strategic renewal started by predicting the requirements of societal sustainability transition for Neste's business regarding changing markets and regulative environments. Because neither had been developed at that time, the horizon for making long-term decisions was limited, which required that Neste's strategic management make risky business and investment decisions based on the company's vision of strategic renewal toward sustainability. This extraordinary risk-taking is described by the Head of Communications as follows:

Of course, now, when looking back, one can say that it [investment in renewable fuel production] has truly been a very large and maybe even a risky decision because it demanded a lot of money, and still, in a way, there was no guarantee for the business to exist.
(Head of Communications)

During this period, the European Union (EU) began working on the first biofuel directives. To achieve its target of becoming a leading northern oil company, Neste decided to invest in its first domestic renewable fuel production plant in Porvoo, Finland. The EU's first biofuel directive discussions were strong encouragement for initiating this investment, which was a key step in the company's strategic renewal.

4.2.3 | Persistent base-building for a sustainable business strategy (2006–2010)

At the beginning of the second process stage, the company's strategy was updated with the goal of becoming the global leader in renewable fuels. This was followed by investment in a second domestic production site. The industrial-scale use of NExBTL technology enabled Neste to launch its first product in renewable road transportation with a sustainable and economically viable value proposition. However, there was no broad consensus on the regulation of this new type of

bio-based fuel. Therefore, at first, Neste was not able to commercialize the product, and it was only allowed to provide renewable fuel to its employees. This demonstrated that the renewable fuel was as efficient and safe as it was claimed to be, which built credibility in the eyes of regulators that would allow its commercialization. Subsequently, multiple countries permitted the commercialization of renewable fuels. However, national-level interpretations and implementations of EU biofuel directives still hinder their commercialization in some countries. Overcoming commercialization boundaries is essential in strategic development to achieve sustainability.

After launching the first renewable fuel, Neste began to receive negative attention from nongovernmental organizations (NGOs) that questioned the sustainability of Neste's palm oil supply chain. Because this had a significantly negative impact on the company's brand image, key stakeholders, particularly customers and even their own employees, questioned the sustainability of the company's business strategy. These concerns encouraged Neste to improve its sustainability efforts to strengthen a long-term, successful business strategy. Neste realized the strategic importance of collaborating with a wide range of stakeholders, including third-party auditors and NGOs, to understand and learn from the issues in sustainable supply chain management and to globally expand its business ecosystem with supply chains to feedstocks that were perceived as more sustainable, thus building new sustainability competencies:

We were developing new competences that were not directly involved with oil refining. (Senior Vice President, Sustainability and Public Affairs)

Although the second process stage was not easy in Neste's renewable business strategy, and the renewable business was not yet profitable, the strategy implementation was accelerated by investing in international production sites in Singapore and Rotterdam in the Netherlands. Investment and commitment to the selected business strategy in the second stage were essential not only to reach production capacity but also to establish the credibility and competences necessary to overcome barriers to the implementation of a sustainable business strategy.

4.2.4 | Turning vision into profitability (2011–2014)

Because of the efforts made in the second stage the renewable business finally became profitable in the third stage. This milestone was vital because it served to strengthen the company's faith in the new business strategy, despite the challenges of commercialization, and it encouraged the company to make even more ambitious updates to integrate sustainability into the business strategy. For the first time, these strategic updates were based on the collective views of the personnel through an annual dialogue that unified the company's vision of striving for environmental sustainability by becoming the preferred partner in the cleaner traffic fuel market. Aligned with the sustainable value proposition of renewable products, Neste's marketing strategy

became more emotional in its appeal, changing the long-term message Neste wanted to transmit to stakeholders about its renewed business.

The tech company regarded R&D as crucial for strategic success, and particularly for building competences to utilize new renewable vegetable oil and waste feedstocks. Along with a growing feedstock variety, Neste's R&D efforts expanded business strategy opportunities with an extended renewable product portfolio. For example, the first renewable jet fuel was developed for commercial use in cooperation with Lufthansa Airlines in 2011. While establishing new partnerships, Neste maintained strategic cooperation with many other customers, suppliers, research partners, NGOs, and industrial associations in its business ecosystem. Here, Neste participated in both industry- and sustainability-related discussions to leverage understanding of the industry and sustainability issues and to fuel the company-level strategic renewal itself.

4.2.5 | Accelerated growth through sustainable technology and strategic collaboration (2015–2021)

After building a solid base for the company's renewed business and managing emerging difficulties during the renewal process, the fourth stage was characterized by the management of growth in terms of both economic and environmental sustainability. Highlighting and communicating the fundamental strategic renewal to the company's employees, its extended stakeholder portfolio, and potential new strategic partners, Neste changed its name from Neste Oil—under which the company had operated as an independent company—to Neste Oyj. In addition to the continuously evolving technology-based strategic renewal process, Neste's renewable business expanded to the field of bioplastics and biopolymers. This expansion was accelerated by new, strategically managed technology, research, and partnering opportunities. The renewables business unit was split into three divisions (i.e., road transport, aviation, and polymers and chemicals) to emphasize them according to the constantly updated business strategy.

This stage of strategic renewal highlighted the need for continuously aiming high based on strategic goals. To stay in a market leader position with secured production capacity and feedstocks as key strategic resources, Neste decided on the largest NExBTL refinery investment in its history, and it strengthened the global supply chain and feedstock diversification by increasing its collaboration with supply chain actors and acquiring one of its major animal fat waste suppliers. However, the most important role in forwarding strategic renewal was potentially played by pioneer customers, who proactively partnered with Neste to mutually advance the company's strategic renewal processes. As partner companies, they strengthened Neste's strategic renewal and position as a desirable partner and market leader:

The City of San Francisco had adopted our products into use. Google had our product, and their commuter

buses use it. This is how the company's reputation spreads. (Head of Strategy, Operations, and Brand Marketing)

Neste's story demonstrates the overall strategic renewal process needed to successfully incorporate sustainability into the business strategy of an incumbent technology company. During this challenging 25-year process, we identified key critical incidents and key issues in strategic management, which are presented in Table 2.

4.3 | Summary of the results

The results of the longitudinal study of Neste's development process showed that its strategic renewal for sustainability required that it manage many large-scale changes in its operations and relationships, including stakeholders in its business ecosystem. Our case study showed that the core of the business was renewed from producing fossil fuels to producing renewable fuels over a period of 25 years, which required many actions by the company's strategic management. The renewal over time was so fundamental that the company changed its name, Neste Oil, which it had as an independent company since it split from Fortum in 2005. In 2015, Neste removed “oil” from its name, becoming Neste Oyj. This change of name indicated the company's shift from a fossil fuel to a renewable, environmentally sustainable and circular business, exemplifying the discontinuous strategic renewal process typical of many incumbent companies (Agarwal & Helfat, 2009).

The transformation required that management learn how to replace conventional business approaches (Siebenhüner & Arnold, 2007), such as seeking new global markets, managing supply chains for feedstocks beyond existing ones, and building new partner networks beyond the existing business ecosystem. By developing new competence and product portfolios, the company's strategic management solidified its sustainability path, thus unifying its vision both within the company and with its external stakeholders. Although the company's strong technological background and core competences in high-tech chemical processing were strategically adapted to meet the call for sustainability, new, expansive knowledge was needed to face newly emerging radical changes in markets, supply chains, and partner networks caused by the strategic renewal for sustainability. Thus, our findings strongly support the importance of learning in implementing sustainability in companies (see Banerjee, 2002; Siebenhüner & Arnold, 2007) and demonstrate that this aspect is key in the strategic development of integrated business and technology strategies in proactively renewing to achieve sustainability over time, particularly among incumbent technology companies. The findings of the present study apply to strategic renewal in the present, long-term strategic development will continue with new business openings.

Now, we have everything planned for the near future, and partly for the next decade. Currently, we are

TABLE 2 Key critical incidents and strategic management issues throughout the stages of Neste's strategic renewal process toward sustainability

Stage	Selected key critical incidents	Rationale for strategic renewal process	Key issues for strategic management
The roots of renewal (late 1990s)	Invention of sustainable technology	Innovation allows for the development of a renewed sustainable product portfolio, which is the core for business strategy renewal.	Ensuring innovative atmosphere and resourcing in R&D to enable exploring Striving for pioneering while staying aware of competitors' technological development
Foreseeing the prospects of innovation and risky decision-making (2000–2005)	Environmental regulation begins to develop on the global level	As the regulations in business environment and ecosystem are slowly changing within a limited horizon, it is challenging to both predict future business demands and steer business strategy with a sustainability orientation.	Recognizing and evaluating the prospects of technology innovation Strategic risk-taking based on foreseeing market opening and regulation development
	Investment decision for first domestic production plant	The investment decision is a concrete action that ensures the production capacity of the new business line, secure the long-term potential for the new business strategy, and communicates the strategic renewal.	
Persistent base-building for sustainable business strategy (2006–2010)	Updated ambitious goal to become a global leader in renewable fuels	Make concrete plans and goal setting for the strategic renewal and showing it to the stakeholders, thus enabling them to commit to shared sustainability goals for mutual benefits.	Considering further investments, both domestically and internationally Expanding feedstock variety and supply chain operations globally Diverse competence building in sustainable business and its practices
	Launching first products and dealing with commercialization challenges Investment decisions for second domestic and two international production plants	Research and development successfully continue to commercialize new products, upon which the new business line and renewed business strategy are built. Investments are necessary for building new production capacity for the renewables business line; the business strategy demands evaluating a need for such investments early on and on continuous basis, also in new locations, to allow scaling up sustainable business.	Expanding product offering and value proposition Managing the ambiguous regulative environment Managing negative societal attention and disputes with active dialogue and third-party auditing
Turning vision into profitability (2011–2014)	Sustainable business becomes profitable	Receiving measurable and successful results of the strategic renewal encourages continued renewal efforts.	Unifying the vision and direction of business strategy Renewing for emotional brand marketing
	Internal strategy dialogue leads to updating vision and brand strategy New partnership contracts to develop a new business line Reaching technical capability to industrially process new feedstocks	Continuous updates to the strategy are important for strengthening the effects of the renewed strategy over time. Particularly the opinions of all employees in strategic updates to commit them to the implementation of the renewal process. Building a new sustainable business line aligned with	Managing regulations that are ambiguously interpreted at the country level Actively participating in industry- and sustainability-related discussions Building legitimacy and business opportunities through partnering Applying developed competences and establishing partnerships to

TABLE 2 (Continued)

Stage	Selected key critical incidents	Rationale for strategic renewal process	Key issues for strategic management
Accelerated growth through sustainable technology and strategic collaborations (2015–2021)	Updating the vision and changing the company name to promote sustainability Establishing new partnerships in various customer segments Investment decision for third international production plant Updating organizational structure and strategic goal to become global leader in sustainable and CE solutions	business strategy demands partners that share their knowledge, build legitimacy for the new business, and help with commercialization. Strategic renewal requires learning to use core competences in a new way to process more feedstocks and thereby produce more alternative products with increasing effects on sustainability. The fundamental nature of strategic renewal is openly demonstrated to all stakeholders to commit partners with similar values for mutually beneficial development. The growing number of customers and large brands support the commercialization of renewable business lines with direct transactions and by increasing business legitimacy and faith in the selected business strategy. Constant evaluation of further investments increases the share of renewable business, aligned with the sustainable business strategy. Constant evaluation of strategic direction and needs for further developing the business strategy to be increasingly sustainable with the implementation of CE principles; strengthen the attention given to emerging sustainable business areas.	create new business lines and serve new markets Strengthening global supply chain management and technical capabilities for diversification Increasingly collaborating with various actors, particularly strategic customers Managing with the regulation, which, despite advancements at the global level, remains ambiguously interpreted at the country level Applying developed competences to create new business lines and serve new markets

discussing what our world will be like in 2030–2050.
 (Senior Vice President, Sustainability & Public Affairs)

In our analysis of critical incidents in the company's history, we identified stages and processual patterns in the company's strategic renewal process (see Figure 2). Each of these stages typically included strategic decision-making regarding the vision, strategy updates, new partnership contracts, changes in the value chain, and new business openings. By analyzing the emerging processual patterns based on critical incidents, we found that the passages between conventional strategy process stages were neither unambiguous nor discrete, and that coincided during the ongoing strategic renewal process (see Farjoun, 2002; Nicholas, 2009). For example, updates and evaluations of organizational structure and vision were critical incidents that occurred repeatedly during the full renewal process. Therefore, we could determine from the critical incidents at a stage level that the

subprocesses of formulation, implementation, and evaluation were repeated patterns in each stage of the strategic renewal process (see Figure 2).

5 | DISCUSSION AND CONCLUSION

5.1 | Discussion

Our findings support the idea that sustainability is a continuous process that pertains strategically to all aspects of a company (Fowler & Hope, 2007). Based on our findings, we conceptualized a five-stage process model of strategic renewal for sustainability (Figure 3), arguing that this type of strategic development constitutes processual patterns comprising three subprocesses: strategy formulation, implementation, and evaluation. These processual patterns are

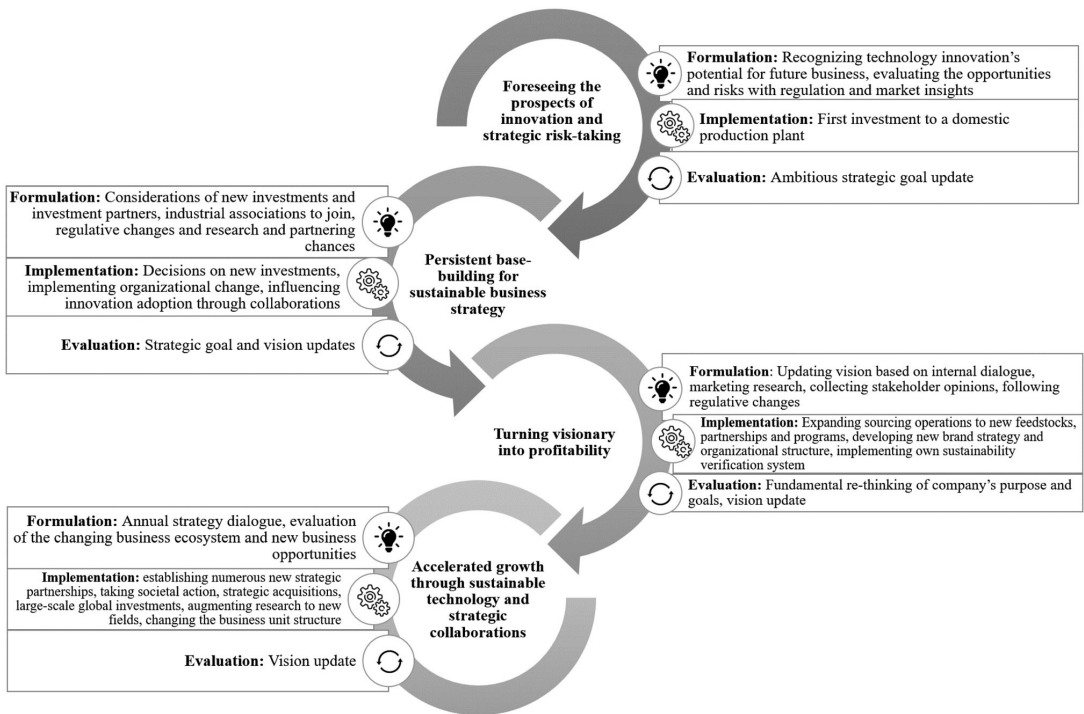


FIGURE 2 Stages and processual patterns comprising the subprocesses of formulation, implementation, and evaluation during the full strategic renewal process

repeated at each stage of the process. The model includes the key management issues in each stage. The model is aligned with prior evidence of the repetitive and cyclical nature of strategy processes (Cohen & Cyert, 1973).

To accelerate the emergence of new stages in the strategic renewal process, positive feedback from sustainability outcomes and stakeholders played a critical role. However, utilizing this positive feedback loop (Papagiannakis et al., 2014) to advance the continuous overall renewal process to achieve sustainability required the strategic management of the incumbent technology company to make proactive but risky decisions, particularly early in the process:

After a certain step, the progress begins to feed itself, but as it won't be automatic, it has to be kept going. (Senior Vice President, Sustainability, and Public Affairs)

In particular, incumbents in the sustainability forerunner position are one step ahead of their business environment and ecosystem, whether they wish to or not. Therefore, strategic management in sustainability forerunner incumbent companies, particularly in the technology business, requires strategic moves and large, costly

investments, even though it is not certain that the business ecosystem will respond positively over time. Such unpredictable environments typically require discontinuous strategic transformation (Agarwal & Helfat, 2009), which could explain why renewal to achieve sustainability is difficult and time consuming, as noted by Keijzers (2002), among other scholars. As the results of the present study showed, managing disruptive strategic renewal can be misaligned with compliance with ambiguous, slowly developing, or even nonexistent regulation, which would otherwise be suggested as the first steps in integrating sustainability in a single-loop learning process (see Banerjee, 2002). Instead, incumbent companies' management has no other choice than to skip the first learning loop and, similar to double-loop learning, proactively instigate radical changes, including actions such as sustainability communications and stakeholder involvement (Siebenhüner & Arnold, 2007). However, in practice, this discontinuous transformation can be hindered by the slow development of regulations and markets, as well as challenges to innovation, such as vision, development, and commercialization (Kaipainen & Aarikka-Stenroos, 2021).

By identifying the stages and their management issues in a strategic renewal process for sustainability, the present case study demonstrated how to align technology and business strategies for sustainability in practice. Incumbent technology companies need to

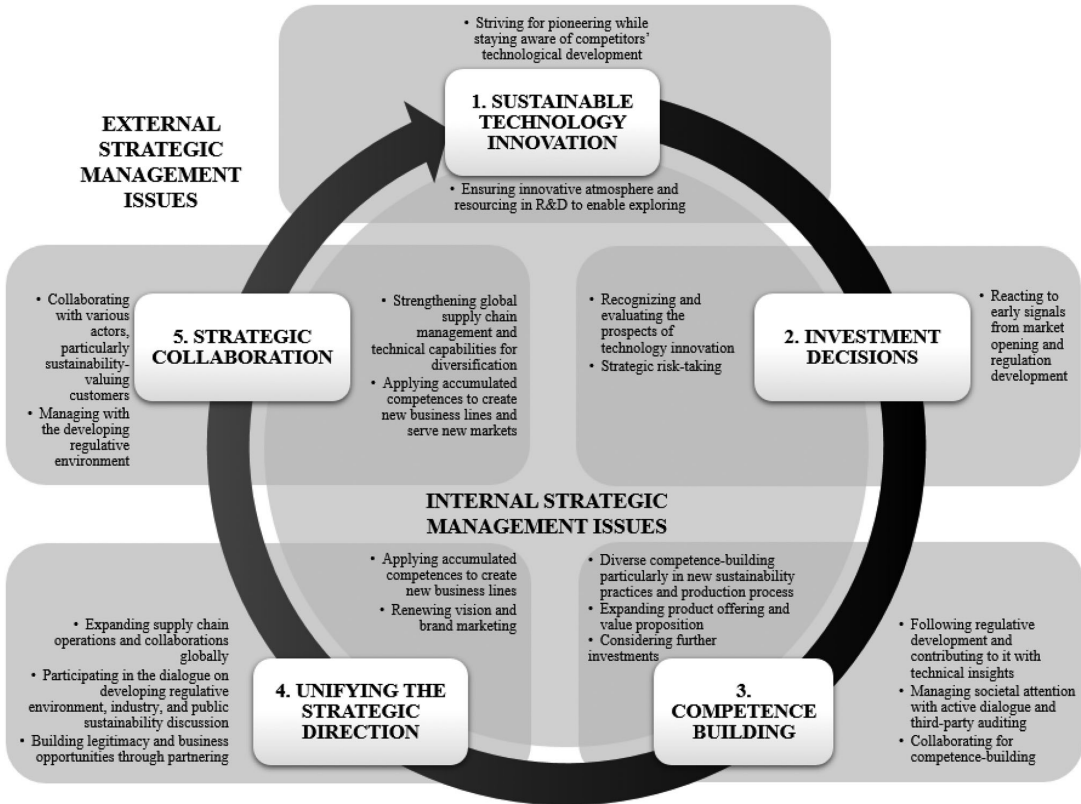


FIGURE 3 Five-stage process model for managing a tech company's strategic renewal toward sustainability and circularity

proactively modify their technologies and invent new ones to renew their business strategies and maintain competitiveness. In this case study, the technology strategy emerged first as the result of technological innovation, and it served as an input in business strategy development (see Chiesa & Manzini, 1998). However, over time, the role of technology changed from providing strategic input to providing support for the established business strategy (see Vernet & Arasti, 1999) through the opening of new sustainable business lines. This interplay of technology, innovation, and business strategy was necessary for the tech company to succeed in strategic renewal to achieve sustainability. This finding supports the understanding that technology and business strategy must be aligned in strategic renewal to achieve sustainability.

In summary, our process model captured the iterative and overlapping nature of the renewal process, allowing for the analysis of its constitution and conceptualizing the key stages in the strategic renewal process, as well as the main management issues in each stage. As shown in Figure 2, each stage proposed in Figure 3 followed the processual subprocess pattern of formulation–implementation–evaluation.

5.2 | Contributions to theory and practice

Our study analyzed a tech incumbent's strategic renewal process to achieve sustainability. The findings revealed the stages, processual patterns, and management issues that constituted the strategy development process. In addition to the process of business strategy development, the findings showed that sustainability required the incumbent company to update its technologies, production, products, competences, partnerships, supply chains, and business model. These findings were conceptualized in a process model (Figure 3) that describes how incumbents can conduct strategic renewal to achieve sustainable tech business in five main stages. We also found the management issues that the incumbent company needed to solve at a particular stage in the renewal process. Our study makes several theoretical contributions to the business strategy literature on environmental sustainability and to research on sustainability, CE, and strategic management.

First, new knowledge about the strategic development process required to achieve sustainability and its management contributes to the business strategy literature on environmental sustainability, in which recent studies have investigated practices for incumbents'

sustainable and circular business model transformation (Rovanto & Bask, 2020; Santa-Maria et al., 2021). Our longitudinal and processual approach allowed us to generate a new understanding extending from the development of business models to that of dynamic business strategies, thus capturing how business strategies are constituted in stages over time by repeating processual patterns of formulation, implementation, and evaluation of business strategy. Our empirical findings revealed critical management issues in the business strategy development process, and our process model indicated that they needed to be addressed timely (Figure 3). In conceptualizing the renewal of an incumbent company, we also contributed to the understanding of how sustainable business strategies are developed and implemented in practice (Engert et al., 2016; Papagiannakis et al., 2014). The findings of our study indicate that in the sustainability context, the renewal process is discontinuous in nature (Agarwal & Helfat, 2009), and it requires a proactive strategy that includes radical changes, similar to double-loop learning (Siebenhüner & Arnold, 2007), to address management issues such as sustainability communications and stakeholder involvement.

Our findings develop new understanding on how technology incumbents' strategic development unfolds through innovation in both technology and business, also contributing to the business strategy literature on environmental sustainability. Our study extends prior research that found that sustainable innovation, particularly business model innovation, was fundamental in renewal to achieve sustainability (Gandolfo & Lupi, 2021; Liu & Kong, 2020; Rovanto & Bask, 2020). Our findings demonstrated that technology innovation plays an important role not only at the beginning of business strategy development but also during the entire renewal process. Therefore, our study showed that as the incumbent tech company's strategic renewal process unfolds, it requires the strategic management of both business and technology innovation development over time to invent, develop, and commercialize new products that are aligned with the renewed business strategy.

Second, our study on how a company implemented sustainability and circularity in its strategy also contributes to the sustainability and CE research, which has lacked an understanding of how companies can strive for sustainability by starting, continuing, and implementing CE through managing their strategy development processes, from inventing circular technologies to scaling circular businesses. From the process perspective enabled by CIT, which is still lacking in the extant research (Rovanto & Bask, 2020; Teruel-Sánchez et al., 2021; Zollo et al., 2013), our study demonstrated that sustainability and CE were part of the strategic management of business and technological innovation over time. These findings demonstrated that business strategy development is interlinked with sustainable development, and instead of developing a separate sustainability strategy (Santa-Maria et al., 2021), a company could integrate sustainability practices into the core of its business strategy over time (see Engert et al., 2016; Liu & Kong, 2020; Martin & Rice, 2010; Schrette et al., 2014). The integration of sustainability and business strategies in the stages in our proposed process model could support incumbent companies that struggle with sustainability and CE transition and help them with

managing slow and demanding technological changes in markets, value chains, business models, and strategies (Kaipainen & Aarikka-Stenroos, 2021; Keijzers, 2002; Ranta et al., 2018). From the perspective of sustainability and CE research, our study emphasizes that sustainability and circularity are important strategic concerns for companies, and therefore need to be integrated in strategic management decision-making throughout continuous strategic development and renewal to achieve sustainability.

Finally, the findings of our study revealed that extreme strategic development occurs in a process. This contribution also applies to sustainability discussions in strategic management research, as it explains that companies can experience extreme turns in their strategies. Our study demonstrated that extreme and typically discontinuous strategic development (Agarwal & Helfat, 2009) constitutes stages and processual patterns, which can be managed from the first innovation to sustained business growth, taking into account both internal and external strategic management issues during the process. Our longitudinal study of a 25-year strategic renewal shed light on such processes by investigating process stages and processual patterns. Figures 2 and 3 show the cyclic nature of strategy, which is characterized by a repetitive processual pattern of formulation–implementation–evaluation subprocesses and the importance of proactive managerial steering throughout the process (Garud et al., 2010). Therefore, in developing a business strategy in a renewal situation, such as integrating sustainability, the process is iterative and requires addressing the management issues identified in our empirically based process model at each stage, as well as across these stages. Based on a new perspective on sustainability and circularity, these insights into extreme types of strategic development contribute to the strategic renewal literature (Agarwal & Helfat, 2009).

Our study has several implications for management. Although company-level sustainability processes can be long and complicated (Keijzers, 2002), as shown in the present case, taking advantage of the proposed process model and using it as a guideline would enable managers to identify important stages and management issues to address, and by doing so, to integrate sustainability and circularity at the core of their business strategy (see Figure 3). At the beginning of the incumbent's renewal process, strategic management needs to focus on making the right predictions and bold investment decisions while including its stakeholders in learning about sustainability issues. Extreme strategic development to achieve sustainability changes both companies' internal operations and values as well as value chains, which requires management to align internal and external stakeholders and thus benefit from their collaboration to accelerate renewal and find new sustainable and circular business opportunities. Thus, the process model would help business and technology managers understand that incumbent companies must proactively advance the renewal to sustainability in and across process stages. The proposed model will enable managers to understand what management issues to focus on and what actions are needed at each stage of the renewal process.

Finally, from the perspectives of policymakers, NGOs, and industrial associations, the key lesson of the present study is that their

involvement and collaboration during the process is an integral part of incumbent technology companies' renewal for sustainability. Therefore, actors who are interested in supporting sustainable business transformation should actively engage and collaborate with incumbents to support them in their renewal stage by stage. In doing so, they will advance the goals of sustainable development.

5.3 | Assessing limitations and avenues for future research

We selected an established single-case design that enabled our investigation of an exceptional in-depth strategic renewal to achieve sustainability (Fowler & Hope, 2007; Gandolfo & Lupi, 2021; Wicki & Hansen, 2019). Although this design limited the generalizability of the results, it enabled the research outcomes to be transferred to similar companies (Wicki & Hansen, 2019). The proposed process model could be particularly applicable to renewing innovation- and technology-based incumbent businesses in which innovation is inherent, engaging not only the internal departments of the company but also its partners in its transition to sustainability (see Geels, 2011). Consequently, further research is needed to determine how the proposed model would function in different business contexts, such as service businesses. Thus, to complement the findings of this study, we recommend that future research utilize a multiple-case design to expand and validate knowledge about strategic renewal processes across industries, markets, and national borders. The findings of our in-depth study allow for further comparisons among diverse companies, industries, and contexts.

We limited our study to process stages, processual patterns, and strategic management issues during a company's strategic renewal to achieve sustainability and circularity. In future research, it would be interesting to explore the particular drivers of the renewal process. Moreover, the roles of business ecosystems, market creation, and innovation could be examined in future research to expand our understanding of managing strategic sustainability integration among technology companies, as well as other types of companies.

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From vision to commercialization of a circular economy innovation: a longitudinal study of overcoming challenges throughout the full innovation process

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6. From vision to commercialization of a circular economy innovation: a longitudinal study of overcoming challenges throughout the full innovation process¹

Jenni Kaipainen and Leena Aarikka-Stenroos

INTRODUCTION

Although circular economy (CE) is expected to drive sustainable development (Ghisellini et al. 2016), to date it remains unclear how real-life firms can realize CE's promises (Brown et al. 2021; De Jesus and Mendonça 2018). What we know by far is that minor adjustments are not enough; we crucially need innovation to fuel CE (De Jesus and Mendonça 2018; Jakobsen et al., Chapter 1 in this volume) and sustainable business (Goodman et al. 2017; Seebode et al. 2012). Yet, more research is needed under the particular lens of innovation management (De Jesus and Mendonça 2018) to overcome the challenges of circularity (Geissdoerfer et al. 2017). In this chapter, we address this need by investigating firm-level CE innovation as a longitudinal process requiring support from diverse actors.

With innovation, we emphasize process perspective over outcome, and refer to a novel technology, product or service that involves marketing and/or technological discontinuity, is diffused beyond the innovator firm, and provides economic value (Garcia and Calantone 2002). Firms' innovation strategy focuses on creating this value, allocating resources, and managing trade-offs (Pisano 2015) while innovator firms execute innovation process activities from visioning to commercialization. As both the innovation process and innovation strategy involve continual processes of experimentation, learning, and adaptation (Pisano 2015), a process perspective is essential in innovating. Firms need to rethink their innovation processes particularly when implementing CE (Aarikka-Stenroos et al. 2021), as sustainable innovating goes beyond firms' core activities (Mousavi and Bossink 2017) and challenges them to abandon old practices (Seebode et al. 2012). However, processes of sustainable (Seebode et al. 2012; Wicki and Hansen 2019) and CE innovating (Brown et al. 2021) remain underexplored. Therefore, we consider a processual approach necessary for capturing the challenges and needed actions throughout overarching CE innovating.

Innovating challenges are not limited to the innovator firm, but often relate to managing diverse actors in the encompassing innovation ecosystem (Adner 2006). For CE innovating, expertise needs to be compiled from various actors (Ghisellini et al. 2016), which is why identifying and involving them is critical (Brown et al. 2021). To understand how actor diversity and their engagement (Driessen and Hillebrand 2013) can support the full innovating process, particularly for CE (Brown et al. 2021; De Jesus and Mendonça 2018; Jakobsen et al., Chapter 1 in this volume) and sustainability (Goodman et al. 2017; Wicki and Hansen 2019), more empirical evidence is needed (Aarikka-Stenroos et al. 2014). When innovating for sustainability in complex environments – such as CE ecosystems (Aarikka-Stenroos et al. 2021) – par-

ticipating actors may co-evolve during the process (Seebode et al. 2012). Investigating such actor dynamics over time calls for processual (Brown et al. 2021) and longitudinal (Phillips and Ritala 2019) research approaches, which remain currently underexplored.

Addressing the gaps and firms' pragmatic need to realize sustainable CE business, this chapter examines from a firm perspective a longitudinal CE innovation strategy and process, occurring from early vision to global commercialization with support from diverse actors. Our research goal is to learn "How can a firm, together with its ecosystem actors, realize sustainable innovating despite the challenges of the CE innovation process?"

To best respond, we take a critical forerunner case that allows a longitudinal investigation of diverse actors and actions in CE innovating. The selected case, Neste Oyj, demonstrates a radical, even disruptive innovation process for renewable energy production, a field considered particularly challenging for CE (Ghisellini et al. 2016). Radical innovation refers to novelties that – from the customer and market perspectives – change behaviours and consumption patterns and require learning on the part of the target market, value chain and customers (Chiesa and Frattini 2011). From the innovator firm perspective, radical innovations are challenging to manage, as they create new business lines, requiring the firm to face unfamiliar product categories and infrastructures (Aarikka-Stenroos et al. 2014). Our case displays these features over an innovating period of 25 years, which required both the markets and the firm to learn and adapt for successful, radical CE innovation.

The chapter is structured as follows. First, we discuss innovation processes in the light of innovation, technology, and business management research. Then, we provide an illustrative analysis of the case study's 25-year CE innovation strategy and process. Last, we discuss the findings, and sum up the contributions for CE and innovation management literature as well as pragmatic implications, and provide avenues for future research.

THEORETICAL BACKGROUND ON INNOVATION PROCESSES AND ACTORS

Diverse conceptualizations and theoretical models illustrate how innovation and innovating occur as a process. Conventionally conceptualized, linear process models, comprise front-end or ideation and visioning, research and technical development and commercialization (including launching, facing markets, and disseminating the innovation) (see, e.g., Chiesa and Frattini 2011). In contrast, more iterative models have also been suggested, which consider commercialization and technical development/R&D as parallel and complementary processes (O'Connor and Rice 2013). Because of this parallel nature, what might initially be considered a good solution can later lead to unintended problems. Hence, the process typically entails regressions and loops. In general, key characteristics of successful innovation processes are innovation and commercialization strategy and its implementation, which explain the iteration mechanism. An innovator firm takes a strategic direction with the potential innovation, refines the activities and decisions described above based on experience and then modifies the innovation strategy and implementation for the next iteration (Lynn et al. 1996).

The process for radical innovation often begins with a vision, which drives both the innovation's technical and commercial development (O'Connor and Veryzer 2001), followed by a techno-market match analysis to define commercializability (Jolly 1997). Finally, the process moves to market learning and commercialization activities, aiming to convert the

radical novelty into a commercial success (Siegel et al. 1995). For the innovator firm, radical innovation often requires learning and experimentation about the driving forces impacting innovation success, particularly in specific market contexts (Chiesa and Frattini 2011; Lynn et al. 1996). Moreover, radical innovation can develop completely new operations and value propositions along the industry and its actors (see Möller and Svahn 2009). Consequently, radical innovations have the power to expand firms' strategic frames (O'Connor and Rice 2013).

However, instead of limiting to the innovator firm's boundaries, innovating should also involve stakeholders from the surrounding multi-actor networks and ecosystems. Researchers in the field of ecosystem, network, and stakeholder research have acknowledged that engaging and involving diverse actors from the business, innovation, and knowledge ecosystems is essential for successful innovating (Aarikka-Stenroos et al. 2014). These may include other complementary and competing firms, public organizations, regulators and policymakers, experts, universities, research organizations, user communities, and associations (see Aarikka-Stenroos et al. 2014; Driessen and Hillebrand 2013). Managing the involvement of these actors throughout innovating is important as it is found to partly improve and partly complicate the process. On one hand, stakeholder diversity expands the breadth of available resources and increases learning and creativity (Driessen and Hillebrand 2013). On the other hand, actor diversity increases heterogeneity in knowledge, logics, competences, and power, and thus increases mismatches between actors' goals, understandings, and technologies, leading to risks and conflicts (Aarikka-Stenroos et al. 2017).

METHODOLOGY

Research Design and Case Selection

To best cover the overarching CE innovation process and its challenges, we follow a qualitative research design with an illustrative, extreme, and critical single-case study (Stake 1995, p. 3). Studying a single-case allows deep-diving to the *collaborative process phases and practices within a circular-oriented innovation context* (Brown et al. 2021, p. 6). Adding a longitudinal approach, we unfold the diverse incidents, activities, and stages during the studied process (Van de Ven 1992).

Having accumulated technical competences since 1948, Finnish oil refiner Neste invented a technology (NExBTL) that expands and creates new lifecycles for renewable feedstocks, waste, and residue by transforming them into renewable fuels (Neste Oil 2011). Such biomass-based fuels are considered clean, environment-friendly, and efficient renewable energy resources (Yilmaz and Atmanli 2017), advancing a major CE challenge (Ghisellini et al. 2016) by converting biowaste into energy (Vanhamäki et al. 2020). Calculated in compliance with the EU Renewable Energy Directive, NExBTL-based fuel results in 90 per cent lower greenhouse gas emissions over its lifecycle compared to fossil fuels (Neste Oil 2011).

In contrast to Neste having started with sourcing Russian raw oil and processing it in Finland, Neste nowadays collects and processes more than ten types of renewable feedstocks globally. Ensuring that the feedstocks are certified and the production complies with the EU's sustainability requirements, all NExBTL refineries have acquired third-party audited International Sustainability & Carbon Certification (ISCC) (Neste Oil 2011), governed by an

association of over 140 members, including research institutes and NGOs (ISCC website). Having expanded from Northern European fossil fuel markets, Neste-branded renewable fuel is nowadays distributed to business and customer markets in Europe and Northern America. Next to road transportation fuels, the same technology is nowadays being applied to jet fuel production and adapted to research in renewable plastics. With its 25-year NExBTL-based innovation strategy, Neste has transformed from a traditional oil refiner to the world's largest renewable fuel producer, with operations in 14 countries and an approximate 40 per cent share of the world's total renewable diesel production. Such an extreme case satisfies our selection criteria by allowing investigating how a longitudinal, full CE innovation process unfolds over time.

Data Gathering, Analysis and Assuring Quality

To illustrate an in-depth, longitudinal case and creating a retrospective case history over time (Van de Ven 1992), we multisource primary data from seven semi-structured interviews of top managers, two focus groups and 16 annual reports published between 2006 and 2021. We interviewed top managers across departments to fully understand the managerial perspective in change processes (Van de Ven 1992), covering research and technology, new feedstock, marketing, sustainability, public affairs, regulation, communications, and sales departments. The interviews were followed by focus groups, one for the interviewed managers, another for the strategy team. Primary data insights were complemented and validated by diverse secondary data from trade journals, magazine and newspaper articles, firm-related presentations and lectures, news releases, blog posts, and stakeholder websites.

Following an iterative, discovery-allowing research process with abductive logics (Dubois and Gadde 2002), our analysis evolved between rich empirical findings and theory-based innovating activities. Supported by the literature review on innovation processes and actors, we mapped the case firm's innovation process and innovation ecosystem using critical incident technique and Kumu.io ecosystem software. After mapping the events, actions, and actors with year-level detail onto a timeline, we classified them according to the theory-driven key innovation process activities the incident principally contributed to: visioning and ideation, research and development, and acceleration and commercialization (see Figure 6.1), to study the emerging process patterns.

Research quality is improved with various strategies: data and informant triangulation allowed reaching data saturation and developing a critical viewpoint to the case; researcher triangulation enhanced interpreting findings with objectivity; and carefully describing the methods and context improved methodological transparency. We also validated the initial findings in focus groups and interviewee commentary rounds.

FINDINGS

We first provide an overview of the case firm's full innovation process. Then, we elaborate the process activities in more detail, explaining the key challenges, actions and supporting actors throughout the process.

NExBTL technology was invented already in 1996 but not advanced until markets and regulators showed growing interest for sustainability in early 2000s. Reacting quickly to early

signals, Neste ramped up NExBTL production in 2005, yet the investment become profitable only in 2011. During the non-linear process with overlapping critical incidents (see Figure 6.1), Neste has overcome many challenges, supported by diverse actors (see Table 6.1). Although the technology has remained fairly unchanged over time, it has launched business model innovation to meet the new, sustainable value proposition (follow for example the vision updates in Figure 6.1), extend supply chain operations globally (follow feedstocks in Figure 6.1), and serve new customers and markets (follow external commercialization activities in Figure 6.1).

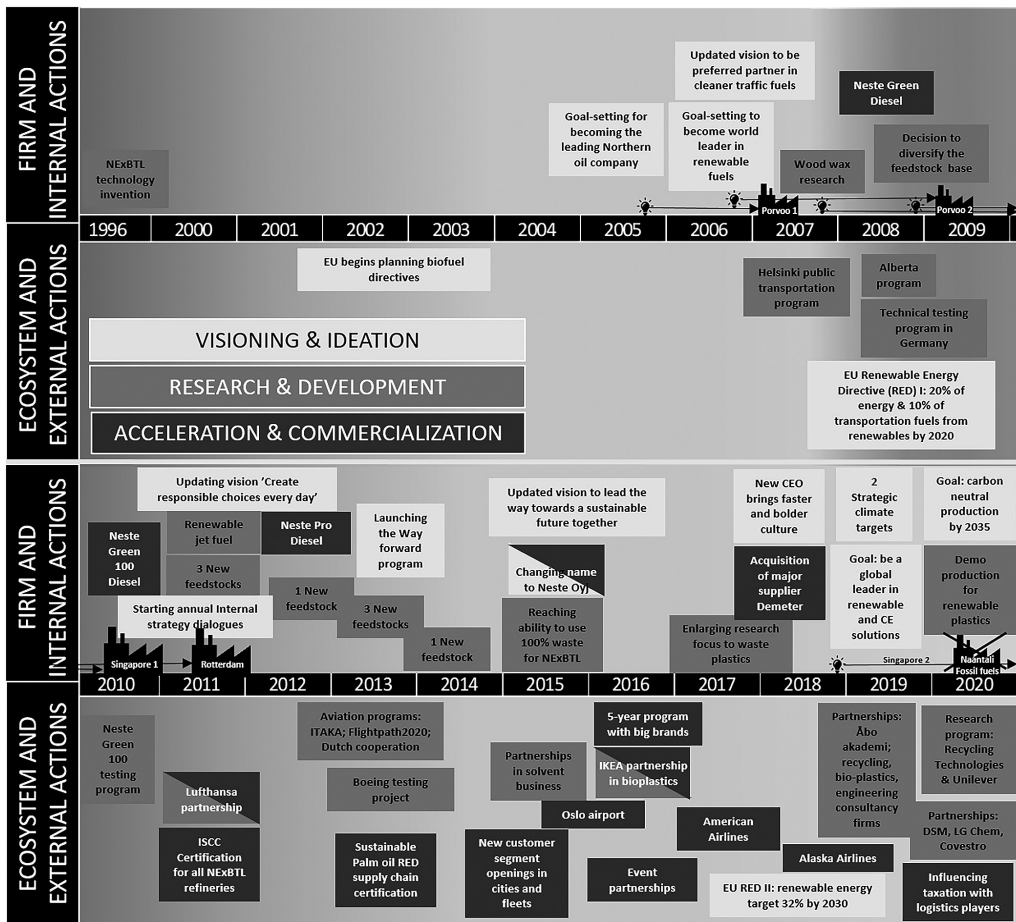


Figure 6.1 Overview of the full CE innovation process and its critical incidents involving internal and external actions

In *visioning and ideation*, the key challenges were inventing the technology and gaining internal support for it, while the key ecosystem actors were competitors, public audience, markets, and policymakers. To *invent the technology*, technically skilled individuals were needed and encouraged by the innovation-supporting organizational culture, originating from both experiment-encouraging leadership and Neste’s technological pioneer heritage.

Regarding ecosystem actors, experimentation was motivated for maintaining competitive advantage while competitors worked with similar bio-based fuel technologies.

For ensuring *internal support for the CE invention*, sustainability-oriented strategizing and bold visioning was crucial when Neste top management evaluated future potential of the new CE-based business idea. From 2000s onwards, early signals from public, markets, and policymakers gave internal faith towards renewable fuels' future. Later in the innovation process, internal support was sealed through firm-wide strategy dialogues.

In *research and development*, the key challenges were in production scaling, answering the external concerns and maintaining continuous innovation, while the needed key actors were research-oriented partners, suppliers, regulators, industry, non-governmental organizations (NGOs), and a subsidiary. To *scale up production*, Neste was not too small in terms of not having enough resources for exploring, but not too large to neglect NExBTL because of its early marginal revenue stream. Later, extending the feedstock variety to various vegetable oils, waste and residue supported access to the feedstock volumes needed for industrial production. As one example of using residue feedstocks, Neste uses McDonald's cooking oil to produce renewable fuel, which is circulated to transport the cooking oil feedstock to Neste's production site. Scaling up was also facilitated by learning by doing, multidisciplinary competences, and cross-functional teams, as well as external competences of Neste's subsidiary.

To address the *ecosystem actors' concerns* on NExBTL's sustainability and safety, Neste discussed actively with regulators, industry, and NGOs, for which NExBTL was new. To advance the discussion and relieve concerns, Neste built credibility through third-party certifications, technical testing and research-oriented partnerships, and established supplier contracts to expand feedstocks from palm oil, questioned particularly by NGOs. By remaining open and providing their viewpoints on sustainability issues, collaborating actors supported Neste in overcoming the external concerns regarding its business sustainability.

As for *continuous innovation*, Neste maintained innovation-encouraging culture, supported by co-evolving innovation and sustainable business strategies. With the multidisciplinary and cross-functional teams as well as existing competences and technology, advancing sustainable CE accelerates new business openings in renewable jet fuels and plastics. Continuous innovation is supported particularly by collaborating with suppliers, customers, and research-oriented partners.

Challenges in *acceleration and commercialization* relate to hindering regulation, adopting launched products, and ensuring business sustainment, and are supported by regulators, industry players, competitors, NGOs, media, public discussion, customers, and research partners. To address *regulation prohibiting commercialization*, Neste keeps discussing with regulators and industry players. While regulation, standardization and product safety statements were not existing, concerns remained; as an extreme example, some even wondered if animal fat-based fuels could transmit mad cow disease. Credibility-building from the R&D stage assures ecosystem actors of product safety and influences regulation for commercialization. Additionally, competitors help in pressuring regulators along with NGOs, media, and public discussion.

Adoption of new products was facilitated by innovating emotional brand marketing and communications, a radical move for a traditional oil refiner to target new sustainability-valuing customers and public. Meanwhile, facts-based arguments were still needed for demonstrating NExBTL products' safety, technological advantages and credibility compared to fossil fuels. Additionally, feedstock expansion in the R&D stage allowed large customers to choose from different feedstocks, facilitating their adoption.

Finally, Neste *ensured its sustained business* with risky refinery investments, which in turn required securing sufficient feedstock volumes, resulting in not only establishing new supplier networks, but also supplier acquisitions. Lastly, partnering with both customers and research partners sustains long-term business.

Neste's story illustrates the challenges, overcoming actions and diverse actors needed during the CE innovation process activities. Our full findings are presented in Table 6.1 with illustrative quotations.

DISCUSSION AND LESSONS FROM THE CASE

This chapter illustrated through an extreme case how a CE innovation process can occur from an innovator firm perspective, from visioning a CE-based solution to commercializing it globally. We next discuss the lessons learnt from the case.

The concluding actor column (Table 6.1) evidently demonstrates ecosystem actors' importance for innovating activities, supporting prior literature findings (Aarikka-Stenroos et al. 2014; Driessen and Hillebrand 2013). As radical innovation develops new operations and value propositions along encompassing actors (see Möller and Svahn 2009), our findings highlight that both the importance and number of innovation-supporting actors increases along CE innovating process. Yet, even sustainability-valuing actors, particularly NGOs and regulators, can hinder the process if the credibility and value of new CE innovation is not properly communicated to them early on. Therefore, the innovator firm needs to seek for collaborations already in R&D, or even visioning. This is because most key actors in R&D activities accelerate commercializing activities later in the process: for example, suppliers expand renewable feedstocks both for R&D resources and new offerings. Similarly, research partners, NGOs, and strategic customers not only facilitate competence-building for R&D, but also build adoption-facilitating credibility. Then again, NGOs and pioneer customers accelerate the public sustainability demand, pressuring regulators to permit market openings and encouraging diffusion to customers.

The complexity of inherently challenging sustainable innovating (Wicki and Hansen 2019) manifests in the case through parallel-role actors; for example, an actor being both a customer and research partner simultaneously. When parallel roles result from the limited partner candidates in the innovation ecosystem, as we estimate to be the case here, the innovator firm needs to establish strategic partnerships with the limited partner candidates, meanwhile seeking partnerships beyond traditional ecosystem boundaries. Developing innovation ecosystem and CE innovation process seem interlinked; accordingly, accelerating the process through innovation ecosystem development is important since visioning. Despite the complexity and collaborator diversity of CE ecosystems (Aarikka-Stenroos et al. 2021), the case displays that determined ecosystem development is the key for successful CE innovating.

Our critical incident mapping shows how innovating activities overlap (see O'Connor and Rice 2013) meanwhile developing new business model innovation from technology innovation, as these innovation types can be interlinked (see Engez et al., Chapter 17 in this volume). This demonstrates also how sustainable CE requires reconfiguring innovation approaches as a major strategic undertaking (see Seebode et al. 2012), for which both innovation and business strategies need to co-develop. The found overlapping process structure also supports

Table 6.1 Challenges, overcoming actions, and diverse actors needed during CE innovation process activities

	Challenges in CE innovating	How can the firm respond to overcome the challenge?	Which ecosystem actors support overcoming the challenge; how?	Illustrative quotation from the case data
<i>Visioning & Ideation</i>	Inventing the technology innovation	<ul style="list-style-type: none"> – Innovative individuals with technical skills – Explore-encouraging organizational culture & leadership – R&D sector resourcing – Cherishing technological pioneer heritage 	<ul style="list-style-type: none"> <i>Competitors</i> – Signalling interest in biofuels, and secure competitiveness via technological experiments 	Young researchers in late 90s were encouraged to “look beyond and do their thing” – Strategy Team
	Gaining internal support for the CE idea	<ul style="list-style-type: none"> – Visionary individuals in top management – Courageous and ambitious goal setting aligned with sustainable business strategy – Unifying the vision with internal dialogue, value programmes and branding 	<ul style="list-style-type: none"> <i>Regulators, potential customers</i> – Providing early signals of emerging markets and regulation that encourage taking strategic risks with the CE innovation 	“We did not have much else than the vision that the product is good, and markets are developing, but regulation did not properly exist” – Sustainability and Public Affairs, Senior Vice President

	Challenges in CE innovating	How can the firm respond to overcome the challenge?	Which ecosystem actors support overcoming the challenge; how?	Illustrative quotation from the case data
<i>Research & Development</i>	Scaling the invention to industrial production	<ul style="list-style-type: none"> – Firm size is suitable for allowing experimentation – Learning by doing – Building multidisciplinary competences – Cross-functional cooperation – Feedstock expansion to ensure sufficient supply 	<ul style="list-style-type: none"> – Subsidiary's complementary competences allowed building first refineries without building first a conventional demo plant 	<p><i>"When opening the world scale refineries, we went forward quite boldly even if there were big question marks in feedstock supply and markets."</i> – Renewables Platform, Top Manager</p>
	Ecosystem actors questioning the product	<ul style="list-style-type: none"> – Active participation in ongoing discussions to learn and interact – Feedstock expansion to meet external requirements and worries related to some of the existing feedstocks – Ensuring that own operations and processes meet the requirements for third-party certification 	<ul style="list-style-type: none"> – <i>Third-party auditors, research-oriented partners, technical testing programmes, NGOs, customers, regulators</i> – Build credibility for innovation and innovator firm's competency through collaborating – Remaining open and active in ongoing discussions with the innovator to allow learning from others who value sustainability 	<p><i>"The firm cooperates with local NGOs in Southeast Asia partners, technical testing programmes, and actively supports work in the areas of legislation and certification aimed at preventing the irresponsible production of palm oil."</i> – Neste Annual Report 2011</p>
	Continuous innovation	<ul style="list-style-type: none"> – Experiment-encouraging culture and leadership as part of sustainable strategizing – Feedstock expansion for incremental innovation – Multidisciplinary competences & cross-functional teams – Developing tech innovation into business model innovation 	<ul style="list-style-type: none"> – Building technical and sustainability-related competences together – Customer cooperation for new solutions with NExBTL technology – Supplying new feedstocks to allow expanding the scope of CE innovation 	<p><i>"If you want to stand out, you need to do a bit differently from others."</i> – Marketing, Top Manager</p>

	Challenges in CE innovating	How can the firm respond to overcome the challenge?	Which ecosystem actors support overcoming the challenge, how?	Illustrative quotation from the case data
<i>Acceleration & Commercialization</i>	Regulation prohibits commercialization	<ul style="list-style-type: none"> - Active participation in industry discussions - Gaining particularly technical credibility through actions taken in research and development activities 	<ul style="list-style-type: none"> <i>Industry associations, regulators, competitors, NGOs, media, public</i> - Collaborating with industry associations for awareness of regulative progress and to stay ahead of competition - Increase in the number of competitors can pressure regulators for allowing the products in new markets - NGOs, media, and public discussion increase regulator attention 	<p><i>"Implementing the directive can be very different in different countries, sometimes purpose-directed, or even protectionist."</i></p> <p>- Public Affairs & Feedstock Regulation, Top Manager</p>
	Facilitating the adoption of launched products	<ul style="list-style-type: none"> - Emotional and sustainable brand marketing for new, sustainable value proposition - Product launches in new geographic areas increase diffusing the innovation - Feedstock expansion to meet customer requirements 	<ul style="list-style-type: none"> <i>Customers, suppliers, public, media</i> - Innovation adoption through direct customer transactions - Suppliers provide feedstock variety from which big customers can choose their orders to be produced - Public audience and media share experiences and information that encourages looking for sustainable products such as NExBTL 	<p><i>"We won't tell people to do anything. We wake them to think and inspire them."</i> - Marketing, Top Manager</p>
	Ensuring the business sustaintment	<ul style="list-style-type: none"> - Risk-taking in investments - Strategic acquisitions for ensuring supply - Maintaining the strategic sustainability orientation 	<ul style="list-style-type: none"> <i>Customers, public; research partners, suppliers</i> - Strategic collaborations with customers, research partners and suppliers to expand existing business and explore new business openings over time - Increasing public interest in sustainability mega trends supports regulative development, customer acquisition, and finding suppliers 	<p><i>"CE has an important role in our new strategy. Now it is the right time to advance circular solutions. Like replacing raw oil with waste plastic in oil products."</i> - Neste Annual Report 2018</p>

Brown et al.'s (2021) idea of involving actors in a dynamic process, engaging new partners over time for collaborative CE innovating.

CONCLUSIONS AND IMPLICATIONS

Theoretical Contributions

We enrich innovation management and CE literature with understanding of the CE innovating process, showing how firms can overcome challenges with diverse actors to implement and accelerate CE innovation over time. This culminates in two key contributions.

First, by taking the innovation management lens (De Jesus and Mendonça 2018) to study CE innovation, we build new understanding of the innovation process from a new perspective (Aarikka-Stenroos et al. 2014; O'Connor and Veryzer 2001). By taking a longitudinal approach (Phillips and Ritala 2019) to investigate the lacking yet fruitful process perspective (Wicki and Hansen 2019), we provide evidence of the looping and iterative innovation process structure (O'Connor and Rice 2013), which has remained unclear particularly regarding sustainable (Seebode et al. 2012; Wicki and Hansen 2019) and CE-oriented innovating (Brown et al. 2021).

Second, we contribute to innovation management and CE literature with understanding how and when ecosystem actors support innovating activities. Aligned with prior innovation studies (Aarikka-Stenroos et al. 2014; Phillips and Ritala 2019; Seebode et al. 2012), our findings support the view that CE innovation makes no exception among innovations that critically need collaboration over time (Brown et al. 2021), both to provide needed competences and resources for R&D (Driessen and Hillebrand 2013) and to radically switch the value proposition in commercializing (Möller and Svahn 2009). Extending prior CE research, our findings display that CE innovating requires firms to establish strategic partnerships, seek collaboration beyond traditional boundaries (as noted previously with sustainable innovations; e.g., Seebode et al. 2012), and actively engage in public discussion involving encompassing actors, such as NGOs and regulators, early in innovating.

Practical Implications

Table 6.1 supports technology and business managers in identifying the main challenges and choosing what actions to take and when in CE innovating. It also advises who to involve and when to overcome the emerging challenges during CE innovating. Three key managerial implications give pragmatic advice as follows:

1. Strengthen innovative organizational culture with experimentation-encouraging leadership and sufficient resourcing to proactively initiate and accelerate new CE innovation processes.
2. Build multidisciplinary competences, also across firm boundaries, and facilitate their use with cross-functional teams already in early CE innovating to allow new, parallel business opportunities to emerge.
3. Establish strategic partnerships with sustainability-valuing actors and seek collaboration beyond traditional boundaries early on to facilitate both R&D and commercialization activities.

This chapter demonstrates how instead of choosing between them, managers can pursue both sustainability and economic gains through executing CE innovation strategies and processes, meanwhile strategically renewing for sustainability with aligned innovation and business strategies. Moreover, the advantages of successful CE innovation are not limited to benefits from the firm perspective; sustaining future production and consumption with firms' sustainable practices and solutions is societally crucial. Consequently, contributing to ensure success of firms' full CE innovation processes is of great interest for many, including regulators, NGOs, and customers.

Limitations and Future Research

Many firm features, such as size, innovation, or market features (e.g., industry and stakeholder conservatism; Möller and Svahn 2009) can shape CE innovation processes. As actions and actors crucial throughout innovation processes may vary based on firm features, as well as innovation types, further research is needed to complement our findings on a primarily technological CE innovation case with business model innovation features. Further, as the processual view to CE innovating remains new and underexplored (Brown et al. 2021), more examinations are needed on diverse sustainable/CE innovation processes, across industries in ecosystem and market creation settings. Lastly, seeing the power of sustainable/CE innovating to strategically transform the way firms do business, we encourage investigating the impact of sustainable/CE innovating under a strategic management lens.

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NOTE

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**PUBLICATION
III**

How companies innovate business models and supply chains for a circular economy: a multiple-case study and framework

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How companies innovate business models and supply chains for a circular economy: a multiple-case study and framework

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Abstract: To implement a circular economy (CE), companies are pushed to innovate respectively their business models, from a micro-perspective, and their supply chains, from a meso-perspective. Despite the increasing research on both these perspectives, there is still a knowledge gap on how companies innovate business models and supply chains for circularity. In the present study, we build on innovation management, Circular Business Model (CBM) and Circular Supply Chain (CSC) literatures and develop a theory-based framework where circularity leads to product/process/service innovation from a micro-perspective, and to possible innovation in companies' supply chains (retaining existing chains/renewing them) from a meso-perspective. Through a multiple-case study of Finnish and Italian CE pioneer companies, we validate this framework, find evidence on interplay between CBM and CSC innovation, and identify innovation strategy variants. The framework contributes to innovation management, CBM, and CSC literatures, and encourages managers willing to adopt circularity to consider innovating simultaneously both their business models and supply chains.

Keywords: *Business model innovation; Supply chain innovation; Circular innovation; Circular business models; Circular supply chains; Circular economy; Sustainable business; Multiple-case study.*

1 Introduction

Shifting to a Circular Economy (CE) calls companies for a systemic change in their product, process, and business model innovation activity, also considering all their stakeholders in the market and society (Aarikka-Stenroos et al., 2021). This is because of the systemic nature of CE: CE is known to propose a major sustainability paradigm (Aarikka-Stenroos et al., 2021; de Jesus & Mendonça, 2018), in which material and

energy loops are closed, slowed, and narrowed down in order to build a regenerative system that involves stakeholders across all levels of society (Geissdoerfer et al., 2017; Kujala et al., 2019). Due to the particularly systemic nature of CE, it is not enough for companies to settle with innovating their business models (micro-perspective), i.e., at the level of internal operations and processes: instead, they need to develop and innovate also their supply chains and related collaborations with external partners (meso-perspective) (Kaipainen & Aarikka-Stenroos, 2021). Accordingly, although innovation is recognized as a key for developing circular business (e.g., de Jesus & Mendonça, 2018; Jakobsen et al., 2021), there is a knowledge gap on how companies innovate business models and supply chains for a CE transition. This gap is of great importance, given the interplay that exists between the concepts of a business model and a supply chain in the CE domain. This interplay requires investigating circular innovation at the intersection between the micro- and meso-perspectives, entailing companies' internal business models change in the collaborative supply chains through innovation. In the present study we argue that only through considering this interplay it is possible to properly understand the emergence of circular innovations.

To date, only a few studies have tried to look at the intersection between the micro- and meso-perspectives for a CE transition (e.g., Aarikka-Stenroos et al., 2022; Geissdoerfer et al., 2018; Urbinati et al., 2017). Prior research has mostly looked at either micro- or meso- perspectives, separately, considering business models and supply chains as stand-alone, not relatable concepts. On the one hand, from a micro-perspective, prior research focused on the concept of a Circular Business Model (CBM), i.e., how CE principles are implemented in companies through the adoption of particular managerial practices, such as product design for circularity or the shift from product selling to product-service systems (PSSs) (Linder & Williander, 2017; Urbinati et al., 2017). Researchers found that such improvement, change and innovation can be either incremental or radical by nature (see Ranta et al., 2021). However, these studies neglect to examine how innovation in a CBM reflects to innovation occurring in supply chains. On the other hand, from a meso-perspective, researchers focused on the concept of a Circular Supply Chain (CSC), i.e., how companies adopting CE principles manage and innovate their relationships with their external partners or supply chain stakeholders (e.g., Farooque et al., 2019; Mangla et al., 2018; Masi et al., 2017). However, this research stream does not say much on the link between CSC and CBM innovation. Thus, current research still struggles to provide a comprehensive, systemic view that brings these two perspectives together in order to allow a deepening of how companies innovate business models and supply chains for a CE transition, or in other words, how companies' business models and supply chains interact when designed for circular innovation.

There are multiple underlying motivations and rationale for companies and their supply chains to adopt and implement circularity through innovation: the motivation can originate from changing regulation and institutions; companies' internal strategies and seeking a competitive advantage, as well as industries' sustainability and circularity road maps (Bjørnbet et al., 2021; Kaipainen et al., 2021; Ranta, Aarikka-Stenroos, Ritala, et al., 2018). When innovating for circularity over time as part of a company's strategic development, it is evident that companies consider both the development of their internal practices as well as supply chain relationships simultaneously (Kaipainen & Aarikka-Stenroos, 2021). This kind of strategic development is particularly challenging for manufacturing companies (Sousa-Zomer et al., 2017), who need to rethink their value creation logics in order to simultaneously manage their daily business with an increasing pressure of environmental regulations, access to scarce resources, and resource price volatility (Kristoffersen et al., 2020; Lieder & Rashid, 2016). However, these challenges are rarely discussed in the manufacturing industry (Sousa-Zomer et al., 2017), even though it has a key role in tackling the United Nation's Sustainable Development Goal for sustainable consumption and production (SDG12) (Kristoffersen et al., 2020). Therefore, studying how manufacturing companies can achieve circular business through innovating their business models and supply chains serves as a particularly interesting context, one not yet adequately covered in research to date.

As a first step towards filling the research gap highlighted above, we address the research question of: *“How companies innovate their business models and supply chains for implementing a CE”* When answering this question, we aim to provide knowledge at the intersection between business models and supply chains in a CE domain by bridging the micro- and the meso-perspectives of a CBM and a CSC and explore how they interplay.

Our research is structured as follows. First, by leveraging the innovation management, CBM, and CSC literatures, we build a framework where innovation for circularity demands different innovations, i.e., product/process/service innovation (micro-perspective); and retaining existing chains/renewing them with incremental or radical innovation (meso-perspective). And then, through an empirical multiple-case study of Finnish and Italian CE pioneer companies, this framework is elaborated with empirical cases in order to provide empirical evidence to the theoretically assumed interplay between a CBM and a CSC in the manufacturing industry. The findings show the interplay with different innovation strategy variants. These new insights complement the lack of understanding on what the implementation of circularity means for companies' business models and their supply chains, paying particular attention to the

manufacturing industry. Our framework and findings contribute to innovation management, CBM and CSC literatures, and encourage managers to simultaneously consider both business models and supply chains when innovating for circularity.

2 Theoretical background

Current theoretical understanding to how companies innovate their business models and supply chains for a CE builds on multiple streams of literature. We lean on established streams on innovation management of business models, supply chains, and value chains, and add to these streams with environmentally-focused innovation management literature, including insights from research on eco-innovation, sustainability-oriented innovation, and circular innovation of business models and supply chains.

2.1 Micro-perspective: Innovating business models for circularity

In general, companies strive for maintaining their business and competitiveness in the ever-changing markets by innovating their business models (Teece, 2010). Business model innovation focuses on pursuing opportunities within the changing environment (Schneider & Spieth, 2013) through “the conceptualisation and implementation of new business models that can comprise the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another” (Geissdoerfer et al., 2018, p. 406). Traditionally viewed, the changes of the value components in a business model innovation can be built around a product or a service (Mitchell & Coles, 2004), with either gradual/incremental changes, or radical changes, such as moving from product-oriented business to services (De Reuver et al., 2013). When innovating a business model from one model to another, transformation can affect the entire business model by changing one or more of its key elements, value proposition, value creation and deliver, value capture, and the interrelations between the elements (Geissdoerfer et al., 2018).

Innovating a business model to be sustainable and circular has been of interest in the prior research from a micro-perspective of CE implementation (e.g., Centobelli et al., 2020; Inigo et al., 2017; Laukkanen & Patala, 2014). Innovating a business model with a circular approach reflects on the process through which companies create, transfer, and capture value in a circular manner (Linder & Williander, 2017). Circularity changes the way the components of business models are designed and developed, and

demands considering opportunities for reducing, reusing, and recycling of material flows within the business model (see e.g., Ranta et al., 2018). Such innovation can necessitate different levels of change: Ranta et al. (2021) found that companies aiming to pursue economic and environmental value and benefits from circularity were led by incremental and/or radical improvements/innovation (Ranta et al., 2021).

The literature stream of CBM points out that companies that want to innovate their business model according to CE principles need to adopt particular managerial practices within their internal boundaries (Ünal et al., 2019; Urbinati et al., 2017), such as product design for circularity, design out waste, or the shift from product selling to product-service systems (PSSs). In the CE domain, these practices touch upon three main units of change: processes, products, and/or services (e.g., Bocken et al., 2016; Jakobsen et al., 2021). This categorisation is aligned also with the main types of eco-innovation (Triguero et al. 2013). First, when the change is focused on the process, companies can pursue circularity in their business model through innovating their processes to favour the closing, slowing, and narrowing of materials and energy according to CE principles (Engez et al., 2021). Second, when the change is focused on products, companies typically consider the nature of their products to prolong their life cycle and reduce the environmental impact, as well as how the resources and components inside these products could be upcycled, downcycled, or recycled when they reach their end-of-life (Franco, 2019; Urbinati et al., 2019). Third, as circularity engages companies to generate money from the delivery of new value propositions, companies are challenged to design new value capture mechanisms. These mechanisms imply a shift from product selling to service selling, which is aimed to extend the producer's responsibility for the product, let the customer be a user and not a buyer, thus avoiding the generation of waste by the customer. These mechanisms can take place through pay-per-use (e.g., leasing or renting) or pay-per-performance (Bocken & Ritala, 2021), and by developing reverse logistics and take-back systems, which are designed to take back the product from the customer by the producer (Ranta et al., 2018; Engez et al., 2021). Such changes in business models inherently require typically also innovation and change in supply and value chains, which is discussed next.

2.2 Meso-perspective: Innovating supply and value chains for circularity

As far as a meso-perspective is concerned, a central stream of research interest has focused on exploring how innovation expands beyond companies' boundaries to their supply and value chains. Indeed, innovation strategies are characterised by their value chain structures, which is a key part of a business model (Denicolai et al., 2018). Thus,

when companies innovate their business model, usually they need to look outside for receiving support from other organisations; particularly in their supply and value chains, in terms of new resources, capabilities, and know-how (Aarikka-Stenroos et al., 2014). This idea is not new to streams of innovation management, such as sectorial systems of innovation (Malerba, 2002), innovation systems (Laukkanen & Patala, 2014) and innovation ecosystems (Ritala et al., 2013). Supply chains refer to a network of organisations that engage in various processes and activities through upstream and downstream linkages, in order to produce value for consumers, with products and services (Christopher, 2011). When this value creation for stakeholders is enhanced through an incremental/radical change of supply chain network, technology, or process occurring in a supply chain, an industry, or a company function, we are discussing supply chain innovation (Arlbjørn et al., 2011). Supply chain innovation can enhance service effectiveness, improve operational efficiency, increase revenue, and maximise joint profits through information and related technology developments and new marketing and logistic procedures (Bello et al., 2004).

In the CE domain, especially, there is an emerging discussion about the design of CSCs, where the actors collaborate in an innovative way in order to achieve circular flows of products, by-products, and waste and to extend the product life cycle: this concerns both upstream and downstream phases of the supply chain (De Angelis et al., 2018; Govindan & Hasanagic, 2018). Turning traditional linear supply chains into CSCs calls for reverse logistics and take-back systems within a single supply chain, or for expansion to a multi-actor supply network that can include actors beyond existing industry boundaries (De Angelis et al., 2018). Thus, for CSCs, it is also typical that collaboration and communication expands from classic supply chain actors to encompassing Non-Governmental Organisations (NGOs), governmental institutions, and other organisations (Aloini et al., 2020; González-Sánchez et al., 2020).

Based on the existing literature on this topic, there are three main ways to innovate a CSC: (i) to redesign the upstream phase of the chain, modifying the collaborations with the suppliers and with the suppliers' suppliers; (ii) to renew collaborations with downstream actors of the supply chain, including customers and end-customers (these two options for change remain typically incremental innovation in terms of how much they impact the company and its encompassing environment); and (iii) to combine the approaches (i) and (ii), with the aim to address both the upstream and downstream phases of the supply chain simultaneously (see e.g., Bressanelli et al., 2019; Zhu et al., 2010). This is the most radical way to innovate supply chains.

Based on the literature review above, the necessity of collaboration to design CSCs becomes a key principle of CE. When reflecting on the CSC literature, however, it becomes of paramount importance to investigate how collaborations take place between supply chain actors in order to favour the closing, slowing, and narrowing of resource loops (Farooque et al., 2019), and how they may impact the design of companies' business models. Although more recent research has shown that CSCs can play a key role in innovating companies' business models and supporting their circular design (Aarikka-Stenroos et al., 2022), further theoretical and empirical effort is required in order to advance knowledge at the interplay between CBMs and CSCs.

2.3 Linking the micro- and meso-perspectives of circular innovation in order to build a framework

To link CBM approach addressing the micro-perspective and CSC approach addressing the meso-perspective innovation towards circularity, we next constructed an integrative framework in order to create a more comprehensive understanding of circular innovation in the intersection of these two approaches. Previous studies have indicated that this intersection requires more research: Aarikka-Stenroos et al. (2022) found that companies starting to implement CBMs developed and launched diverse innovative processing technologies, products and services and that their circular supply chains played crucial role in driving and enabling this change. Zucchella and Previtali (2019) found that CBM innovation may be fueled by CSC collaborations modifying the value proposition, value delivery, value transfer, and/or value capture of the business model.

By interpreting and drawing from the existing knowledge on CBM and CSC research streams, we had a theoretical framework that captures the key insights from both literature approaches and pays attention to the level of needed change and innovation by distinguishing radical and incremental innovation. We shaped this framework as a matrix (see Figure 1).

<i>Radical innovation</i>	Potential variants of circular innovation strategies		
<i>Incremental innovation</i>			
<i>No change/innovation</i>			
<i>Innovation for CSCs (meso)</i>	<i>Process innovation</i>	<i>Product innovation</i>	<i>Service innovation</i>
<i>Innovation for CBMs (micro)</i>			

Figure 1 Theoretical framework.

From the micro-perspective, circularity tends to necessitate innovation in companies' business models. Therefore, on the *x-axis* we distinguish whether the innovation in a CBM is focused on a process, a product, or a service. Typically, innovating the business model with process or product-orientation is less radical compared to shift towards a service-oriented business model (e.g., De Reuver et al., 2013). The changes in processes, products, or services are also associated with innovation in the supply chain (Gao et al., 2017). From the meso-perspective, the question is how much change is needed in the current supply chain collaborations in order to support the innovation of companies' CBMs. Therefore, on the *y-axis* we distinguish the options for designing CSCs between no change/innovation, incremental innovation, and radical innovation. Here, the degree of circular innovation of the supply chain varies from incremental to radical; we consider the innovation as incremental if the company modifies either its upstream or downstream phase, or both, in a moderate way, whereas the radical innovation of the supply chain demands the designing of entire new supply chain collaborations from both upstream and downstream phases with a major impact in the business environment. If the supply chain remains the same, there is no change/innovation in the supply chain collaborations.

What happens at the intersection of the implemented innovation from the micro-perspective and from the meso-perspective defines different types or variants of circular innovation strategies. This is what we proceeded to investigate with the following empirical case study.

3 Research design

To develop the understanding on how companies innovate their business models and supply chains for implementing CE, we next elaborated on and defined the applicability and functionality of the theoretical framework depicted in Figure 1 by leveraging an empirical multiple-case study. We carefully sampled a total of 10 Finnish and Italian case CBMs, implemented as a specific business branch by companies that have a CE mindset and that are implementing CE as pioneers in their industries, and with particular reference to the manufacturing industry context. The cases represent CBMs that are recognised as pioneers in their field, thus they serve as instrumental cases. The companies were purposefully selected from a wide range of sectors, from

oil & energy sector to retail, and from furniture industry to electronics in order to provide generalisability to the applicability of the developed framework.

The multi-source data entails interviews, group discussions, annual reports, and other secondary data sources on the CBM and CSC design at each of the case companies. In the empirical multiple-case study, we took a deductive approach and utilised the theoretical framework in order to systematically analyse and map CE pioneer cases based on how they have innovated their CBMs, with process/product/service focus, and CSCs, through maintaining or renewing the supply chains with a varying degree of innovation, i.e., no innovation/change, incremental or radical.

Table 1 Selected CBM cases, characteristics of companies, and data sources

<i>Circular business model cases</i>	<i>Case company industry, size (number of employees) & revenue (Million euros, Me)</i>	<i>Data sources</i>
Water packaging CBM	Food & Beverage > 250 employees, 320 Me	Interviews, secondary data
Textile re-processing CBM	Textile industry 10 employees, 26 Me	Interviews, group discussions, secondary data
Soil circulation CBM	Construction industry 10 000 employees, 3 310 Me	Interviews, secondary data
Biofuel CBM	Oil & Energy industry 4 850 employees, 15 150 Me	Interviews, group discussions, secondary data
Appliances refurbishment CBM	White appliances 25 employees, < 1 Me	Interviews, group discussion, secondary data
Techno-polymers' lamp CBM	Materials & Polymers 300 employees, 150 Me	Interviews, secondary data
Ready-to-assemble furniture CBM	Furniture manufacturing 250 employees, 90 Me	Interviews, secondary data
Marble based textile CBM	Textile industry 2 employees, < 1 Me	Interviews, group discussion, secondary data
Tools-as-a-service CBM	Manufacturing tools 237 employees, 64,6 Me	Interview, group discussion, secondary data
Coffee cups as a service CBM	Food & Beverage > 250 employees, 2 000 Me	Interviews, secondary data

4 Findings

The findings from the case analysis allow us to position the cases according to the theoretical framework (Figure 1). The positioning is displayed in Figure 2, which shows the diversity of variants for circular innovation strategies by the studied case companies embedded in their supply chains and involving varying degrees of innovation to both the micro- and meso-perspectives. Each case is briefly explained and analysed next.

<p>Radical innovation</p>	<p><i>Biofuel CBM:</i> Sourcing residuals and waste for processing bio-based fuel</p>	<p><i>Marble-based textile CBM:</i> Combining two separated supply chains for new product development</p> <p><i>Ready-to-assemble furniture CBM:</i> Sourcing recycled materials for furniture production</p>	
<p>Incremental innovation</p>	<p><i>Soil circulation CBM:</i> Collecting and transporting soil between construction sites</p> <p><i>Textile re-processing CBM:</i> Re-processing used textile materials for producing workwear</p>	<p><i>Techno-polymers' lamp CBM:</i> Products made with additive manufacturing distributed with a new downstream chain</p>	<p><i>Coffee cups as a service CBM:</i> Collecting used materials back from the offered service</p> <p><i>Tools as a service CBM:</i> Comprehensive tool service with a monthly fee to industrial customers</p>
<p>No change/innovation</p>	<p><i>Water packaging CBM:</i></p>	<p><i>Appliances refurbishment CBM:</i></p>	

	Treatment of recycled plastics	Sourcing for manufacturing refurbished products		
<i>Innovation for CSCs (meso)</i>				
<i>Innovation for CBMs (micro)</i>	<i>Process innovation</i>	<i>Product innovation</i>	<i>Service innovation</i>	

Figure 2 Sampled cases mapped according to the theoretical framework

4.1 Process-oriented CBM innovation

For the water packaging, textile re-processing, soil circulation, and biofuel CBMs, the innovation necessary to enable circularity has its core within the internal processes.

Water packaging CBM

The main issue for the water packaging company was reducing the use of virgin plastic materials in the manufacturing process, being concerned about the environmental impact, as well as pushed by an evolving normative context addressing this issue. By serving large beverage companies, the company addressed the value creation in the CBM basing it on the development of a new internal manufacturing process, requiring purposively designed different settings for existing equipment and the addition of a pre-treatment phase. The new process allowed the company to introduce an increasing amount of recycled plastic as input materials for production. The extant supply chain of the company has been involved in the process innovation, and new specific supply contracts for the recycled plastic input have been signed. However, while no significant innovation has been put in place at this level, the company is exploiting its existing relations with suppliers.

Textile re-processing CBM

Due to the significant environmental impact of the textile industry and the values of pioneering companies in the field, a workwear company designed a textile re-processing CBM. The company tailors workwear for their customers, primarily service companies, and produces the workwear primarily in its Baltic production sites from ecological and recycled textile materials. The value creation in the CBM is based on the process innovation that allows extracting the fibres from used textiles and re-organising them for manufacturing new products, designed with circular principles. The supply chains are built in close collaboration with material suppliers and

subcontractors in order to meet the CBM's needs, but they do not reflect a significant innovation or change taking place to enable the business model: only incremental innovation shows in the downstream chain, as customers are able to send back their used textiles for re-processing and re-production.

Soil circulation CBM

The soil circulation CBM was initiated by a traditional, large industrial construction company in order to avoid logistics and landfill costs from the usage of soil materials. Instead of ordering new soil and dumping the used soil, the CBM allows circulating the soil materials within and between construction sites. At the heart of the CBM to create value is the process for circulating the soil material. To do this, the construction company has developed new processes to collect and transport the soil from one construction site to another, including the design of the reverse logistics within the upstream supply chain that reflect incremental innovation to the supply chain collaborations.

Biofuel CBM

The biofuel CBM was created within a traditional energy & oil company that realised it could not survive with fossil-based business and wanted to explore new, sustainable ways of producing fuel for road and aviation transportation. At the core of the business model innovation for circularity is the technology that allows processing the globally sourced renewable feedstocks into fuels and selling them with a higher price margin to customers in Northern Europe and America. The value creation in the CBM innovation is thus based on innovating the process for fuel production. Drastic changes in the supply chain were implemented in order to build a transparent supplier network for new types of feedstocks and to deliver them to customers more widely distributed with multiple contents compared to the previous linear business model: As the CBM demands renewable feedstock in high volumes, the feedstock needs to be sourced globally through completely new upstream supply chain networks that are made transparent for externals, principally the customers. At the same time, the downstream supply chains have changed with not only new geographical areas interested in the renewable fuels, but also with novel customer types that have expanded over time covering other sectors e.g., the aviation sector.

4.2 Product-oriented CBM innovation

The appliances refurbishment, techno-polymers lamp, food e-commerce, and ready-to-assemble furniture CBMs focused on building a product-oriented circular offering.

Appliances refurbishment CBM

The appliances refurbishment CBM was built on the existing business of the company dealing with spare parts management and after sale services provision for a number of appliances producers. The value creation in the CBM is based on the product innovation, by bringing directly on the market, as well as the existing service business, refurbished products. Indeed, instead of discarding appliances with major failures coming from final customers, the products are fully refurbished and given a new extended life on the market. As far as the supply chains are concerned, the company was not bringing significant changes to its existing business, apart from placing additional orders for spare parts and other components needed for the refurbishment process. Given the limited size of the company, it is worth mentioning that it was able to manage the downstream activities towards the final customers internally, otherwise it could have required access (incremental innovation) to a different set of suppliers already well present in the appliances market.

Techno-polymers' lamp CBM

Similar to the previous case, the company started its CBM innovation by introducing internally a new product, based on additive manufacturing technologies, exploiting the presence inside the company of raw materials and the flexibility of 3D printing technologies in order to create a new lamp. The product that lies at the core of the CBM uses the polymers' scraps from the manufacturing process of the company, which allows the company to enter in a new market, i.e. the lighting segment for final users, quite far from its existing B2B business. As a consequence, the company had to innovate also the supply chains to which it connects. In particular, a new-to-the-company network of suppliers was accessed in order to reach the final market, thus representing an incremental innovation to the supply chains.

Ready-to-assemble furniture CBM

The ready-to-assemble furniture company was initially in the business of supplying wood components for furniture producers when it decided to develop a completely new product based on 100% recovered materials. The value creation in the CBM deals with a product innovation which is able to exploit exhausted furniture as a source of input for new furniture. As well as the development of the new product, the company had to radically innovate also its supply chain. Indeed, there are existing actors in its network providing the supply of exhausted furniture, that was normally treated as waste and therefore managed by waste recollection companies. The ready-to-assemble furniture company internally created and developed a consortium of actors for collecting and recovering the material required.

Marble based textile CBM

To respond to the needs of the market that highlight the high performance and a more responsible impact of textile materials, and to reduce waste materials in the marble industry, the company innovated a CBM with marble-based textiles. Using the powder of marble, usually a scrap of the manufacturing process for marble products, as an additive for creating a completely new marble-based textile product is the core idea of the CBM innovation of the company. In this case, the product innovation for circularity has required a radical change in the supply chains. Indeed, the company was obliged to implement radical innovation in order to operate through connecting two previously distinct supply chains: the supply chain of marble products and that of textiles. This connection between the two supply chains radically modifies the usual chain of players in the industry and creates a unique symbiosis between the two industries via the supply chains.

4.3 Service-oriented CBM innovation

As for the service-oriented innovation for offering a circular solution, only two of the sampled cases were identified. Those were the coffee cups as a service CBM and the Tools as a service CBM.

Coffee cups as a service CBM

Being concerned about the environmental impact of exhausted coffee cups produced by the company to serve the consumer market, the coffee provider company initiated coffee cups as a service CBM. The value creation of CBM deals with a completely new service designed by the company to provide the needed cups to the customers, ensuring at the same time the take back of exhausted ones. Exhausted cups are treated in order to recycle the technical material (aluminium) and produce compost with the organic residues. The coffee cup as a service CBM uses the extant chain to reach the final customer and implies incremental innovation in the downstream of the supply chain by connecting with two new for the company but already existing supply chains for exploiting the exhausted coffee and the recovered aluminium.

Tools as a service CBM

The industrial tools company provides tools to construction, energy, and manufacturing businesses, which all are material- and energy-intensive and are facing the crucial need for implementing sustainable solutions demanded by global regulations. The tools as a service CBM is based on renting industrial tools to customers with a monthly fee that covers costs of use, repair, and insurance for theft. The value logics of the CBM lean on service innovation. The supply chains in the CBM

support the supply and distribution of the tools, as also non-service-based business models of the company. An incremental change to the supply chains is present by the repairing and collection of used products from the customers. However, the tools collected from customer rental are not re-distributed for new customers in a closed-loop supply chain, but instead thrown away.

5 Discussion

When positioning the empiric cases into the theoretical framework, we are able to draw observations on the key aspects of the circular innovation, acknowledging both CBM and CSC approaches. Our structured analysis and positioning of cases in the framework allow us to find evidence of the assumed circular innovation strategy variants that differ in terms of CBM innovation (micro-perspective) and required CSC innovation (meso-perspective).

In the micro-perspective (X axes in Figures 1 and 2), we see that the business model innovation showcases through innovation of processes, products, and services that could be expected based on the reviewed prior innovation literature. However, in the context of a circular economy, this diversity of innovation types leading to a CBM innovation has been a research gap until recently (Engez et al., 2021). Therefore, it is important to note that the studied cases manifest diverse ways in which to innovate a business model for circularity. Interestingly, despite this variation potential, most cases focused on product-oriented innovation in their CBM. This finding indicates that it may be easier for companies to start looking into their products when inducing a CBM. In contrast, the change towards service-oriented CBMs appears more restricted, although services are proposed as a viable and effective option for manufacturing companies innovating their business models to, for example, enhance the value proposition and redesign the value chains (Velamuri et al., 2013). The challenges in moving from products to services may appear when turning existing linear business models to circular, because such change is a radical and thus demanding in companies' business model innovation (De Reuver et al., 2013). We also find that the change principally related to processes, products, or services is often not strictly dichotomous and limited to only one type of business model innovation but, for example, a process-oriented innovation may trigger movement towards product- and service-oriented business model innovations (see also Kaipainen & Aarikka-Stenroos, 2022).

The meso-perspective findings (Y axes in Figures 1 and 2) display the diverse ways for innovating through circular supply chains. The empiric cases show, for example, implementation of reverse logistics (soil circulation CBM), development of supply

chain transparency tracking systems (biofuel CBM) to be outcomes of innovating supply chains when supporting a CBM. Also, connecting supply chain actors across industry borders appears in the cases (Marble textile CBM; Coffee cups as a service CBM), which is highlighted in prior circular supply chain literature as being important for enabling CBMs (Aarikka-Stenroos et al., 2022). As the illustrative cases demonstrate, a radical innovation to supply chains is demanding even for CE pioneer companies to implement in practice, although it has been researched within the sustainable supply chain innovation field more than incremental innovation implementation (Gao et al., 2017). Radical innovation of supply chains seems also to occur often together with, or as a result of, product-oriented business model innovation.

Our research reveals cases where innovation occurs only in the micro- or at the meso-perspective. However, interestingly, most of the circular pioneer companies have innovated both simultaneously. Thus, the key finding confirms our assumption that circularity demands considering and innovating not only the micro-perspective, including the business model and internal processes, but also the meso-perspective through supply chain collaborations. As we position the cases according to the theoretical framework, we find that the real-life implications for circular business entail various combinations of micro- and meso-level innovation. We call these found combinations variants of circular innovation strategies. With these strategic variants, this study is able to show how much variation there is actually in the two dimensions, expanding from the prior research (Aarikka-Stenroos et al., 2022; Kaipainen & Aarikka-Stenroos, 2021; Ranta, Aarikka-Stenroos, Ritala, et al., 2018) that has pointed to the general need for innovation in order to enable circular economy business. With our framework, we can complement the existing understanding by showing the variation through strategic variants resulting from innovation in the two dimensions, business model and supply chain, with a varying degree of radicality. Although the existence of strategic variants that the companies imply by combining various levels of micro- and meso-perspective innovation is implicit in our findings, the likelihood and circumstances for such variants to emerge requires further research.

6 Conclusions

In the present study, we aimed to explore how business models and supply chains interact when being designed in a circular way. We compiled theoretical framework in the intersection of the micro- and meso-perspectives of the circular innovation in CBM design and conducted a multiple-case study with instrumental cases. Based on the theoretical and empirical insights, we show the evident connection between micro- and meso-perspectives in the design for circularity and display innovation strategy variants

(see Figure 2) that apply different combinations of innovation in CBM design from micro- and meso-perspectives. With the evidence from the cases that were mapped in the framework, we are able to provide empirical evidence to the theoretically interpreted linkage between micro- and meso-perspectives in CBM design, finding that the framework applies not only to theory, but also practice in real-life CBMs. According to the findings, implementing a CE demands companies to develop their business models strategically through different combinations of innovation in the CBM design (i.e., process, product, and/or service) and in the CSC design (no change/innovation, incremental innovation, and/or radical innovation). These insights provide much-needed understanding to both theory and practice of innovation management for circular business model and circular supply chain design. When selecting which combination of the micro- and meso-level innovation a company implements into its CBM, the company needs to take fundamental strategic decisions in its innovation and business management. Therefore, the framework allows companies to identify themselves within the framework based on the CBM they are executing. Here, the framework also allows them to elaborate on both their current and future choices for the circular value proposition (Ranta et al., 2020) and their value creation within the processes, products, and/or services in the micro-perspective of a CBM. Meanwhile, the decisions made in the meso-perspective for innovating circular supply chains may impact incrementally or radically the means of companies' circular value creation (see Mishra et al., 2018; Ünal et al., 2019).

The selected combination of the micro- and meso-level innovation a company implements into its CBM serves as a strategic path for the company to pursue not only circular business model innovation, but also long-term guidelines for a circular innovation strategy. However, the variants for circular innovation strategies that are emerging from Figure 2 are not mutually exclusive, meaning that when innovating CBMs and CSCs, a company may entail and reflect features of multiple circular innovation and business strategies simultaneously. For example, biofuel CBM expanded the know-how of chemical processing in order to develop new business by innovating production of renewable plastics. Meanwhile, interestingly, as the circular innovation strategies develop over time (Kaipainen & Aarikka-Stenroos, 2021), the strategic decisions within the logics for value proposition and creation in the CBM also evolve over time. Accordingly, companies may possibly move together with their CBMs from one circular innovation strategy variant to another as the time passes.

6.1 Contributions to theory

We are among the first to present a framework that reveals the interplay between the micro- and meso-perspectives of CE, involving innovation to processes, products, and services from the micro-perspective of a circular business model, as well as from the meso-perspective in the design of circular supply chains. Thus, our findings and proposed framework have multiple contributions to theory, particularly in innovation management research, as well as in the intersection of the addressed literatures of CBM and CSC.

For innovation management research, the findings strengthen the understanding of the interlinkage between two major types of innovation, those of business models and that of supply chains, strengthening the understanding of diversity of innovation types (e.g., Garcia & Calantone, 2002) in the context of a circular economy (Brown et al., 2021; de Jesus & Mendonça, 2018). Our study extends and sharpens earlier research discussing diverse circular innovation types (Engez et al. 2021) and levels of novelty (Ranta et al. 2021) that can lead to CBM innovation. Also, our study displays the variation of circular innovation and structures and theorises this variation by utilising the two innovation perspectives (micro- and meso-perspectives) and distinguishing radical and incremental change. From the perspective of CBM research, the proposed and empirically elaborated framework brings new knowledge to the ways circularity can reflect in the innovation of processes, products, and services of a company in order to create, transfer, and capture value in a circular way (Franco, 2019; Urbinati et al., 2017; Ranta et al. 2021). Then again, taking the perspective of CSCs, the axes of the framework complement the lack of understanding to the key dimension through which companies can implement a CE in practice in their supply chains through innovation, and integrate it in their business models by developing their collaborations with other organisations in their supply chains in order to achieve circular goals (De Angelis et al., 2018).

6.2 Practical implications

Our study has several practical implications aimed at company managers who are willing to apply circular principles in their business and increase the degree of circularity within their companies. By identifying the company CBM according to their positioning within our framework, company managers will be able to learn about the available directions in which they can continue developing their circular strategic combinations of innovation, to be applied to their business models internally and/or within supply chains.

Above all, we call managers who want to innovate a CBM to think in a more systemic way: to not only (re)design their CBM starting from their internal boundaries, but also simultaneously to expand their view into their supply chains. As this study shows, the innovation of a CBM necessarily goes hand in hand with CSC collaborations, and thus pursuing circularity in companies demands open-mindedness towards holistic and systemic circular innovation strategies, involving both micro- and meso-perspectives.

6.3 Limitations and avenues for future research

We acknowledge that our study has also some limitations: we focused on developing CBMs and circular business, rather than the process of developing particularly a circular process/products/service. As our study analysed a set of selected cases, more generalisability could be pursued with additional cases and with an extended data collection and analysis. Furthermore, the discussed framework and the appearing variants of circular business models and strategies (see Figure 2) could be investigated more in-depth by addressing a specific set of circular innovation strategy archetypes, as well as their linkages in order to develop business strategies to circular. This qualitative research aimed to take the first step by uncovering the variation of innovation for circular business and should be continued by further studies on why variation and the possible archetypes emerge, and how to manage simultaneous innovating of the business models and supply chains – this direction would link the topic to companies' capabilities and motivations to innovate. More thorough investigation of these emerging circular innovation strategies, their possible archetypes, and their dynamics over time could be allowed, for example, with application of longitudinal case research. Here, as the companies innovate strategic changes to the micro- and meso-perspectives of their business models, future research could look into the path dependency and path creation (Garud et al., 2010) during the development of companies' circular innovation strategies over time. Furthermore, more research is needed on how innovation in CBM and CSC leads to circular transformation and renewal of particularly environmentally burdensome industries, for example, textile or construction, and how the disruption in such industry-crossing technological systems can be managed by aligning companies' CBM innovation and related CSC innovation.

There are also multiple research avenues beyond the specific setting and context of our study. The framework may serve useful also in identifying and analysing innovation strategies not limited to circular economy context. Furthermore, our study is focused on manufacturing companies, and thus leaves room for future research to investigate further the applicability of the framework in other types of industries. Also, our study

does not take explicitly into account country-specific factors affecting the analysis, allowing for a further extension to other geographical contexts and comparisons.

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PUBLICATION IV

Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda

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Companies' circular business models enabled by supply chain collaborations: An empirical-based framework, synthesis, and research agenda

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ABSTRACT

The circular economy (CE) has been lauded as a path enabling more environmentally sustainable economic growth for diverse industrial companies, requiring them to design and implement circular business models (CBMs). A CE widens a company's perspective to include supply chains when adopting and implementing a CBM; however, the intersection of CBMs and circular supply chain management (CSCM) research has been understudied. Although considerable CBM research has been carried out, the role of supply chain collaboration in companies' CBMs has been neglected. To address this research gap, in the present study we integrate knowledge from CBM and CSCM literature and conduct a qualitative multiple case study of six Italian and Finnish companies in order to analyze how their supply chain collaborations enable implementation of CBMs. The results allow us to develop a new conceptual framework, a synthesis of how supply chain collaborations support companies' CBM design and implementation, and a research agenda comprising seven thematic management aspects at micro, meso, and macro-levels. The framework, synthesis, and agenda provide conceptual guidance and structure for researchers and pragmatic guidance for managers.

1. Introduction

The circular economy (CE) has been recognized as a path enabling more environmentally sustainable economic growth (Kirchherr, Reike, & Hekkert, 2017). It represents a new industrial approach aimed at disrupting the dominant linear “take, make, dispose” economic paradigm of production and resource consumption (Ghisellini, Cialani, & Ulgiati, 2016) by introducing sustainable models of regenerative design, “cradle-to-cradle” principles, industrial ecology, and clean production. Thus, it aims to create a restorative industrial system that is sustainable by design (Geissdoerfer, Morioka, de Carvalho, & Evans, 2018). For many industrial companies, increased circularity implies the redesign of technologies, products, services, operations, and business models (Ranta, Aarikka-Stenroos, & Mäkinen, 2018), often requiring the focal company to collaborate with others in order to enable and implement

such circular redesign of their businesses.

As the shift from a linear to a circular approach is a system change, it requires circular shift and redesign to happen on different levels, from single companies and organizations (micro-level), to organizational collaborations and supply chains (meso-level), and further to regional and national developments (macro-level) (Khitous, Strozzi, Urbinati, & Alberti, 2020; Ranta et al., 2018; Ünal, Urbinati, Chiaroni and Manzini, 2019). Research, thus far, has provided rapidly increasing understanding on how single companies, at micro-level, can adopt and implement circularity via circular business models (CBMs), managerial practices, and value creation logics (Lüdeke-Freund, Gold, & Bocken, 2019; Ranta, Keränen, & Aarikka-Stenroos, 2020; Tura et al., 2018; Urbinati, Chiaroni, & Toletti, 2019). At the macro and meso-levels, it has largely focused on how industries or sectors adopt and implement sustainability or circularity (Merli, Preziosi, & Acampora, 2017) and only rarely and

Abbreviations: CBM, Circular Business Model; CSC, Circular Supply Chain; BM, Business Model; SC, Supply Chain; CE, Circular Economy; B2B, Business-to-Business; CSCM, Circular Supply Chain Management; PSS, Product-Service System; REM, Resource efficiency measure; LCA, Life Cycle Assessment; RTA, Ready-To-Assemble; R&D, Research and Development; CEO, Chief Executive Officer.

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recently it has studied how inter-organizational collaborations enable implementation of circularity (Ingstrup, Aarikka-Stenroos, & Adlin, 2021). Although considerable CBM research has been carried out among start-ups and larger companies, CE business research lacks understanding of how particularly industrial-scale companies' CBMs are enabled by supply chain collaborations. This understanding is crucial, as the CE principles (i.e., recycling, reuse, and reduction) necessitate, for example, closing material and product loops (Geissdoerfer et al., 2018) and therefore implies changes in companies' relationships, collaborations, and, in particular, supply chains (Kaipainen & Aarikka-Stenroos, 2021; Kaipainen & Aarikka-Stenroos, 2022).

Circularity, realized via supply chains, is the focus of circular supply chain management (CSCM) (Geissdoerfer et al., 2018; Zhang & Watson IV, 2020), addressing circular flow, and emergence and re-emergence of value, from materials and resources in the supply chain (Haneef et al., 2016). Thus, circular supply chain (CSC) literature suggests that value can emerge from, for example, leasing and service outcomes instead of ownership, and that value can be created via closed, short, and cascading loops rather than partially closed ones. Collaborative and collective value is captured, and customer effectiveness is less important. Furthermore, the scope of CSC is local, not global, and reuse, refurbishment, and cascading extend use repair and recycling activities (De Angelis, Howard, & Miemczyk, 2018). Surprisingly, although supply chains are recognized as key to CE implementation (Geissdoerfer et al., 2018; Hazen, Russo, Confente, & Pellathy, 2020), and studying them is urgent and has critical impact (Farooque, Zhang, Thürer, Qu, & Hui-singh, 2019), CSC research is still in its infancy and takes the form of conceptual syntheses; empirical investigations are lacking (Bressanelli, Pigosso, Saccani, & Perona, 2021; Geissdoerfer et al., 2018; Lahane, Kant, & Shankar, 2020; Masi, Day, & Godsell, 2017). There is, however, a consensus on the need for empirical case studies and examples of successful implementations of CSC (De Angelis et al., 2018; Ferasso, Beliaeva, Kraus, Clauss, & Ribeiro-Soriano, 2020; Govindan & Hasanagic, 2018; Hazen et al., 2020; Ranta et al., 2020; Sehnem, Vazquez-Brust, Pereira, & Campos, 2019).

To summarize the extant research gaps, CBM and CE business research provide company centric understanding on companies' CBMs and value creation but lacks understanding of what the role of supply chain collaborations is in enabling this, particularly when doing business from industrial-scale physical circular resource flows. CSCs provide understanding on how value can be created from circularity in chains but does not provide empirical evidence on what this implies for single companies with industrial scale business. Emerging 'B2B' and industrial business research examining circularity has studied start-ups (Närvänen, Mattila, & Mesiranta, 2021) and industry-academia collaborations for the CE (Ingstrup et al., 2021) and, therefore, has not studied this important aspect either.

In the present study, therefore, our aim is to bridge the gap between the CBM and CSCM literature streams by extending the perspective from a company focus (micro-level) to the more relational inter-organizational collaborations and supply chains (meso and macro-levels) (De Angelis et al., 2018; González-Sánchez, Settembre-Blundo, Ferrari, & García-Muiña, 2020; Masi et al., 2017). This approach allows us to develop a new understanding on how industrial companies can implement their CBMs via their supply chains collaborations. To achieve this, we emphasize not only the perspective of a company and its CBM, but also place supply chain collaborations at the center of a new CBM framework. Thus, we follow the so-called "portfolio" approach of managing business relationships developed by Ritter, Wilkinson, and Johnston (2004), meaning that a company needs to develop and manage its collaborative relationships with customers, suppliers, complementors, and competitors, because they directly and indirectly affect a company's business' performance. Following this "portfolio" approach, we look at collaborations from a company perspective, to be managed. By following definitions for CE oriented collaborations, by Mishra, Hopkinson, and Tidridge (2018) and González-Sánchez et al. (2020), in

this paper, we consider collaborations as joint activities between the company and the other actors for circularity and examine supply chain collaborations that enable a company's CBM design and implementation. Collaborations within a supply chain for a CBM can concern upstream and downstream supply chain actors, including, for example, suppliers' engagement, training, selection, and environmental collaboration with customers (Bressanelli, Perona, & Saccani, 2019; Ferasso et al., 2020; Hussain & Malik, 2020), and can pursue superior environmental and economic performance (Farooque et al., 2019).

To reach our research aim, we pose the following research questions: "When industrial companies design and implement a CBM, how is this reflected in their supply chain collaborations?" and "How do such collaborations support companies in the design and implementation of their CBMs?" Answering these questions adds to theory, but is also pragmatically important, as it generates new understanding of how industrial scale companies can increase circularity and sustainability via business model (re)design and supply chain collaborations, and it advises managers on how to improve both company-level and collaborative operations.

We take a theory-development approach and start by merging existing knowledge from the two research fields to build a new framework for CBM design and CSC collaborations. This framework then provides a structure for an empirical exploration of how industrial companies' CBM design and implementation is enabled via supply chain collaborations. In the empirical part, we conduct a qualitative multiple case study of six Italian and Finnish industrial companies to identify and conceptualize generalizable patterns across regional and industrial contexts, and to develop a more polished model and synthesis, which explain how supply chain collaborations support industrial companies in CBM design and implementation. We also develop a structured research agenda to encourage future scholars to study further this important, still developing area. The framework, synthesis, and agenda offer practical guidance for managers who may otherwise struggle to put CE principles into practice.

The present study is structured as follows: Section 2 provides the current state of research in the fields of CBMs and CSCM and thus builds a theoretical framework for CBM practices and CSC collaborations. Section 3 provides the rationale for the methodology in terms of research design, data gathering, analysis, and evaluation. Section 4 presents the case studies. Section 5 summarizes the results and proposes a final framework/model. Section 6 discusses the results and synthesizes how collaborations support companies' CBM design and implementation and what, therefore, needs to be managed. And finally, Section 7 concludes with theoretical contributions, a structured research agenda for future research, and managerial implications.

2. Theoretical background and conceptual development

2.1. Circular business model (CBM) research

CBM research emerged from the CE domain with the aim of investigating business strategy at the micro-level, taking the company as the unit of analysis (Bocken, De Pauw, Bakker, & Van Der Grinten, 2016; Ranta et al., 2018). Accordingly, companies willing to adopt CE are encouraged to adopt specific managerial practices in their CBMs in order to create, transfer, and capture value in a circular fashion (Linder & Willander, 2017). Managerial practices represent the actions that top managers can implement in the business model of the companies in which they operate to ensure such companies move toward adoption of a CBM (Únal, Urbinati, & Chiaroni, 2019). For example, value is *created* when Design for X practices are adopted in product production and process redesign (Sassanelli, Urbinati, Rosa, Chiaroni, & Terzi, 2020). These design practices may entail remanufacturing and reuse, or the restructuring of relationships with suppliers, manufacturers, and retailers (Vermeulen, 2015). Value is *transferred* by leveraging new modes of communication with clients to promote a company's value proposition, which includes the use of multi-channel communication (Urbinati,

Table 1
Managerial practices for CBM design (adapted from Franzò et al., 2021).

Business model dimensions	Value creation	Value transfer	Value capture
Managerial practices	<ul style="list-style-type: none"> - Design for X practices - Resource efficiency measures (REMs) or practices on the supply side, demand side, and life cycle to reduce the resources needed for goods or services, redesign of processes, life cycle assessment (LCA) techniques - Selection of partners along the supply chain and development of a suitable ecosystem of several stakeholders - Energy efficiency and use of renewable energy sources - Exploitation of waste as a resource 	<ul style="list-style-type: none"> - Commercial and promotion initiatives - Communication of circularity through all channels - Offering the right value to the right customers - Management of changes in customer habits (or even changes in customers) due to selling circular products or services 	<ul style="list-style-type: none"> - Shift from product selling to the product-service system (PSS) - Extension of the product life cycle through collaborative consumption and virtualization of services - Building and maintenance of relationships with customers (to achieve waste elimination and closing loops; e.g., incentives and benefits offered to customers for taking back used products)
Main references	<ul style="list-style-type: none"> Marconi, Germani, Mandolini, & Favi, 2019; Mendoza, Sharmina, Gallego-Schmid, Heyes, & Azapagic, 2017; Sassanelli et al., 2020; Scheepens, Vogtl, & Brezet, 2015; Gilbert, Wilson, Walsh, & Hodgson, 2017; Diaz Lopez, Bastein, & Tukker, 2018; Urbinati et al., 2017; Niero & Hauschild, 2017; Smieja & Babcock, 2017; Moreno, Court, Wright, & Charnley, 2018; Lacy & Rutqvist, 2016; Esposito, Tse, & Soufani, 2018 	<ul style="list-style-type: none"> Centobelli, Cerchione, Chiaroni, Del Vecchio, & Urbinati, 2020; Geissdoerfer et al., 2018; Kirchherr et al., 2017; Urbinati et al., 2017; Evans, Gregory, Ryan, Bergendahl, & Tan, 2009; Bocken, Short, Rana, & Evans, 2014; Baxendale, Macdonald, & Wilson, 2015; Pomponi & Moncaster, 2016; Liedler, Asif, & Rashid, 2017; Shao & Ünal, 2019 	<ul style="list-style-type: none"> Tukker, 2015; Reim, Parida, & Ortqvist, 2014; Witjes & Lozano, 2016; Rosa, Sassanelli, Urbinati, Chiaroni, & Terzi, 2020; Urbinati et al., 2017; Lacy & Rutqvist, 2016; Singh & Ordóñez, 2016; Ranta et al., 2018

Chiaroni, & Chiesa, 2017) and platform-sharing (Kirchherr et al., 2017). Value is *captured* by managing customer relationships and implementing product-service systems (PSSs) with pay-per-use or pay-per-performance service models (Tukker, 2015; Tukker & Tischner, 2006). Use-oriented PSSs are especially aimed to maintain the product as central in the offer, but the product remains under the ownership of the producer (e.g., pay-per-use), while result-oriented PSSs are particularly aimed at allowing the producer to sell results rather than products (e.g.,

pay-per-performance) (Khitous, Urbinati, & Verleye, 2022).

Table 1 shows the most relevant studies in the field of CBMs, highlighting particular managerial practices which support CBM design, as informed by the recent contribution of Franzò, Urbinati, Chiaroni, and Chiesa (2021). These practices can be implemented by, or benefit from, collaboration with actors in the supply chain.

The effective implementation of the practices shown in Table 1 requires upstream (supplier, manufacturer, and retailer) and downstream (customer) collaborations. Building on Zucchella and Previtali (2019)'s study, we argue that the transition to CE, and, in particular, to CBMs, is more valuable if the views of individual companies align with those of actors in the system concerning their understanding of "how the system is orchestrated, how value is created, and how the system can grow and expand" (p. 276). This implies that a network of actors operating symbiotically in the supply chain is crucial to CBM design and implementation. Therefore, we take stock of the studies reviewed in Table 1 and explore the collaboration opportunities made available to actors in CSCs by designing and implementing a CE in a company's business model.

2.2. Collaborations for circular supply chains (CSCs)

CBM implementation challenges companies to rethink their value creation, transfer, and capture beyond organizational boundaries, and thus create CSCs (De Angelis et al., 2018; Geissdoerfer et al., 2018; Lüdeke-Freund et al., 2019). CSCs allow managing the flows of products, by-products, and waste in supply chains and their surrounding industrial and natural ecosystems through CE principles (Farooque et al., 2019). This separates them from other similar concepts, such as green supply chains, sustainable supply chains, reverse logistics, closed-loop supply chains, and industrial symbiosis.

CSCs demand novel collaboration across the upstream and downstream supply chains (Masi et al., 2017; Zhu, Sarkis, & Lai, 2008) beyond sector boundaries, extending to institutional, governmental, and societal actors for development of functioning regulatory, fiscal, and cultural environments and applications of smart technologies (González-Sánchez et al., 2020; Govindan & Hasanagic, 2018). Collaboration allows implementing three widely recognized circular strategies: (i) the closing strategy, which comprises recycling measures and is aimed at closing the loop between post-use and production; (ii) the slowing strategy, which intensifies the product use period through the design of long-life goods and product-life extension (i.e., service loops to extend a product's life, for example, through repair or remanufacturing), resulting in a slowdown in the flow of resources; and (iii) the narrowing strategy, which improves resource efficiency by using fewer resources per product (Bocken et al., 2016).

It is critical to extend understanding from general stakeholder mappings to the versatile collaborations between supply chain actors (Bressanelli et al., 2021; Ferasso et al., 2020) for real-life implementation of CSCM strategies, particularly on the more neglected slowing and closing strategies (Bressanelli et al., 2021) and from the industrial business perspective. Table 2 shows that the extant understanding on how to collaborate for implementing CSCM strategies (i.e., closing, slowing, and narrowing) is fragmented across several research streams (Geissdoerfer et al., 2018; Lahane et al., 2020; Masi et al., 2017): production and manufacturing; supply chain and operations; and CE and sustainability. Meanwhile, understanding from the 'B2B' and industrial business perspective is limited to implicitly, assuming SC collaborations in industrial CE implementation.

2.3. A theoretical framework for studying a company's CBM practices and CSC collaborations

In this section, we piece together insights from CBM and CSCM literature streams: CBMs focus on companies' micro-level practices to generate value from circularity (i.e., value creation, value transfer, and

Table 2
Collaborations for implementing CSCM strategies as discussed in related and relevant research streams.

	<i>Production and manufacturing research</i>	<i>Supply chain, operations, and logistics management research</i>	<i>Sustainability and CE research</i>	<i>Industrial business and B2B research</i>
	Growing discussion focusing principally on the supply chain perspective	Narrow stream taking the perspective of SC and various SC actors to investigate CE implementation	Stream considering CSCM as part of CBM and/or as an enabler of different sustainability dimensions	Stream examining industrial businesses' circularity (BM, supply chain)
Collaborations for implementing CSCM strategies	<ul style="list-style-type: none"> - Collaboration for reverse logistics, closed-loop supply chains, and take-back incentives, emphasizing regional/local loops (<i>Closing, narrowing</i>) - Collaborative (re)designing of products with CE principles, and identification of components, exclusion of toxic materials, and improved after-use collection (<i>Closing, slowing</i>) - Controlling material flows between supply chain collaborators by integrating tech/digitalization into processes (<i>Closing, slowing, narrowing</i>) - Collaborating to lease, rent, and share with servitizing revenue models (<i>Slowing, narrowing</i>) - Developing partnerships and trust among different supply chain actors; engaging new actors in multi-actor supply networks, across competing SCs and between industrial sectors (<i>Closing, slowing, narrowing</i>) 	<ul style="list-style-type: none"> - Collaboration for reverse logistics and closed-loop supply chains (<i>Closing, narrowing</i>) - Extending collaboration to develop suppliers' capabilities in improving CE initiatives across the supply chain (<i>Closing, slowing, narrowing</i>) - Collaborative (re)designing products with CE principles (<i>Closing, slowing</i>) - Collaborating to lease and utilize services, enabled by digital systems (<i>Slowing, narrowing</i>) - Engaging multi-actor supply network in collaboration and reducing waste in all production stages, including integration and coordination between logistics partners and customers interested in decarbonizing logistics (<i>Narrowing</i>) 	<ul style="list-style-type: none"> - Collaboration for reverse logistics, closed-loop supply chains, and industrial symbiosis (<i>Closing, narrowing</i>) - Collaboration on product development that applies long-life modeling and Design for X (e.g., design for durability and life extension) (<i>Closing, slowing</i>) - Collaborating for product-service system BMs and sharing, leasing, and renting services, enabled by utilization of digital technologies (<i>Slowing, narrowing</i>) - Developing collaborations with customers with CE goals, utilizing various communication practices and knowledge sharing along the supply chain to ensure greater intensity in the relationships, and agreeing on the distribution of profits to coordinate the system under a fixed risk-sharing degree (<i>Closing, slowing, narrowing</i>) - Selecting the correct suppliers, building relationship capacity, and developing close collaborations with them for efficient and shared management of resources and decrease of waste in all production stages (<i>Narrowing</i>) - Collaborating to lease and utilize services, enabled by digital systems (<i>Slowing, Narrowing</i>) 	<ul style="list-style-type: none"> - Communicating economic and environmental benefits to supply chain collaborators by preparing value propositions through resurrecting value logics (<i>Closing</i>) - Inclusion and information flow in collaboration among all supply chain partners, from design and raw material suppliers to end users, service providers, and recyclers (<i>Closing, slowing, narrowing</i>) - Implementing well-defined contract models that ensure the coordination of the circular supply chain collaborations (<i>Narrowing</i>) - Collaborating for product-service system BMs (<i>Slowing, narrowing</i>)
Main references	Govindan & Hasanagic, 2018; Bressanelli et al., 2019; De Angelis et al., 2018; Mishra et al., 2018; Mangla et al., 2018; Yang, Smart, Kumar, Jolly, & Evans, 2018; Vljajic, Mijalovic, & Bogdanova, 2018; de Sousa Jabbour, Jabbour, Godinho Filho, & Roubaud, 2018	Hazen et al., 2020; Sehnem et al., 2019; Liu, Feng, Zhu, & Sarkis, 2018; Guide & Van Wassenhove, 2009	Farooque et al., 2019; Lahane et al., 2020; Geissdoerfer et al., 2018; Bressanelli et al., 2021; Lapko, Trianni, Nuur, & Masi, 2019; González-Sánchez et al., 2020; Masi et al., 2017; Maranesi & De Giovanni, 2020; Lüdtke-Freund et al., 2019; Julianelli, Caiado, Scavarda, & de Cruz, 2020	Fehrer & Wieland, 2020; Ranta et al., 2020

value capture), and CSCM focuses on meso-level collaborations to implement circular strategies (i.e., closing, slowing, and narrowing resource loops). We associate each CBM dimension with a specific CSCM strategy to propose a theoretical framework of CBM practices and CSC collaborations. Then, we discuss the connection between CBM practices and CSC collaborations in more detail.

To attain a closing strategy, companies can activate a set of managerial practices related to reverse and closed-loop logistics (Guide & Van Wassenhove, 2009; Julianelli et al., 2020; Lapko et al., 2019). In this case, companies may collaborate for closed-loop production or to take back materials and resources in closing the loop between post-use and production (Corvellec & Stål, 2019; Sehnem et al., 2019). To achieve a slowing strategy and extend the product life cycle, companies can apply service-oriented thinking to their business models (Hazen et al., 2020) and activate redesign practices for materials and resources within a product (Bressanelli et al., 2021; De Angelis et al., 2018; Sassanelli et al.,

2020). Accordingly, companies collaborate for Design for X practices, pay-per-use systems (Bressanelli et al., 2021; Kjaer, Pigosso, Niero, Bech, & McAloone, 2019), supplier exploitation, customer engagement, and stakeholder communications to identify and collect residual products and maximize their utilization (Berg & Wilts, 2018; De Angelis et al., 2018). And finally, to achieve a narrowing strategy focused on energy and material resource efficiency objectives, companies can implement collaborative policies or service models with pay-per-performance systems (Bressanelli et al., 2021; Diaz Lopez et al., 2018). Therefore, multiple points of engagement or communication should be exploited by companies to exchange resources at the height of their life cycle and reduce their environmental impact (De Angelis et al., 2018; Schwanzholz & Leipold, 2020).

The proposed framework, therefore, maps key managerial practices that can be implemented in CBMs, catalyzed by (circular) supply chain collaborations to achieve CSCM strategies (Fig. 1), and is used as a

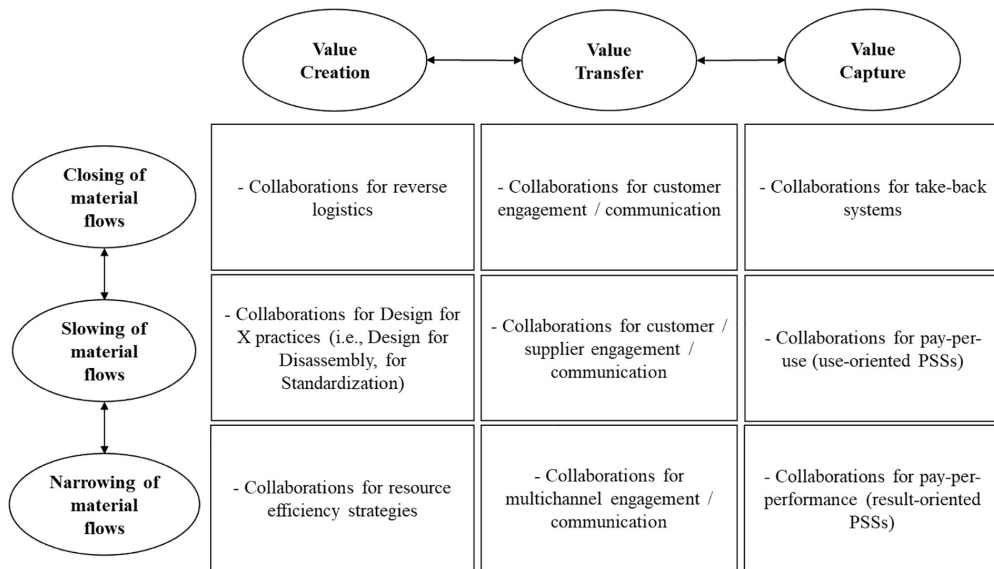


Fig. 1. Theoretical framework for CBM practices and CSC collaborations.

theoretical structure for the following empirical study.

3. Methodology

3.1. Research design and multiple case study

As little empirical research has been conducted on how companies (particularly industrial scale) can implement CBMs via their supply chains collaborations. (De Angelis et al., 2018; Ferasso et al., 2020; Govindan & Hasanagic, 2018; Hazen et al., 2020; Sehnem et al., 2019), we apply a qualitative research design and a multiple case study strategy to explore the phenomenon empirically. A multiple case strategy with a moderate number of industrial company cases allows us firstly to examine each case deeply enough in order to understand its characteristics within the supply chain and the contexts of its collaboration, including industrial and regional settings; and secondly to compare cases over industrial and regional contexts in order to identify and theorize more generalizable patterns (Beverland & Lindgreen, 2007; Eisenhardt, 1989). We selected six companies from two European locations, Italy and Finland (three from each), with similar characteristics: (i) all the companies had a circular industrial-scale business in either process manufacturing (material processing and reprocessing) or product and project business; and (ii) all had made circularity-related changes to their business and had successfully and profitably established a CBM as demonstrated by, for example, attaining a market leader position. As circular business can take various company business model forms, shaping also needed collaborations (Ranta et al., 2020), we have acknowledged this variation by using a variation principle (Patton, 2005) within our sampling to improve the transferability of our findings. The process manufacturing cases (A, B, and E) concern forest, oil, and textile industries, whereas the product/project cases (C, D, and F) concern construction, furniture, food, and beverages. The multiple case settings allow us to develop theory, via a structured analysis of several examples and via cross-industry and cross-regional comparisons, unmasking general patterns of how circularity and related business model development shape companies' supply chain collaborations. Therefore, we aim to provide an analytical and conceptual, rather than a statistical, generalization.

All the selected companies are headquartered in Europe and conduct business globally. The companies were identified from CE research projects carried out by the researchers, which allowed us to form a pre-understanding of each company and develop trustful links with the management of each. Therefore, dynamic, meaningful, and even confidential data on business development could be acquired and analyzed. This pre-understanding also enabled us to apply a theoretical sampling principle in our study (Flick, 2004; Patton, 2005); that is, since the selected cases supplied information relevant to our research focus as they had made circularity-related changes in their supply chains, we were able to refine the emerging theoretical categories of CBM development through supply chain collaborations. Following a “portfolio” approach (Ritter et al., 2004), the case ‘unit’ was determined to be an industrial company that had implemented a CBM in which supply chain collaborations played a key role, and each of the company's collaborations at the meso and macro-levels formed the case boundaries. We primarily captured the companies' perspectives as we focused on their CBMs and related supply chain collaborations. Background information and data gathered for each case are shown in Table 3.

3.2. Data gathering, analysis, and evaluation

Our analysis uses primary data from company interviews and secondary sources, as described in Table 3, to develop rich insights (Eisenhardt, 1989). Thematic, in-depth interviews were conducted from 2019 to 2021, both face-to-face and online, with company representatives including CEOs, managers, and leading experts, who explained the technical and business operations of each company, circularity within them, and related supply chain collaborations. For each case, between two and 13 respondents were interviewed. Between two and four main interviews formed the basis understanding per case, and supplementary interviews provided even more depth and triangulation in some cases. The interviews addressed the following themes: (1) how circularity is shown in the business (e.g., in technology enabling industrial-scale circular business and in business operations realizing the CBM, i.e., value creation, value transfer, and value capture); (2) how the company's business and business model are developed and developing toward circularity and the role of collaborations in this process (e.g.,

Table 3
Cases and data sources.

Company and industry	Company size (Revenue) (million euro [MEUR])	The core industrial business and the role of supply chain	Primary and secondary data
Case A (Finland) Process manufacturing; forest industry	9,800 MEUR	Produces wood-based products, such as paper, pulp, wood-plastic composites, and paper-based labels. Reverse logistics for label waste	Three interviews conducted 2019–2021 (Service Director, Vice President of Biomass Business Unit, Director of Feedstock Operations) Secondary data: Company reports, news, and press releases Four main interviews (Senior Vice President of Sustainability and Public Affairs, Vice President of Research and Technology, Head of New Feedstock, Key Account Manager of Nordic Region) and six supplementary interviews, conducted 2019–2021 Secondary data: Company reports, news, press releases, and interactive lectures Three main interviews (Retired Head of Environmental Affairs in Infrastructure Construction, Development Engineer, Project Engineer) and 10 supplementary interviews with Project Managers, conducted 2020–2021 Secondary data: Company reports, news, and press releases Three interviews conducted 2019–2020 (Managing Director, Head of Sustainability, Head of Marketing) and five supplementary interviews with the members of the sustainability team, conducted 2019–2021 Secondary data: Company reports,
Case B (Finland) Process manufacturing; oil refinery and technology development	14,900 MEUR	Produces, refines, and markets oil products and provides engineering services and licensing production technologies. Diversified supply chains for renewable fuel products	
Case C (Finland) Product and project business; construction	>3,000 MEUR	A construction company operating broadly in the fields of buildings and infrastructure. Construction projects require collaboration and coordination with a variety of suppliers, leading increasingly to reusing soil materials within and between construction projects	
Case D (Italy) Product and project business; coffee & food	> 3,000 MEUR	Produces and distributes the coffee cups of a well-established brand. Supply chain includes aluminum and other materials for the cups and coffee for the content. Reverse logistics for used cups	

Table 3 (continued)

Company and industry	Company size (Revenue) (million euro [MEUR])	The core industrial business and the role of supply chain	Primary and secondary data
Case E (Italy) Process manufacturing; textiles	> 20 MEUR	A diversified textile producer working in different fields (textiles for clothes, fabrics for furniture, etc.). The company produces high-end fabric with recycled fabrics from acrylic curtains	videos, news, and press releases Two main interviews (Head of Marketing, Head of R&D) and three supplementary interviews with R&D employees involved in the development phase, conducted 2019–2021 Secondary data: Project website, company reports, news, and press releases
Case F (Italy) Product and project business; furniture	> 100 MEUR	The company produces and sells ready-to-assemble (RTA) furniture designed to combine beauty and functionality with industrial production and environmentally sustainable development. All furniture is made with ecological particleboard panels, 100% recycled wood, made using a process with low environmental impact	Three main interviews (CEO, Head of Marketing, Head of R&D) and two supplementary interviews with members of the marketing team, conducted 2020–2021 Secondary data: Company website, company reports, news, and press releases

business model development and redesign and related changes in collaborations); (3) the key partners and stakeholders enabling circularity in industrial business and the rationale for their role; and (4) the focus of the company's future plans and directions, and further collaborations needed due to circularity; and challenges, perceptions, and expectations for the changes that will occur to the business landscape due to increased circularity requirements (e.g., industry norms and regulation of circularity) at the company/micro-level and wider meso and macro-levels. Interviews typically lasted 45–90 min and were recorded and transcribed. Field memos were written during the interviews, which were complemented by prior and follow-up telephone discussions and e-mail correspondence.

In all cases, secondary data included internal and media-originated data, such as technical documents, annual reports, companies' marketing materials and marketing brochures, newspaper articles, and companies' websites and other webpages concerning their products, solutions and offerings, businesses, evolving market and business environments, and collaborations. This data provided details on the focus of the company's circular business, business model aspects, and related collaborations.

To analyze the data and theorize from the cases, we followed an abductive reasoning process that is particularly useful for developing theory and can start either with tight and pre-structured or loose and

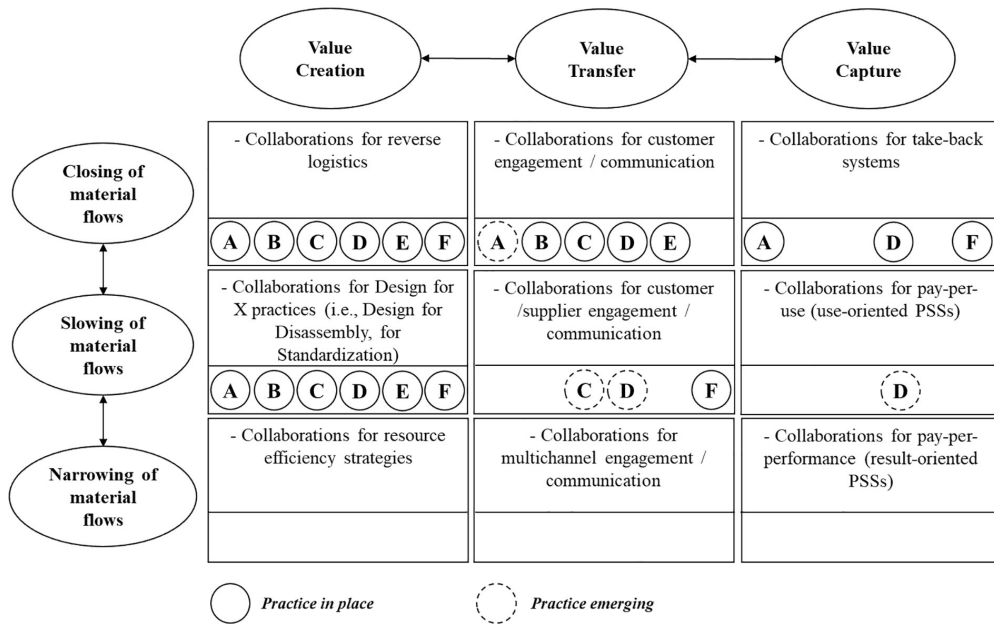


Fig. 2. Case companies and related implementation of CBM practices and CSC collaborations mapped onto the dimensions of the theoretical framework.

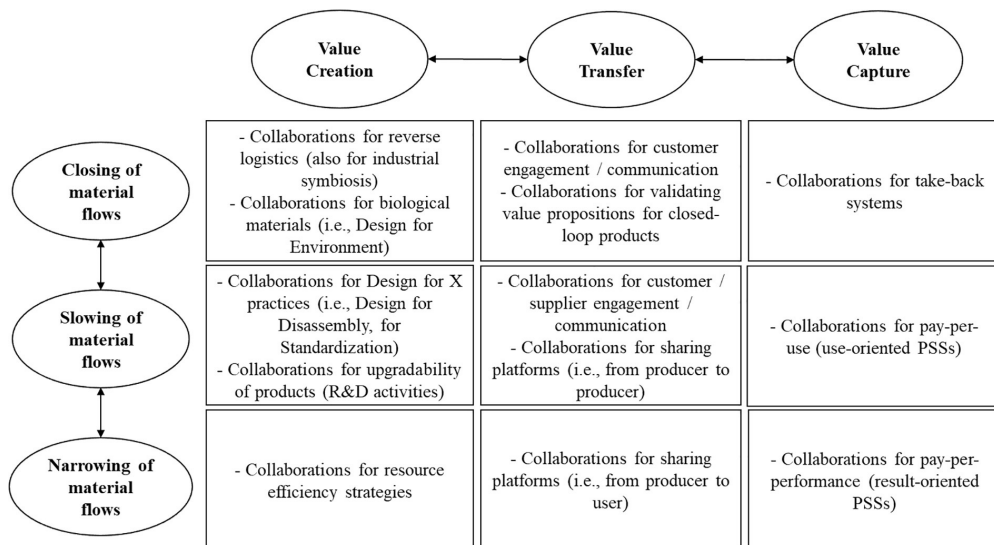


Fig. 3. Final framework for CBM practices and CSC collaborations.

emergent frameworks in order to enhance theorization (Andersen & Kragh, 2010; Dubois & Gadde, 2002; Reichertz, 2004). Concerning this research, we began with a simplified loose framework (Fig. 1) and theoretical mapping (Tables 1, and 2), which offered initial theoretical support and an analytical structure to identify and analyze CBM dimensions and collaborations with different supply chain actors and other stakeholders from empirical cases, in a somewhat deductive manner. Some findings were identified in a more data-driven thematic

analysis, in an inductive manner. Through iterative analysis rounds, we developed the final model (Fig. 2) and synthesis (Table 5) that show the analyzed themes.

As an example, on thematic analysis and conceptual mapping, a Case A interviewee commented, “We are eager to collect that waste, and they do not have to pay for its treatment, as it is a useful raw material for us” (Head of Strategic Partnerships). This statement was interpreted to help explain the value-capture dimension of CBMs. In Case D, an interviewee

stated, “We had to convince our dealers and final shops to work more closely with us, and we had to re-negotiate all the contracts with the logistic providers to make this possible” (Member of the Sustainability Team). This was interpreted to reflect the need for collaborations with supply chain actors. Collaborations with dealers and final shops have been classified, based on their goal, as belonging to customer engagement/ communication, whereas those with logistic providers are interpreted as supporting the reverse logistics process.

The analysis began with a *within-case* analysis that resulted in an overview of each company's CBM dimensions and the role of collaboration. In the subsequent *cross-case* analysis, we compared cases. This frequently triggered new rounds of within-case analyses: The practice or supply chain actors and collaborations identified from one case were also sought in other cases and, when found, they were conceptualized as general patterns. Through several analytical iterations between within and cross-case analyses, including cross-industry and country comparisons, we collectively replenished our theoretical conceptualizations displayed in a final framework (Fig. 3), a synthesis of areas of supply chain collaborations for CBMs (Table 5), and a research agenda (Table 6) for emerging crucial knowledge gaps.

To ensure the quality and trustworthiness of the results, we applied multiple analysis tactics and different types of triangulations (Flick, 2004): Researchers shared analysis frameworks and interpretation and analysis procedures, and there was ongoing discussion of case comparisons to implement *researcher triangulation*, and *data triangulation* was actualized by collecting data from different primary and secondary sources from two different contexts. Next, we briefly describe the individual cases and then analyze them.

4. Case presentation

4.1. Case A

Forest industry-based Company A first developed a CBM around 2012: “It started with our wood-plastic composite innovation” (Service Director), which enabled the use of the side and waste streams of Company A's wood-based label material production.

The objective of the CBM is to collect label release liner waste and turn it into innovative wood-plastic composite and paper products. Doing so “offers a promising closed-loop solution, and scaling this would accelerate the company's drive for material circularity” (Ellen MacArthur Foundation's analysis assessment report for Company A; news release quotation). Although the original idea was to collect the company's own side and waste streams, the idea grew into a commercialized service that scaled up with the help of digital technology applications: “We extended the [label release waste collection] service [from our own production plants] and offered it to all our customers and their customers” (Service Director).

Company A realizes value creation through changes in collaborations with direct customers (e.g., label converters) and end-customers (e.g., brand owners): Through new collaborations, customers and end-customers now learn from Company A how to modify their own processes and systems to allow collecting waste efficiently from their own production and organize its collection for the take-back system. With over 200 global network partners, Company A coordinates the waste collection as part of its daily logistics planning. This means enhanced communications with a logistics service provider, who needs to consider the reverse logistics when utilizing its sub-contractor network in order to transport waste with fourth-party logistics principles.

To enable value transfer, Company A expands the scope of customer collaborations to plan together how to promote the CBM to the end-customers: “We have recognized this service to be one of the strongest—if not the strongest—ways to open the dialogue [with end-customers]” (Service Director). Hence, the close collaboration with direct customers has new agenda due to circularity and allows engaging both direct customers and end-customers to the CSC.

To capture CBM value from the customer/end-customer perspective,

the collaborations need to communicate that the collection service offers reduced waste disposal costs and landfill, improves recycling rates in production, and meets regulatory requirements. This builds a responsible and circular-oriented reputation compared with traditional waste management methods. Furthermore, from Company A's perspective, value is captured in the CBM via collaborations with extended scope for developing take-back systems: “We are eager to collect that waste, and they do not have to pay for its treatment, it is a useful raw material for us” (Head of Strategic Partnerships; quotation from news release).

4.2. Case B

Traditional oil refiner, Company B, started designing a CBM based on a technology innovation for transportation and aviation fuels that expands and creates new life cycles for renewable feedstocks, while reducing emissions throughout the fuel life cycle by up to 90% compared with fossil fuels.

The shift from a fossil-based fuel to a circular business model was enabled by global waste and residual sourcing and innovative raw material processes: “Our business model is rather unique in the world; no other similar model procures so many different feedstocks from around the globe” (Senior Vice President of Sustainability and Public Affairs).

Value creation in the CBM relies on establishing long-term collaboration with a globally extended supplier network for vegetable oil, animal fat, waste, and residue. Here, an understanding of the diversified supply streams and their limitations is augmented through supplier collaboration, differing from the traditional BM's contract-based supplier relationships for Russian raw oil. The need to maintain long-term supplier collaboration and establish new renewable feedstocks supplier collaborations is always present: “We can still do a lot by going toward waste and residue and looking for waste streams that are not yet used, for example because they are of worse quality” (Key Account Manager, Nordic Region). This is because, “the further we go in this feedstock scene of waste streams, the less it is possible to get those nice 10-kiloton-sized shipping deliveries straight to our production plants” (Head of New Feedstock). To learn how to operate with a wider range of renewable feedstocks, Company B collaborates in joint R&D and participates in research consortiums with research institutions, customers, and other companies, including its competitors. Managing the increasing variety of supply streams and supplier collaborations is facilitated by digitalization technology, which allows tracking the material streams and enables development of an internationally certified transparency system for SC sustainability, strictly demanded by customers and non-governmental organizations (NGOs). Collaboration through open discussion and meetings with NGOs created opportunities for Company B to learn how to manage SC in a sustainable way. Interestingly, regulation also shapes supplier collaborations. For example, the European Union's Renewable Energy Directive 2 often impacts raw materials and their volumes, emphasizing the use of certain feedstocks, such as algae, whereas national level regulation defines where the renewable fuels can be commercialized, requiring Company B to collaborate with regulators.

To transfer the value of the CBM, Company B works in close collaboration with strategic customers to discover together new ways for reducing their emissions. Close collaboration for value transfer also allows new sources of value creation, such as the reverse logistics of specific strategic customers, which allows customers' waste to be turned into feedstocks in order to refine renewable fuels.

The value capture in Company B's CBM rests not only on the higher price margins of technically more advanced renewable fuels but also on providing customers with new ways to decrease their carbon footprint in order to achieve their sustainability goals and enhance their sustainable brand image. To achieve this aspect of its CBM's value capture, new types of communications are needed as part of customer collaborations. However, the CBM does not introduce new types of collaboration in supply chains to capture this value.

4.3. Case C

Company C noted that the cost of using soil in infrastructure construction is mainly due to logistics and landfill regulations, rather than the soil materials themselves. Therefore, the company found economic potential in establishing a circular solution and a CBM for soil reuse.

As part of its sustainability goals and due to the perceived economic benefits, construction Company C introduced circularity into its business model by reusing soil materials within and between infrastructure construction projects: *“This [reusing soil materials] is a simple thing, there are surpluses, and they are used where there is a lack”* (Retired Head of Environmental Affairs, Infrastructure Construction).

Value creation *“is about removing soil and replacing it with other types of soil, and there the core is to manage this process and its logistics efficiently”* (Development Engineer). The value creation dimension of the CBM requires many operational changes to be made in collaboration with partners: *“It requires land, city planning and zoning, refining of excavated soil, temporary storage, and an internal or inter-organizational system”* (Retired Head of Environmental Affairs, Infrastructure Construction). Soil material reuse is not coordinated at the corporate level in Company C. Instead, reuse is tightly bound to each ongoing construction project, with each construction manager independently handling soil material recycling at each construction site. Consequently, efficient soil reuse requires establishing and developing different collaborations for individual projects. Consistent reuse of soil material between projects requires increased project coordination in the project pre-phase collaboration, particularly with clients and public organizations, as well as collaboration for logistics optimization (e.g., soil transported from one site to another, and short-term storage only). To facilitate collaboration between involved parties to circulate soil and measure the circulated soil amounts, Company C utilizes advanced digital data management. Collaboration is also needed with local authorities and regulators to influence the regulation for soil storing throughout the supply chain.

Value transfer in the CBM depends on project-specific circumstances. Generally, supply chain collaborations and communication must be established with sub-contractors, who transport the soil materials for reuse in alignment with their core business; client companies and municipalities, who suggest reuse purposes for the soil materials in line with longer-term perspectives on appropriate upcoming projects; and competitors and other internal construction projects, who can either provide soil materials for use or order soil materials for their own reuse purposes. Company C also communicates the environmental impact of soil reuse in projects externally to engage customers and suppliers.

Although this CBM provides value in multiple ways to both Company C and its supply chain collaborators (e.g., cost savings for both material provider and recipient), the value capture dimension of the CBM has not developed new supply chain collaborations.

4.4. Case D

Coffee and food processor Company D started its journey toward CE by recognizing *“the amount of value of metals completely wasted when the used coffee cup is thrown in the garbage by our customers”* (Head of Sustainability).

The CBM of Company D is based on a purposively redesigned recycling process for used cups, which allows the technical (aluminum shell) and biological (coffee waste) materials to be separately recovered for further exploitation in new supply chains.

The value creation dimension of the CBM was initially built through a newly established collaboration with an Italian association of recyclers. *“It was the first time we talked to recyclers, as we were not used to recovering the product after being used by the customer. We were aware of the job of recyclers, but we considered it outside of our business”* (Member of the Sustainability Team). Based on the interactions with this association, a set of local recyclers in the area of the Italian headquarter of Company D

was selected to design and pilot the new process. This collaboration involved engineers and technicians from both sides and resulted in a process that included a washing treatment to separate coffee waste from the metal cups and a process to separate the cover of the cup from the shell (which is made of pure metal). The shell is then ground to obtain the recyclable material. *“The initial investment was made by the company, but we wanted to be sure of the final result before engaging our customers”* (Head of Marketing). When the process proved to be efficient and sustainable from environmental and economic perspectives, the company began working on the reverse logistics chain to collect used cups. *“We had to re-negotiate all the contracts with the logistic providers to make this possible. Recovering exhausted cups also required us to be compliant with different types of regulations”* (Member of the Sustainability Team).

After the value creation, Company D designed the value transfer dimension in its CBM. The role of dealers and local shops was of paramount importance to engage customers in collecting used cups. *“We had to convince our dealers and final shops to work more closely with us”* (Member of the Sustainability Team). Also in this case, even if the collaboration with the dealers was already in place, it had to be purposely extended to include additional activities (collection and storage of exhausted cups) with their related reward systems. Company D did not want to compromise product quality: *“We wanted to keep the same taste and experience for the final customer”* (Head of Marketing). Therefore, Company D initially launched in a large Italian city, where cups were collected from local shops. After returning used cups, customers received discounts on the new supply of fresh cups. When the process began producing sufficient material, Company D established two additional collaborations. In the first, a specialized organic fertilizer producer (again a new supplier) composted the coffee waste from the cup-washing process. The second collaboration was established with a local rice producer (new customer), belonging to the supply chain of industrial agriculture, in order to exploit compost production. The compost is used to grow rice on a local farm, and the rice is bought and donated to charity via a sustainability program in which the company devotes some of the economic returns made by metal recycling. *“We felt this was part of how we could be more sustainable”* (Head of Sustainability).

Finally, the value capture dimension for Company D is based on a pilot program for recursive buying, mirroring a PSS model based on pay-per-use relationship, and enhancing company-customer engagement. For this pilot program, Company D was able to exploit its existing network of dealers, linking the recursive buying program to the reward scheme developed for supporting the value transfer dimension of the CBM.

4.5. Case E

“For each tent made, about 10% of the fabric is discarded. This is unsustainable from both an economic and an environmental perspective” (Head of Marketing). Company E is a leading producer of high-quality tents and other textile products, and its approach to CE started after the company explored improvements to its production process efficiency. *“We were already topping our production efficiency, so the only way to reduce waste is to find an alternative use for it”* (Head of R&D).

Company E's CBM was built upon the idea of using the waste of acrylic curtain fabrics (the main input for the company's production of tents) to create new and higher-quality fabrics which, blended with virgin fibers, could be used as input in textiles (mainly carpets) and furniture (mainly sofas and chairs).

The value creation dimension of the business model started with the establishment of a new collaboration with a few R&D companies actively sought and involved by Company E to support the internal R&D department (textile chemists) in the design of a mass-dyed, outdoor acrylic-fiber-recycling system. *“We had the idea it could work, but we need to access also new competences on the production processes”* (Head of R&D). The resulting material derives entirely from acrylic curtain fabrics and consists of a by-product with no real extant reuse value (being disposed

Table 4
Key CE collaborations in the six industrial companies.

Cases/type of collaborations	Case A	Case B	Case C	Case D	Case E	Case F
Collaborations for reverse logistics	Reverse logistics create take-back systems for linear waste from direct customers	Arranging reverse logistics to collect partners' waste and turn it into fuel which can be bought back by the partners	Willingness to arrange reverse logistics, primarily for economic and practical reasons	Established with logistics providers to collect used cups from dealers and local shops	Established with logistics providers to collect production waste from competitors	Established with logistics providers to collect used wood and production waste
Collaborations for Design for X	Hands-on guidance for customers to adjust internal processes as required to implement the service in practice	Collaboration with, e.g., research institutions to learn about utilization of increasingly sustainable raw materials in the production process	Early construction project planning and design for soil reuse	Established with recyclers to design a dedicated metal/organic recycling process	Established with R&D companies to design the new production process	Established with R&D companies to design the new production process
Collaborations for resource-efficient strategies	–	–	–	–	–	–
Collaborations for customer engagement/communication	Emerging practice: Collaborating with and engaging direct customers to promote the service to end-customers	Close collaboration with strategic customers to help them reduce their emissions	Engaging customers in early project planning to utilize their long-term horizon to identify future soil reuse opportunities	Established with dealers and local shops to engage customers in collecting used cups	Established (in the form of a consortium) with textile and furniture producers to exploit new markets for recycled fabric	
Collaborations for customer/supplier engagement/communication	–	–	Emerging practice: Increasing communications and awareness of the environmental impact of soil reuse in projects	Established with a new supplier (specialized organic fertilizer producer) to turn the coffee waste into compost Established with local rice producers (customers) to exploit compost production	–	Established, in the form of a consortium with other producers and recyclers, to expand the network of suppliers of input materials for recycled panels
Collaborations for multi-channel engagement/communication	–	–	–	–	–	–
Collaborations for take-back systems	Collecting back the linear waste after use from direct customers (via reverse logistics when possible) and end-customers	–	–	Established with dealers and local shops to collect back used products	–	Established (tentatively) with members of the consortium to collect used products
Collaborations for pay-per-use	–	–	–	Promoting a pilot for a pay-per-use customer relationship as part of the take-back system	–	–
Collaborations for pay-per-performance	–	–	–	–	–	–

of in landfill under current legislation). The recovered material reduces the consumption of primary raw materials, thus having a significant long-term impact.

Initially, to expand the sources of inputs beyond the internal waste, Company E established a collaboration with logistics suppliers in order to collect waste from their competitors. “We started addressing our competitors by telling them we wanted to collect their waste. Their initial reaction was priceless” (Head of Marketing). This had a positive financial impact, as the new materials and recycled fibers collected accounted for 50 to 70% of the weight of the final product, with blends of other natural and synthetic fibers accounting for the remainder.

To ensure the value transfer, Company E found new customers for the recycled fabrics. The new yarn cost more than the yarn commonly used in the awning industry, thus making it difficult to be used in the Company's original business. However, the characteristics of the new

fabrics meant that they could be upcycled in such a way that textiles and furniture could benefit from their original features, such as color fastness against ultraviolet rays, and stain-resistant and anti-mold properties. Company E worked hard to set up a consortium of potential users among textile and furniture producers interested in buying new fabrics. Establishing a consortium of customers was the only way Company E could engage companies belonging to other industries and make them aware of the new products.

The value capture dimension of the business model was not yet in place when our study of Company E came to an end.

4.6. Case F

Company F is 50 years old and is one of three business units that make up a larger holding company operating in the wood and resins

sector. The industry includes wood panel production, chemical/material R&D, and production and sales of ready-to-assemble (RTA) furniture. The CEO explained that “we were not satisfied with the quality of our recycled wood products, so we decided to develop a recycling process ourselves.”

The CBM of Company F is based on a wood panel made with 100% recycled wood to be further used in the group's RTA furniture business. The introduction of the new panel allowed the company to reduce virgin materials bought for its furniture business almost to zero, thus creating a loop from wasted wood to furniture.

The value creation dimension of the business model started when Company F entered into a new collaboration with an independent R&D company in order to develop and tune the process of producing its special panel. “We were sure it could have been done, but we needed an external check. This was also critical to get the internal approval of the idea.” (Member of the marketing team). When the product was tested and determined to be economically and environmentally sustainable, Company F faced the challenge of creating a chain of suppliers large enough to collect the waste and used wood needed for production. “Once the process was ready, we thought ... and now how can we source enough wood?” (CEO). As with the case of Company D, also here, the Company had no connections with recyclers, due to the fact they worked outside the linear chain of its traditional business. Company F was thus forced to establish new partnerships with several recycling facilities in order to collect used furniture and increase the amount of material processed every year. To ensure that the flow of materials is effectively managed, Company F extended also existing collaborations with its logistics suppliers to set up regular connections with the recyclers.

The value transfer dimension of the CBM for Company F was achieved by exploiting, in a different way, its connections with other players in the industry, successfully establishing a consortium of > 40 producers of wood products willing to adopt the new panel. “We approached other players with a transparent statement, involving them in an ethical industrial development” (Head of Marketing). Members of the consortium use Company F's panels for their production and provide production waste to Company F. The network of logistics suppliers has been further extended to include consortium members in the collection process.

Recently, Company F has experimented with the collection of used furniture from the commercial enterprises (e.g., showrooms) run by the consortium members, mirroring a take-back program. The value capture dimension of the business model is still in the initial development phase.

5. Results

5.1. Key CSC collaborations for CBMs and increased circularity in the six industrial companies

As discussed, concerning the theoretical framework, we postulate that supply chain collaborations play a key role in the design and implementation of industrial companies' CBMs. The evidence collected from each case study is shown in Table 4. The presence and purpose of the collaborations for CE in each case are highlighted.

Evidence suggests that loop closure, through proper reverse logistics, is important for the development of CBMs (Bernon, Tjahjono, & Ripanti, 2018). Even if logistics are commonly externalized, new collaborations must, in all cases, be established to properly design the characteristics of the reverse logistics service. In some cases (Companies A, D, and F), reverse logistics was an enabler of take-back systems implemented to connect with customers and/or end-customers and recall the materials needed for circularity. Regarding value capture, take-back systems are the only systems in place. None of the considered companies has adopted pay-per-use or pay-per-performance approaches or established related collaborations. Such customer interaction models, even if they fit the CE approach, are among the most difficult to implement (Sousa-Zomer, Magalhães, Zancul, & Cauchick-Miguel, 2017) and only companies at the end of their circular transformation journey are effectively

dealing with them.

Concerning value creation, collaborations are also commonplace in the development of Design for X practices for circular products implemented by the companies. The companies partner because they lack internal competencies (Sassanelli et al., 2020). To properly design a circular product, in-depth knowledge of the product's life cycle and components, including dismantling and end-of-life treatment processes, is needed (Cong, Zhao, & Sutherland, 2017). The desired level of knowledge is far beyond that required in a linear economy. Furthermore, in almost all cases (even those which do not require collaboration in this phase), the journey toward CE starts with (re)designing the product, which leads to the transformation around which all other changes in the organization and supply chain collaborations are then arranged. Similarly, the absence of collaborations for resource-efficient strategies is consistent with the argument that companies adopting a CE approach are aware of the relevance of environmental sustainability (Di Maio, Rem, Baldé, & Polder, 2017). Therefore, all the companies internalized the competences needed to make their internal processes energy and material resource efficient.

Finally, concerning value transfer, the role of the collaborations used to expand the companies' ability to effectively communicate new approaches to customers and suppliers is important. CE demands broader and closer collaborations with customers and suppliers, as they are involved in recurrent, circular flows of products and materials (De Angelis et al., 2018).

The collected evidence sheds light on the forms of collaborations and the actors involved. In all cases, the companies (re)designed products and made significant changes in their supply chain, both as actors (that connect to other industries, such as fertilizers in Company D) and organizational form (e.g., the collaboration networks established by Companies A, B, and F). The need to expand existing networks in order to embrace CE and to explore forms of collaboration that are more consistent with the types of relationships established (e.g., a consortium of peers) aligns with the literature (Lahane et al., 2020).

5.2. CBM practices and CSC collaborations: Case comparison

The companies can be compared using the framework we developed (see Fig. 1). Fig. 2 summarizes the adoption of a specific CBM practice, as described in the theoretical framework, regarding the CSCM objectives. The analysis and comparison also revealed how the ongoing CE transition was reflected in the companies' businesses. We identified many emerging managerial practices that were being developed, adopted, or implemented in industrial companies and their supply chain networks. A ‘full’ circle indicates the practice is fully in place, and a ‘dotted’ circle means the practice is emerging among the companies.

The discussion of the business model dimensions clearly reveals that only a few practices for value capture were adopted. Concerning value transfer, only practices related to closing material flows are in place, and the role of platforms seems marginal. The lack of a well-developed CE platform ecosystem (i.e., a dedicated platform for resource-sharing Aarikka-Stenroos, Ritala, & Thomas, 2021; Schwanzholz & Leipold, 2020) requires companies to leverage collaborations in order to ensure loop closures within their own network. Companies focus on value creation, where practices dealing with Design for X (Sassanelli et al., 2020) and reverse logistics (Julianelli et al., 2020) clearly drive the supply chain (re)organization. Collaborative practices are lacking in the narrowing of material flows because companies exploit present market services for energy efficiency in Italy and Finland, and they do not need to collaborate. Furthermore, many industrial companies have focused on optimizing their businesses' material efficiency for cost efficiency (closing and slowing); companies' strategic collaborations to narrow material flows have not been found. However, value capture involving customer relationships requires further modification and reflects the challenges that pay-per-use modes face in diffusion among customers (Kjaer et al., 2019; Tukker, 2015).

5.3. Summarizing and proposing the final framework

The analysis results revealed new actions related to the implementation of supply chain collaborations in CBMs that have not been identified in the existing literature. Thus, a theoretical framework was developed in the final conceptual model, shown in Fig. 3, based on the multiple case study to generate a more structured and detailed understanding of industrial companies' potential activities and practices in supply chain collaborations in order to design and implement CBMs. Current developments among industrial companies focus on closing and slowing material flows from the CSCM perspective. From the business model perspective, the developments focus on value creation and value transfer. However, the relative lack of collaboration activities for value capture emphasizes that further developments are required.

For closing strategies in value creation, in addition to the reverse logistics processes necessary to close the loop between the user and post-use production (Julianelli et al., 2020), we identified that supply chain collaborations for biological materials emerged to effectively extract renewable biological materials in the CBM. For example, in Case B, novel supply chain collaborations were necessary to replace fossil fuel raw materials with renewable biological feedstocks. Also, design for environment collaborations were identified to close material flows for biological materials. For example, in Case D, collaborations to design cups and their recycling process were necessary to close the material flow. Value transfer-related collaborations emerged as important in closing material flows. Multi-channel communication collaborations (Urbinati et al., 2017) were complemented by supply chain actors to validate and improve the value proposition of CBM loop closures. Case C highlighted the importance of early collaboration with clients and public organizations to ensure that the value proposition was desirable and that it could be achieved. Collaborations for take-back systems (Corvellec & Stål, 2019) were validated as part of the framework in Case A, which had established suitable supply chain collaborations with customers and end-customers.

For slowing strategies, collaborations for value creation were identified. Existing research has identified that collaborations for design practices for a product's materials and resources are necessary to extend its life cycle (Sassanelli et al., 2020). These results deepened the collaboration objectives. Design for disassembly and standardization is a collaborative practice that slows material flows in the supply chain by enabling multiple actors to contribute. For example, in Case E, the entire packaging chain participated in the take-back system for fabric waste.

For value transfer, sharing platforms identified in the literature (Berg & Wilts, 2018) also emerged in some cases. For example, Case C identified digital technologies as useful for communicating with companies about upcoming projects and potential improvements for suitable soil reuse project identification. Representing an information-sharing platform between producers, Case F was part of a > 40-producer consortium that ensured the use of ecological panels in products.

For the narrowing strategy, we did not identify any significant collaboration activities. In the literature, narrowing strategies have been linked with energy-efficient strategies (Diaz Lopez et al., 2018). Thus, the focus on energy efficiency in the case companies' markets could have diminished the emergence of these activities in the CBM design and implementation. However, there is a severe lack of collaborations in the value capture dimension of the business models; only a few cases implemented partnerships/relationships in the form of take-back systems with revenue sharing. Collaborations for PSSs (Kjaer et al., 2019) or customer-facing sharing platforms (Schwanholz & Leipold, 2020), both of which have large impacts on companies' value capture systems, were not identified in any of the cases. There is a contrast between the ubiquity of collaborations for value creation and the lack of collaborations for value capture. This finding reflects the existing literature on CBMs, which indicates that models for implementing CBMs have become plentiful (see for example Lüdeke-Freund et al., 2019), whereas identification of value emergence from CBMs remains nascent (Ranta

Table 5

Synthesis: How industrial companies' CBMs can be supported via supply chain collaborations and CSCM (Thematic areas, aspects to be managed and empirical examples).

Thematic and research areas	Aspects to be managed and link to theory	Rationale and case example/validation
How companies' CBM and business (practices, strategies) is supported via supply chain collaborations (at micro level)		
	Design practices (González-Sánchez et al., 2020; Mishra et al., 2018)	Companies implemented circularity with partners through design practices concerning new products, materials, services, and processing. <ul style="list-style-type: none"> Case E designed coffee waste; Case A designed label-waste upcycling products and processes. Circular solutions by companies demanded branding to highlight and demonstrate the circular offering collaboratively enabled with partners:
Managerial practices improving CBM implementation via supply chain collaboration	Communications practices, including branding (Julianelli et al., 2020; Lüdeke-Freund et al., 2019)	<ul style="list-style-type: none"> Case A branded the circulated, loop-closing novel composite material; Case B branded its renewable fuel, and Case E branded a new fabric through a consortium of customers Companies collaboratively harnessed new collection logistics to reprocess waste, reverse logistics, and implement take-back systems, for example involving customers:
	Logistics practices: Organizing and reorganizing logistics of existing supply chains, enabling reverse logistics (De Angelis et al., 2018; Faroque et al., 2019; Govindan & Hasanagic, 2018; Lahane et al., 2020)	<ul style="list-style-type: none"> Case A gathered label waste to reproduce it as composite; Case C optimized soil use and transportation; Case D collected coffee waste. New value propositions by industrial companies were enabled as circular-modified supply chains to provide more recyclable/upcyclable/optimized and, therefore, more sustainable products/materials:
CBM development and innovation fueled with circular supply chain collaborations	Value proposition-related aspects (Fehrer & Wieland, 2020; Ranta et al., 2020)	<ul style="list-style-type: none"> In Case A, wood-plastic composite, and in Case F, recycled wood panels were an upcycled alternative to wood products; in Case B, renewable fuel was a regenerative alternative to fossil fuel. Interestingly, in the studied cases, less transition toward "as a service" and product-service systems was realized with supply chain actors. More value and diverse value elements were delivered to customers and supply chain partners through collaborations:
	Value delivery and transfer-related aspects (Centobelli et al., 2020; Geissdoerfer et al., 2018; Kirchherr et al., 2017)	

(continued on next page)

Table 5 (continued)

Thematic and research areas	Aspects to be managed and link to theory	Rationale and case example/validation
	Value capture-related aspects (Tukker, 2015; Urbinati et al., 2017)	<ul style="list-style-type: none"> In Case B, local customers could provide their waste to be turned into fuel and gain different economic, symbolic, and environmental benefits. Companies faced changes in their revenue models but captured the value via higher price or via reduced waste management costs in the value chain: In Case B, non-fossil renewable fuel is a feasible, higher-priced substitute in engines but requires supplying different waste frictions and residuals efficiently from customer-suppliers. Case E's recycled yarn was high-priced. Cases A and C decreased chain waste management costs. <p>Joint R&D and innovation enabled industrial companies with supply chain collaborations to increase circularity and sustainability of their products or operations, relevant for their CBM.</p>
Innovation and product/service development realized through circular supply chains	Diverse innovation types driving business model change and supporting circularity in supply chains (De Angelis et al., 2018; Engez, Ranta, & Aarikka-Stenroos, 2021; Govindan & Hasanagic, 2018; Ranta et al., 2020)	<ul style="list-style-type: none"> Tech innovation in Cases A and F (wood composite), service innovations in Cases A and D (taking waste back for reprocessing), process innovation in Case D (washing), Case C (cross-site soil coordination), and Case E (fiber processing) all enabled circularity with and via the supply chain. The strategic role of the supply chain collaborations (enabling circularity) in the company's core business model and strategy varied:
Strategic development and strategic partnerships via supply chain collaborations	Circular supply chain collaborations as a part of the company strategy (Govindan & Hasanagic, 2018; Hazen et al., 2020)	<ul style="list-style-type: none"> Case B strongly renewed its business model and business strategy with new strategic supply chain partners, whereas Case C pursued a new, more circular operational model for its normal core business with replaceable collaborators enabling circularity.
How companies' CBM requires broader collaborations between industrial companies and supply chain collaborations (extending the view of CBMs from micro to meso and macro-levels)		
Digital technologies and tools enabling and advancing circular	Digital data gathering, sharing, and processing, and digital sharing	Digital technologies enabled industrial companies to interact,

Table 5 (continued)

Thematic and research areas	Aspects to be managed and link to theory	Rationale and case example/validation
supply chains and CBM feasibility	platforms (Bressanelli et al., 2019; Bressanelli et al., 2021; de Sousa Jabbour et al., 2018; Ranta et al., 2020)	manage, and coordinate their supply chains, as well optimize material use, material processing, or logistics with supply chain actors.
		<ul style="list-style-type: none"> In Case B, digitally steered renewable fuel processing produces high-quality fuel from very versatile waste and regenerative resources from the supply chain. In Case C, digitalized data and communication between the company and the client optimized soil reuse. <p>Novel, even unconventional and co-opetitive, collaborations were initiated.</p>
	Need to initiate radically new collaborations, strategic partnerships and co-opetitive relationships (De Angelis et al., 2018)	<ul style="list-style-type: none"> In Case A, the company collaborated with waste logistics providers to collect waste for company reprocessing; in Case B, diverse waste resources were supplied by radically new partners for renewable fuel processing. Case C showcased co-opetition for circularity, as the company collaborated with other construction companies to reuse soil, as did Case E when it collaborated with awning producers. <p>Close, tight industrial symbiosis-kind of collaborations emerged.</p>
Novel collaborations, and changes in relationships initiated for circular supply chains		<ul style="list-style-type: none"> In Case D, coffee waste was turned into compost through a specialized supplier. Companies collaborated for industrial development and survival, as their co-evolution toward circularity and developing industrial norms improved the sustainability of the whole industry and therefore also CBM feasibility.
	Need to form novel close collaborations for circular resource flows (De Angelis et al., 2018; Gonzalez-Sánchez et al., 2020)	<ul style="list-style-type: none"> In Case C, construction companies, in Case B, fuel and transportation companies, and in Case E, textile and fiber companies together collaborated due to tightening sustainability pressure concerning these environmentally burdensome industries. Companies co-advance market development and societal acceptance for
Collaborative industry and market developments, due to sustainability and circular economy transition, to allow and strengthen companies' CBM at market and society	Need to collaborate for industry development and sustainable industry norms (new "rules" for the industry) (Bressanelli et al., 2019; Hazen et al., 2020)	
	Need to collaborate through policy making, and regulation and social	

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Table 5 (continued)

Thematic and research areas	Aspects to be managed and link to theory	Rationale and case example/validation
	institution shaping to accelerate and ensure societal acceptance of circularity and CBM (Govindan & Hasanagic, 2018; Kaipainen & Aarikka-Stenroos, 2021; Näränen et al., 2021)	<p>circular solutions via policy making, regulation, institutional work, and shaping social institutions. This creates avenue for companies' CBM in long run.</p> <ul style="list-style-type: none"> • In all cases, a change in the mindsets and regulations concerning recycling materials and using recyclable or renewable instead of virgin and/or fossil fuel materials supported industrial companies and their supply chain actors in the circular business implementation, and vice versa. • Some case regulations also inhibited the formation of supply chains (e.g., Case B).

et al., 2020). Importantly, research on how to appropriate wider and more dispersed value (Kirchherr et al., 2017) between necessary collaborators is missing. Thus, the results show that companies choose CBMs that allow them to maintain control of the business model and, therefore, profitability as opposed to business models where wider collaboration throughout value creation, value transfer, and value capture is necessary to ensure value emerges alongside profitability. Existing research suggests that this single company-focused supply chain perspective is problematic in the development of sustainable supply chains (Frostenson & Prenkert, 2014). In a CE, companies can rarely effectively close loops alone; instead, collaborations in the upstream and downstream supply chain should be pursued (Urbinati et al., 2017). Thus, the findings highlight that, in the cross-section of supply chain and business model research, a meso-level perspective on activities is called for. This issue not only prevents the holistic implementation of CSCs but inhibits the emergence of systemic, macro-level sustainability improvements that the CE is expected to deliver (Ghisellini et al., 2016; Murray, Skene, & Haynes, 2017).

6. Discussion: A synthesis of key findings on companies' CBM design and implementation enabled by supply chain collaborations at micro, meso, and macro-levels

This multiple case study explored how industrial companies' CBM design and implementation leads them to collaborate with their supply chain actors. Therefore, we started to examine this with a "portfolio" approach, putting the company with a CBM not only in the center, but also examining the supply chain collaborations that enable the company to actualize its circular business: thus, we moved from company-centric micro-level toward more relational, collaborative developments in the focal chain, industry and market at meso and macro-levels. The investigated industrial companies' CBMs and related collaborations were also found to be dynamic (not static) constructions.

Our synthesis (Table 5) discusses how and why supply chain collaborations support industrial companies in their CBM design and implementation. It explains where companies' CBM implementation, indicated in our framework (Fig. 3), leads them in their supply chain collaborations. In big picture, to implement a CBM, companies need also to innovate, strategize, digitalize and shape regulative institutions, in

collaboration with diverse supply chain actors. Thereby, our synthesis includes our framework elements (Fig. 3) and display that CBM implementation leads to many collaborative practices and operations (ranging from branding to logistics and reverse logistics). Moreover, due to our exploratory, theory-developing approach, synthesis includes also emerging elements that broaden the view to the needed collaborations: companies' CBM design and implementation require chain and industry level collaborations at meso and macro-levels (ranging from increased digitalization or redesign of the whole chain to market creation and industry-level joint actions for regulation development) that strengthen companies' CBM feasibility and performance by changing the rules of the game in the industry, market and society. This means that companies need to manage diverse collaborations in order to enable their CBM. Therefore, Table 5 synthesizes the seven thematic areas of companies' supply chain collaborations for CBMs to be managed. These seven themes are theorized from general patterns from our data and are validated with our empirical multiple case cross-comparisons and, therefore, assumingly applicable to different businesses, industries, and regional contexts.

At the micro-level, we found a set of managerial practices, comprising design, communications, and logistics, enabled by supply chain collaborations. Companies' business model development necessitated the reorganization of existing relationships and the creation of new collaborations to ensure the circularity of operations. Joint technology development, R&D, and innovation activities (particularly in cases A, B, D, and E) and implementation of digital tools (in cases B and C) trigger and enable implementation of CBMs and deliver and capture value from circularity. Furthermore, the value dimensions through which customers evaluate value extend beyond the economic value of CBMs. This requires further development of marketing argumentation practices to convey a larger value spectrum to customers and partners. Customer investments in a CE are also catalyzed by service contracts, where customers shift some of the risks to the supplier. These contracts require practices for new financing arrangements, as with cases A and D, which used take-back systems. All these were done via supply chain collaborations.

At the meso and macro-levels, we found that industrial companies' CBMs provoked and required digitalization and collaborative arrangements and initiatives for increased circularity, both within and across the industry, even with competitors (Table 5). Interestingly, many micro-level developments led to meso and macro-levels collaborative developments, due to companies' circular sourcing and offerings, which allowed some to transcend their conventional supply chains and industry sectors (cases A, B, and D) and realize their CBM, whereas others remain in their existing conventional chains (cases C, E, and F). Circular companies' collaborations tend to spill over into larger stakeholder interactions through collaborative initiatives, such as the joint development of industry norms and social institutions to provide better support for CSC and CBM implementations, not only in the industry sector but also throughout society.

7. Conclusions

7.1. Theoretical contributions, future research agenda, and limitations

The present multiple case study provides several contributions to the literature. The first is the proposed framework, that integrates circularity, supply chains, and business models by incorporating theoretical knowledge from disconnected research streams of CBM and CSCM and empirical insights (Fig. 3). We explained how companies' CBM design and implementation necessitates collaborations with supply chain actors. The intersection of CBM and CSCM has been under-researched (De Angelis et al., 2018), with no clear CE agenda in the business model perspective concerning supply chains (Govindan & Hasanagic, 2018); however, the study fills this knowledge gap. Concerning sustainability and circularity on the 'B2B' and industrial business research continuum,

we responded to recent calls to investigate the implementation of CE from a company-level perspective (i.e., the micro level), particularly in industrial-scale businesses (Ranta et al., 2020), in order to complement recent discussions of the start-up perspective (Närvänen et al., 2021). Our multiple case study of six industrial companies explored the CSCs and other collaborations needed to increase circularity in their business models. Concerning the emerging CBM research in 'B2B' and industrial business research, we developed a structured understanding of the value creation, value transfer, and value capture dimensions of industrial companies' CBMs, realized through supply chain collaborations. Thus, the study complements previous studies on the value proposition aspects of a business model by identifying what kind of value CE-aligned suppliers communicate to their customers (Ranta et al., 2020) and how industrial companies introducing CBMs can influence market perceptions to strengthen the model's value proposition (Närvänen et al., 2021; Press, Robert, & Maillefert, 2019).

Furthermore, the study extends the perspective from companies' internal practices to their collaborative relationships, meso-level chains and networks, and macro-level business environments. We mapped structurally industrial companies' collaborations with supply chain actors for circular business and explained what collaborative activities they need to manage for their CBM design and implementation (see thematic synthesis in Table 5). This contribution is important, as previous CE research in 'B2B' and industrial business have been limited to general stakeholder interactions for a CE and the sustainability (Ingstrup et al., 2021; Inigo, Ritala, & Albareda, 2020; Närvänen et al., 2021; Press et al., 2019). This accounts for the emerging need for CSCM (Bressanelli et al., 2021; Lahane et al., 2020; Sharma, 2020). The findings show how companies' collaborations with supply chain actors advance their value creation potential, though companies are still learning about circular value transfer and value capture practices that would ensure that all actors in the chain are able to benefit. This aligns with existing literature suggesting that management of CSCs allows companies not only to enhance value creation (Guide & Van Wassenhove, 2009), but also to connect to meso and macro-levels (in the study via CSC collaborations with new partners) across supply chains and industries (see also De Angelis et al., 2018).

Concerning the sustainability and CE research stream, by analyzing how circularity-seeking companies design and implement supply chains for increased sustainability, the present study extends existing CE and sustainable business model literature, focused on static CBM goals (Lüdeke-Freund et al., 2019), with much-needed empirical and industrial supply chain examples of how circularity is designed and implemented in practice in supply chains and integrated with business models (De Angelis et al., 2018; Ferasso et al., 2020; Govindan & Hasanagic, 2018; Hazen et al., 2020; Sehnem et al., 2019). The final framework, in Fig. 3, shows industrial companies' empirically mapped practices and CSCM strategies of closing, slowing, and narrowing material flows per business model dimension (Geissdoerfer et al., 2018; see also Bocken et al., 2016). The framework also provides insights into companies' real-life supply chain applications, by investigating these strategies together (Bressanelli et al., 2021). We identified that, although value creation practices related to the closing and slowing of material flows have been embraced in early-adopter companies, there is potential to improve CBM design and implementation by further embracing practices in the value transfer and value capture dimensions of a CBM. Furthermore, dematerialization strategies and service models (Bressanelli et al., 2021; Geissdoerfer et al., 2018; Hazen et al., 2020) for circularity were surprisingly rarely realized with supply chain actors in our cases. This finding raises the question of whether material processing-focused industrial companies are moving toward servitization and service models with their CBMs to realize intensifying and dematerializing CSCM strategies (Geissdoerfer et al., 2018; Hazen et al., 2020). These insights contribute to the understanding of required applications, success factors, and best practices in different industries and geographic areas with company-specific variables to implement circularity in supply chains

Table 6
Research agenda for further investigations on companies' CBMs and related collaborations.

Research themes	Research topics and questions for future research
	<i>Design practices:</i>
	<ul style="list-style-type: none"> How can a company initiate and manage the design of materials, products, and processes in collaboration to enable circularity?
	<i>Communications and branding practices:</i>
	<ul style="list-style-type: none"> How do companies communicate the circularity aspects of offerings with environmental impacts within and outside supply chains; How are customers and supply chain partners informed and advised about circularity? How is (industrial) branding applied by companies to increase circularity in their business models and industrial collaborations?
	<i>Logistics practices: (Re)organizing the logistics of existing supply chains toward more circular</i>
	<ul style="list-style-type: none"> How do companies induce and enable reverse logistics, such as take-back systems, or optimize logistics for circularity and sustainability?
	<i>Value proposition and its development:</i>
	<ul style="list-style-type: none"> How are offerings redesigned in industrial chains, e.g., through service models and PSSs? How do industrial companies increase circularity through servitization; that is, does servitization promote circularity among industrial companies, or vice versa?
	<i>Value delivery and transfer development:</i>
	<ul style="list-style-type: none"> How do diverse channels and platforms enable a company's CBM implementation? What do customers gain from a company's circular supply chain? What is the customer value?
	<i>Value capture development:</i>
	<ul style="list-style-type: none"> How is value capture redesigned in collaborations? How are circularity benefits monetarized and turned into profit via supply chain collaborations?
	<i>Diverse innovations driving companies' CBM and related collaborations</i>
Companies' diverse managerial practices improving circularity via collaboration (micro)	
Companies' business model development and innovation via circular supply chains (micro)	
Innovation in companies' circular supply chains (micro-meso)	<ul style="list-style-type: none"> How do circular companies apply novel technologies, service models, product innovations, process innovations, and business model innovations to generate more economic and environmental value in and via supply chains?
Strategic development via supply chain collaborations (micro-meso)	<i>Circular supply chain collaborations as a part of the company strategy</i>

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Table 6 (continued)

Research themes	Research topics and questions for future research
	<ul style="list-style-type: none"> • How do industrial companies' strategies develop due to CBM, and what does this mean for their relationship portfolio? • What are the strategic collaborations and relationships for this purpose? <p><i>Digital data gathering, sharing, and processing, and digital sharing platforms</i></p>
Digital technologies and tools enabling circular supply chains (micro-meso)	<ul style="list-style-type: none"> • How do industrial companies implement diverse digital platforms to enable circularity, e.g., match the resource provider and the need, or redistribute material resources? • What digital tools improve optimization of resource/material and logistics, and management of circular-oriented production/service operations within the supply chain? <p><i>Need to initiate new collaborations within the supply chain to increase circularity</i></p>
Novel collaborations for circular supply chains (meso-macro)	<ul style="list-style-type: none"> • What types of collaborators are the most crucial for companies' CBM and with whom particularly companies should tie collaborative relationships to advance the circular development at company, chain, and industry? • What is the role of collaborations over conventional industry borders for a company's CBM? • How does co-opetition support industrial companies' CBM? • How do companies create close collaborations, such as industrial symbiosis, to ensure sustainable and profitable resource flows and resource efficiency strategies (the nexus of industrial symbiosis and supply chains)? • How are circular supply chain partners and their specific resource-circulating processes identified, motivated, engaged, facilitated, and coordinated? <p><i>Extensive collaboration for market creation and development; industry development and survival</i></p>
Collaborative industry and market development, due to sustainability and CE transition (meso-macro)	<ul style="list-style-type: none"> • How have sustainability and circularity goals changed the rules of the game among industrial companies and consequent industry-level norms and practices? • How do industrial chains and industry sectors benchmark and learn more circular operation modes from other industries, through cross-industry development? • What can an industry learn and benchmark from another industry or (private) sector to increase circularity (e.g., improved process design or coordination; take-back systems)? <p><i>Collaborations for industry norm and institution development to increase circularity in society</i></p> <ul style="list-style-type: none"> • How do industrial companies with circular strategies and CBMs collaborate for societal and market developments and engage in policy making, regulation development, institutional work, and

Table 6 (continued)

Research themes	Research topics and questions for future research
	<p>social institution shaping to support adoption and diffusion of circular principles?</p>

(Bressanelli et al., 2021; Lahane et al., 2020).

As the field is still developing, the comprehensive thematic synthesis displaying patterns from our multiple cases (Table 5) is developed the following research agenda (Table 6). The research agenda identifies the knowledge most urgently needed to further develop circularity in industrial companies' businesses, tightly connected to the surrounding networks and ecosystems.

As the research agenda proposes, many themes, varying from micro-level company-centric research settings to meso and macro-levels phenomena, require more investigation (see Table 6). Future research should deepen the analysis of companies' managerial practices (e.g., branding, take-back, or PSSs) that catalyze increased customer involvement in business models, reinforce the closing and slowing of material flows, and enhance downstream CSCs. The present study discovered that companies are more likely to establish collaborations with upstream supply chain stakeholders in order to create circular value and enhance upstream CSCs, which close and slow material flows. Therefore, the downstream chain and the role of customers in CBMs deserve more study. Furthermore, the types of collaborative relationships (e.g., partnerships) should be studied in order to understand the diversity and continuum of relationships.

We acknowledge that this explorative study has limitations. The present study highlighted select industrial company cases (processing and product/project-centric) that could bias the findings. All were material-flow-based businesses, and the sampling may have missed PSS aspects. Companies with more knowledge or service oriented CBMs may provide different answers. However, the sample of six qualitative cases, with similar characteristics of industrial-scale circular processing and product business (albeit with some variations), and case comparisons over regional locations and businesses, allowed us to identify patterns and make analytical generalizations (Baskarada, 2014). In the present study, we focused on companies' CBMs and collaborations following the relationship "portfolio" approach by Ritter et al. (2004). Therefore, we mostly gathered data from individual company perspectives. Richer case studies, with data from multiple actors from the supply chains and surrounding stakeholders, and diverse CE ecosystems (Aarikka-Stenroos et al., 2021), could develop deeper knowledge of inter-organizational collaborations, thus enhancing our network- and system-level understanding.

7.2. Implications for managers

The present study provides useful guidance for managers. The developed framework (Fig. 3), synthesis (Table 5), and agenda (Table 6) are pragmatic tools that can be used to identify important internal collaborative relational practices in order to make the business model more circular via supply chain collaborations. The framework and agenda indicate the most critical areas of supply chain collaboration that industrial companies should collaborate and why they should increase circularity. Thus, managers can be informed of the potential of supply chain collaborations for circularity and can be used to guide diverse operations from micro and meso-level to the macro-level. Finally, the framework identifies which collaborations are critical when developing each business model dimension of value creation, value transfer, and value capture for different CE principles. For example, for companies pursuing loop-closure in material flows, partnerships for reverse logistics, innovative processing, and renewable materials are crucial. Value propositions can be validated with partners that contribute to

communicating the value of the business model or developing the market and society strategically. Collaborations for take-back systems, optimized processing, and industrial symbiosis can contribute to value capture while strengthening profits from the business model.

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