Towards Circular Business Models for Sustainability

Exploring Innovation, Implementation, & Environmental Impact

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EMMA JOHNSON
IIIEE | FACULTY OF ENGINEERING | LUND UNIVERSITY

CIRCULAR BUSINESS MODELS are widely seen as a solution to reduce waste and improve resource efficiency. Yet their implementation in practice often falls short of delivering meaningful sustainability outcomes.

This dissertation explores how companies implement circular business models, the capabilities and collaborations that enable them, and the conditions under which they deliver reduced environmental impacts. Following a trajectory from the investigation of organizational innovation processes to environmental impact assessments, the research culminates with a conceptual critique through the lens of sufficiency—reimagining circular business models to support deeper sustainability transformations.

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DOCTORAL DISSERTATION

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Abstract: Businesses play a key role in transforming production and consumption for sustainability, where circular business models (CBMs) offer one solution to reduce waste and rethink resource use. Although CBMs may be able to provide environmental and economic benefits, it is unclear how they can be implemented effectively and contribute to sustainability goals. To understand how CBMs can contribute to broader sustainability transformation, this thesis explores the implementation processes and environmental impacts of CBMs. The research was conducted utilizing an inter- and transdisciplinary approach, consisting primarily of qualitative analysis of in-depth case studies, followed by a systematic literature review, and including the quantitative method of life-cycle assessment.

The findings highlight a range of capabilities that are needed for the implementation of CBMs from operational capabilities such as digitalization and service integration to strategic capabilities like managing organizational ambidexterity and cultivating mindset shifts. A key contribution of the dissertation is showing that these capabilities are enabled and developed through dynamic collaboration processes— both internally through cross-functional teams and externally through strategic partnerships that facilitate resource sharing, joint experimentation and learning. The research also contributes novel empirical insight into the environmental impacts of CBMs, demonstrating that such impacts are highly context-dependent and influenced by business model design and consumer behavior. Through original and aggregated life cycle assessments, the dissertation highlights critical impact factors such as substitution rates, infrastructure, and transport, and discusses environmental trade-offs.

The varied environmental outcomes of CBMs can also be attributed to their primary reliance on efficiency strategies to reduce waste without questioning overproduction and consumption. The dissertation extends the conceptual framing of CBMs by integrating sufficiency perspectives, advocating for production-oriented strategies that target absolute reductions in resource use such as made-to-order production and limited marketing. It also emphasizes the need to critically examine how organizational structures influence strategic decisions that often encourage continuous growth without question. By analyzing both implementation processes and environmental impacts, the dissertation offers a comprehensive understanding of how business models can more effectively support a circular economy that contributes to transformative sustainability in production and consumption.

Key words: circular business models; organizational transformation; strategic capabilities; environmental impact; life cycle assessment; sustainable innovation

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To our planet

Table of Contents

Abbreviations

AESA	Absolute environmental sustainability assessment
BMI	Business model innovation
B2B	Business to business
B2B2C	Business to business to consumer
B2C	Business to consumer
CBM	Circular business model
CBMI	Circular business model innovation
CE	Circular economy
CEAP	Circular Economy Action Plan
ESPR	Ecodesign for Sustainable Products Regulation
FETP	Freshwater ecotoxicity potential
GWP	Global warming potential
HTPc	Human carcinogenic toxicity potential
ISO	International Organization for Standardization
LCA	Life-cycle assessment
PSS	Product-service system
SDG	Sustainable development goals

Abstract

Businesses play a key role in transforming production and consumption for sustainability, where circular business models (CBMs) offer one solution to reduce waste and rethink resource use. Although CBMs may be able to provide environmental and economic benefits, it is unclear how they can be implemented effectively and contribute to sustainability goals. To understand how CBMs can contribute to broader sustainability transformation, this thesis explores the implementation processes and environmental impacts of CBMs. The research was conducted utilizing an inter- and transdisciplinary approach, consisting primarily of qualitative analysis of in-depth case studies, followed by a systematic literature review, and including the quantitative method of life-cycle assessment.

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List of Papers

Paper I

Johnson, E. (2022). Closing competency gaps for circularity: Exploring partner dynamics for circular-oriented innovation. *Sustainable Production and Consumption*, *34*, 130–147. https://doi.org/10.1016/j.spc.2022.08.029

Paper II

Johnson E., Kaipainen J. (2024). Decarbonizing incumbents through circular business model innovation: A longitudinal case study of managing dynamic capabilities. *Manuscript- Under Review in Long Range Planning.*

Paper III

Johnson, E., & Plepys, A. (2021). Product-service systems and sustainability: Analysing the environmental impacts of rental clothing. *Sustainability (Switzerland)*, *13*(4), 1–30. https://doi.org/10.3390/su13042118

Paper IV

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Paper V: Johnson, E., Mont O. (2025) Is it enough? An integrated conceptualization & empirical exploration of sufficiency-oriented business. *Manuscript- Under Review in Journal of Business Ethics.*

Paper Contributions

Paper I *EJ conceptualized the research design and methodology, collaborated with the case companies, conducted all data collection and analysis, and wrote and revised the manuscript.*

Paper II *EJ initiated the paper, developed the research design and methodology, collaborated with the case company, conducted all data collection and analysis, wrote the majority of the first draft, and took the primary role to rewrite additional drafts and revisions. JK assisted with the conceptual development of the paper and methodological design for analysis, wrote parts of the first draft, and revised the full draft and additional drafts.*

Paper III *EJ initiated the paper, developed the research design and methodology, collaborated with the case company, conducted all data collection and analysis, wrote the first draft, and took the primary role to rewrite additional drafts and revisions. AP supervised and reviewed the manuscript.*

Paper IV *EJ initiated the paper, developed the research design and methodology, conducted the first round of data collection and first and second round of analysis, wrote the first draft, and took the primary role to rewrite additional drafts and revisions. OM conducted the second round of data collection and analysis, revised and edited the first draft, and reviewed additional drafts and revisions.*

Paper V *EJ initiated the paper, developed the research design and methodology, collaborated with the case companies, conducted all data collection and analysis, wrote and revised the first draft. OM supervised and reviewed the manuscript.*

Other Publications

Book chapter

Johnson, E., Mont, O. (2025). The myth of service immateriality for sustainable consumption. In Mont, O (Ed), *Dispelling myths about sustainable consumption. Forthcoming.*

Conference papers and extended abstracts

Johnson, E. (2021). Classifying indicators to manage the transition to circular business models: A systematic literature review. *Life Cycle Management Conference Proceedings*

Johnson, E. (2022). Filling Competency Gaps through Collaboration for Circularity: Insights from a gap exploiter business model. *New Business Models Conference Proceedings 2022.*

Johnson, E. (2023). Business models for sustainability impact, not potential: A literature review of the life-cycle impacts of business model strategies. *Product Lifetimes and the Environment (PLATE) Proceeding.*

Johnson, E. (2023). Rationalizing the Importance of Business Models for Sustainability Transitions- A Conceptual Exploration of Incumbents and Business Model Innovation. *New Business Models Conference Proceedings 2023.*

Johnson, E., Kaipainen J. (2024). What does it take to go circular? Managerial capabilities for incumbent circular business model innovation. *New Business Models Conference Proceedings 2024.*

Popular Science Summary

Our current way of consumption and production is unsustainable in that society is exceeding the Earth's planetary boundaries and creating long-term and irreversible effects on an environmental, social, and economic level. Businesses play a key role in addressing these effects, where circular business models (CBMs) offer one solution to reduce waste and rethink resource use. However, while CBMs promise both environmental and economic benefits, there remains a lack of clarity on how they are implemented in practice and limited empirical evidence of their actual environmental impacts.

The dissertation therefore explores how companies innovate and implement CBMs, analyzing cases from a variety of sectors to capture a broad range of implementation contexts. By analyzing companies with different characteristics, the research highlights nuances across organizational and contextual factors that shape both the implementation processes and impacts of circularity. In addition to exploring implementation processes, the dissertation evaluates the environmental impacts of CBMs compared to traditional linear models. It considers various types of impact categories beyond carbon emissions, including freshwater toxicity and pollution. The dissertation focuses specifically on technical CBMs, which involve products made from inorganic or synthetic materials (e.g. clothing or electronics) that cannot safely return to nature at end-of-life.

As CBMs require new ways of thinking and doing business, companies need to build and develop various new capabilities. This dissertation highlights key capabilities sought after for CBM implementation, including operational capabilities like product tracking, repair and recovery, and market knowledge for second-life goods. It also identifies how strategic capabilities are enabled and developed, such as the ability to manage transitions from established business practices to new models and logic while maintaining brand reputation and customer trust, along with the ability to foster mindset shifts at both individual and organizational levels. Operational and strategic capabilities can be procured or developed through dynamic collaboration processes—internally through cross-functional coordination and organizational alignment, and externally through strategic partnerships that facilitate resource sharing, joint experimentation and learning. Strategic partnerships can vary from short-term arrangements to help some companies pilot and kick-start a circular project, to long-term where partnerships serve to cover operational capability gaps.

Beyond the capabilities and collaboration needed for CBM implementation, this dissertation analyzes and synthesizes life-cycle assessments of CBMs to identify the business model and consumer behavior factors that most significantly influence their environmental impacts and sustainability potential. The analysis reveals that CBMs often involve trade-offs across environmental impact categories. For example, while one rental model had lower carbon emissions than a traditional sales model, it had higher human and freshwater ecotoxicity impacts than traditional sales due to increased transport needs. Overall, key factors shaping environmental outcomes include product use and substitution patterns, lifespan, end-of-life options, pricing strategies, and supporting infrastructure and logistics. Although CBMs often lower production impacts by enabling reuse, these benefits can be offset by increased transport and other resource demands required to support circular operations. Moreover, it remains uncertain whether consumer engagement with CBMs displaces traditional sales.

CBMs alone cannot address the environmental problems of production and consumption. While CBMs utilize efficiency strategies to reduce waste, they do not question the looming issue of overproduction and overconsumption. To enhance their sustainability potential, CBMs should be integrated with sufficiency strategies such as made-to-order production and limited marketing to reduce absolute resource use for more effective change. Beyond production-oriented strategies, companies must also consider how their organizational structure affects strategic decisions that often encourage increasing growth and production. Furthermore, more localized and regionalized networks for production as well as attention towards an organization's impact on community is needed for CBMs to more holistically support sustainability outcomes.

The dissertation explores how CBMs can support a circular economy and broader sustainability transitions by analyzing both implementation processes and environmental impacts. By drawing on interdisciplinary perspectives and real-world case studies, the research advances the understanding of how CBMs are put into practice and how they can more effectively drive sustainable production and consumption.

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Emma

Malmö, April 2025

Research Context & Funding

This dissertation has been written at the International Institute for Industrial Environmental Economics (IIIEE), an interdisciplinary research and education institute at Lund University that aims to advance knowledge to catalyze sustainable solutions through active and collaborative engagement with societal actors across industry and policy.

This research has been funded by three Swedish projects that have contributed to shaping the research:

Mistra Resource-Efficient and Effective Solutions (REES)
The project sought to cocreate knowledge with Swedish original equipment manufacturers (OEMs) on how a transition towards circular and sustainable business models can be managed. It aimed to do so through design support, policies, and environmental and financial impacts for resource-efficient and effective solutions.

Mistra Sustainable Consumption - from niche to mainstream
The project brings together academia, business, policymakers, and societal partners to examine how small-scale sustainable consumption practices can be scaled and normalized.

QUEST
The project was funded through the Swedish Environmental Protection Agency and aimed to map, analyze, and synthesize knowledge on sustainable business models. Its objective was to assess their environmental and systemic impacts, and to explore the contextual conditions, key actors, and interaction dynamics that enable them.

A special thanks for the financial contribution from the Foundation for the International Institute for Industrial Environmental Economics and the Foundation in memory of Lars Inge Grundberg for supporting the finalization and the printing of this PhD thesis.

Preface

When I first heard about the term *circular economy*, I was thrilled that there was a concept, a vision for society, that addressed many of the frustrations I encountered in my everyday life. It felt like a more systemic and ambitious version of the 'zero waste' movement that I had been trying to follow. This involved mindful consumption and avoiding participation in production systems that generate excessive waste, particularly packaging. For example, I made my own toothpaste and moisturizer from bulk-bought supplies to reuse containers, and I brought my own jars to bulk stores to reduce overall packaging. These were small but meaningful ways for me to take action.

While I valued these individual efforts, I grew frustrated by the lack of supportive infrastructure. For example, when I moved to Sweden, the only nearby bulk store was 40 minutes away by bus and more expensive— making the effort neither practical nor personally sustainable. That's why the idea of a circular economy, built on the intention to design out waste, felt so compelling. With better infrastructure, everyday circular practices could be scaled for a broader impact.

The idea of circular businesses was particularly exciting. Take the blender I had to replace several times under warranty; each time, a tiny broken part rendered the entire (otherwise functional) appliance useless. In a circular model, it would ideally be repaired or the broken part replaced. Great! The idea of renting clothes for events and parties rather than buying it and wearing it once? Brilliant! I was so eager about this particular idea that I spent a summer at a start-up incubator working on an idea for a peer-to-peer clothing sharing app for students in university towns like Lund that have high student populations who frequent many themed events.

However, this idea never came to fruition because I started questioning its broader applicability. Would such a model make sense in towns like where I'm from in California— where people are car-dependent, public transport is nearly non-existent, and city centers are spread far apart? I doubted that a clothing sharing app in this context could have any environmental benefit. This doubt sparked a larger curiosity about the environmental impacts of circular business models and eventually evolved into a research idea.

The questions I have grappled with personally about building more circular and sustainable systems closely align with those explored throughout this dissertation.

1 Introduction

We are living in a manner of global unsustainability and human-induced ecological crisis. This is evident as recent science indicates that six out of nine planetary boundaries have been crossed—meaning that humanity has transgressed the limits of key Earth system processes that enable a safe operating space for life (Richardson et al., 2023; Rockström et al., 2009). Crossing such limits can create tipping points leading to irreversible changes across the various planetary boundaries—most commonly discussed is the tipping point for climate change past 1.5 C global warming (IPCC, 2022), but also tipping points in biodiversity (e.g. mass species extinction) as well as land-use change and other processes (Steffen et al., 2015). The implications of this are an increasingly unstable world, not only from a biophysical perspective, but also a social one. The consequences of passing such thresholds create uninhabitability of certain regions of the world which increases populations of climate refugees, proliferate the potential for global pandemics, and intensify geopolitical conflict over resource security.

Increasing global resource extraction and use is responsible for a large portion of the related environmental impacts (Steinmann et al., 2017; Van Der Voet et al., 2004), where society's current system encourages unlimited production and consumption to prioritize economic growth. Globally, production and consumption are primarily linear, or follow the logic of 'take, make, waste'. In the last fifty years, material use has increased more than three times and is projected to continue growing at an average of 2.3% per year—meaning that by 2060, resource use will increase by 60% from 2020 levels (United Nations Environment Programme, 2024). The world cannot even sustain current consumption levels, as shown by an increasingly early 'overshoot' day each year, as well as 2024 confirmed as the warmest year on record, reaching beyond 1.5 C pre-industrial levels (Copernicus Climate Change Service, 2025; NASA, 2025).

The idea of a circular economy (CE) offers one pathway to address resource degradation, use, and associated emissions. While there are many interpretations and an increasing number of definitions of a CE (see e.g. the 221 definitions evaluated by Kirchherr, Yang, et al. (2023)), the circular economy in its essence proposes to maintain the value of resources (e.g. materials and products) in production and consumption processes by replacing the 'end-of-life' concept with various reuse and recovery strategies (Kirchherr et al., 2017). These strategies are sometimes broadly categorized and referred to as narrowing, slowing, and closing

resource loops (Bocken et al., 2016) or more specifically as R-strategies such as refuse, rethink reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover (Potting et al., 2017) as shown in Figure 1. Narrowing resource loops entails strategies that use fewer resources and inputs in the product design and manufacturing, while slowing includes strategies that extend a product's use phase and therefore slow the consumption of resources, while closing loops refers to minimizing waste by utilizing product, parts, and materials post-use as inputs in another production process (Bocken et al., 2016).

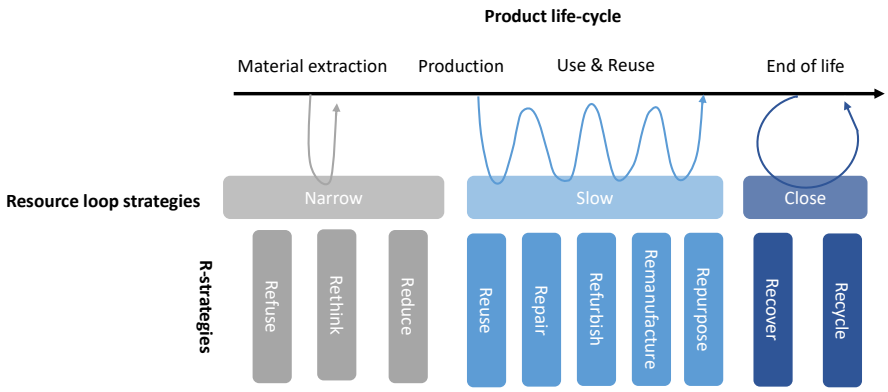

Figure 1 Product life-cycle and where circular strategies can be applied

The CE has been recognized as an important approach for climate mitigation across a variety of sectors (IPCC, 2022), and has been stated as essential for the UN SDG 12's goals of responsible and sustainable production and consumption (United Nations, 2024). The CE has been estimated to enable a global reduction of carbon emissions between 8 and 34% (Aguilar-Hernandez et al., 2021), with some estimates of carbon emission reduction by 39% along with a 28% reduction in virgin resource use (Circle Economy, 2021). The prevalence of circularity as a topic in public discussions has tripled in the past five years (Circle Economy, 2024), and proponents of the CE have emphasized its role in decoupling resource use from economic growth, increasing its attractiveness as a solution from both a policy and industry perspective.

1.1 Operationalizing the circular economy

To operationalize the CE, it requires action on a macro-level (national and international), meso-level (municipality and business eco-system), and micro-level (products and companies) (Ghisellini et al., 2016; Kirchherr et al., 2017). For example, the EU Commission drives macro-level CE implementation in its agenda under the Green Deal which includes the Circular Economy Action Plan (CEAP) (2014, updated 2020) and related initiatives. It connects with legislation such as the updated Ecodesign for Sustainable Products Regulation (ESPR) (Reg 2024/1781), which now incorporates circularity requirements and applies to a wider range of products. It is also interconnected with several other regulations and directives such as the EU Taxonomy regulation (Reg 2020/852), Corporate Sustainability Reporting Directive (CSRD) (Directive 2022/2464), and Corporate Sustainability Due Diligence Directive (CSDDD) (Directive 2024/1760)— all which support different sustainable and circular activities as well as reporting requirements for industries and organizations across the EU. Right to Repair laws have also been established to empower consumers to repair their own products by requiring manufacturers to provide repair information and resources. These laws have been enacted or are in discussion across various regions globally (Repair.org, 2025).

Circularity on a meso-level can be understood with the implementation of, for example, circular public procurement policies at the municipal level or city-specific circular strategies and agendas. For example, the city of Amsterdam aims to be a "fully circular city by 2050" and has a strategic agenda focusing on circularity in its food and waste system, consumer goods, and the built environment (City of Amsterdam, 2025). Many other cities have also developed circular agendas and initiatives (CCD, 2024). Circularity can also be operationalized across a business ecosystem through the facilitation of industrial symbiosis, where resources are exchanged or shared in near geographic proximity. In this approach, outputs or byproducts from one business's operations can be used as essential input(s) for another company's production process (Chertow, 2000; Ghisellini et al., 2016). One of the first and most well-known examples of industrial symbiosis is the ecosystem between 17 organizations in Kalundborg, Demark that has been in operation since 1972.

On a micro-level, the CE can be implemented across various industries, where companies can implement circularity through their products as well as business models (Kirchherr et al., 2017; Kristensen & Mosgaard, 2020). While circularity in products requires designing for the reuse of materials and parts, circularity in business models requires designing a new system to reuse parts and products. Circular business models (CBMs) aim to transform the traditional linear model of production and consumption into a circular economy by cycling, extending, intensifying, and dematerializing material and product use (Geissdoerfer et al., 2020), ideally leading to a reduced need for extracting virgin raw materials and

continuously producing new products (Zink & Geyer, 2017). In such a system, products are designed for extended use and ease of repair, remanufacturing, and recycling. Furthermore, services are designed to include product take-back and reverse logistics to enable circularity at different levels (Nußholz, 2017). For example, the furniture company Vitsoe manufactures its products with circular principles— designing its furniture for a long life with durable materials and modular and adaptable components to avoid the need for new furniture as living situations change over time. The company Nornorm also offers furniture designed with circular principles, but rather than sell individual pieces, they offer a subscription that provides its corporate customers a fully-furnished office space where Nornorm handles set-up, repair, and disassembly and refurbishment once furniture is no longer needed. While both companies utilize circular principles in their products, Nornorm's application of circular principles requires a new type of business model than what is traditional for furniture sales to facilitate a new system and approach that supports circularity. This, for example, can involve or rely on infrastructural and technological systems beyond the company itself, where a business model interacts between a micro and macro-level.

Business models have been understood to play an important role in enabling sustainability transitions, where they have the potential to disrupt current socio-technical norms and support the stabilization of more sustainable innovations and solutions through scaling and ubiquitous implementation (Bidmon & Knab, 2018; Wells, 2013). Because of the strength of the private sector and the role it can play for CE, "a CE understanding lacking business models is one with no driver at the steering wheel" (Kirchherr et al., 2017, p. 228).

This dissertation focuses specifically on CBMs, defined as how a company creates, captures, and delivers value with the intention to improve resource efficiency and extend the useful life of parts and products (Nußholz, 2017) such as through R-strategies (see Figure 1). Operationalizing CBMs requires various changes in the product, the connection of the company to its partners and other actors in the value chain, as well as customer relationships. As a result, the implementation of CBMs has the potential to scale and influence the widespread adoption of circularity. This dissertation utilizes circular business model innovation (CBMI) as a lens through which the implementation of CBMs is examined, and the terms are used interchangeably throughout the text.

1.2 Problematization- Theoretical and practical concerns of CBMs

While CBMs are acknowledged for their potential to solve issues regarding resource use and its associated environmental impacts, they also face criticism in how they address sustainability issues (Corvellec et al., 2022; Korhonen et al., 2018). CBMs and their contribution to broader CE goals are criticized for their lack of clarity on how they can be implemented effectively and in alignment with sustainability goals (Kovacic et al., 2020; Schröder et al., 2019). These critiques are grounded in tangible challenges faced by organizations experimenting with CBMI, as well as in the limited empirical evidence of their actual environmental impacts.

Interpretations and approaches to circularity differ as the concept of CE has originated and converged from different fields as well as evolved in both industry and research over the past several years (Bocken, 2024; Calisto Friant et al., 2020; Geissdoerfer et al., 2020; Kirchherr, Yang, et al., 2023), resulting in various uncertainties surrounding best practice for implementation. Identifying the practicalities and activities of CBMI processes is therefore important to comprehend their implications for successfully scaling circularity in alignment with sustainability goals (Holmes et al., 2021; Kirchherr, Yang, et al., 2023; Purvis et al., 2023) rather than as another efficiency measure implemented with short-term perspectives (Daddi et al., 2019; Slawinski & Bansal, 2015).

This dissertation seeks to address the challenges posed by ambiguous implementation processes and unclear environmental consequences of CBMs for sustainability. These issues and their related knowledge gaps are further examined in the following sections.

1.2.1 Ambiguous implementation processes

Despite a plethora of research on how to design CBMs theoretically and conceptually (see eg. Bocken et al., 2016; Geissdoerfer et al., 2020; Nußholz, 2017), the adoption of CBMs in industry has been slow (De Angelis, 2022; Fehrer & Wieland, 2021; Kirchherr, Urbinati, et al., 2023). Of examined cases of CBMs, company examples show that circular principles are adopted only partially or in a manner that aligns with their own interests, and implemented primarily through pilot projects that exist alongside the established company's traditional business model (Frishammar & Parida, 2019; Geissdoerfer & Santa-Maria, 2022; Stål & Corvellec, 2018). Furthermore, several examples of CBMs that were initially praised for their innovation and market potential have failed to achieve long-term viability and are no longer in operation— for example, the baby clothing subscription model in Denmark called Vigga, and the circular packaging system for household consumables in the US market called Loop.

The limited examples of successful CBMs on the market may be attributed to the design-implementation gap, or the gap in understanding how companies address underlying implementation challenges for CBMs (Baldassarre & Calabretta, 2023a; Geissdoerfer, Savaget, & Evans, 2017). While there are various documented barriers to CBMI[1] that exist on an operational, financial, organizational, technical, legal, market, and value-chain level (see Table 1 for examples), there remains limited understanding of how organizations undergo transformation toward CBMs and navigate such barriers (Tosi et al., 2024). There is a need to understand how companies can implement CBMs on a theoretical and practical level (Baldassarre et al., 2020), with a particular focus on understanding from a cultural organizational perspective (Bertassini et al., 2021; Coffay & Bocken, 2023; Roome & Louche, 2016). Focusing on organizational-level changes offers a critical leverage point, as strategic decisions at this level influence an organization's ability to address other barriers and manage transformation towards CBMs.

Table 1. Barriers to CBMI

General Barriers	Examples
Organizational	Lack of capabilities, need for new mindset
Operational	Increased liabilities, need for new logistics network(s) and recovery processes
Technical	Lack of expertise generally and in reusability of various materials
Financial	High investment costs and uncertainty
Market	Lack of awareness and/or acceptance
Value chain	Existing supply chain dependencies and lack of clarity for responsibilities
Legal	Misaligned and lack of incentives

As the strategic logic of circularity and its prioritization of value conflicts with the logic of business-as-usual, CBMI can create various organizational tensions (Daddi et al., 2019; De Angelis, 2021; Frishammar & Parida, 2019; Tosi et al., 2024). Discerning how firms address such tensions and manage organizational culture in implementing circularity strategies for sustainability goals are therefore important as insights within companies at this level are still considered a black box (Atkova et al., 2025; Baldassarre & Calabretta, 2023b; Bertassini et al., 2021; Coffay & Bocken, 2023; Hofmann & Jaeger-Erben, 2020; Santa-Maria et al., 2021a). Research on managerial perspectives across different industries, company sizes, and geographies has been called for to better understand how CBMs can be successfully adopted (Bocken & Geradts, 2020; Geissdoerfer et al., 2022). In particular, there is

[1] Refer to Bianchini et al., 2019; Bocken & Geradts, 2020; Guldmann & Huulgaard, 2020; Hina et al., 2022; Linder & Williander, 2017; van Keulen & Kirchherr, 2021 for identified CBMI barriers.

a need for further understanding of what capabilities are needed, and how to acquire them to support organizational transformation towards CBMs across different contexts and time-frames in the emergence, implementation, and scaling of CBMs (De Angelis et al., 2023a; Reim et al., 2021; van Eechoud & Ganzaroli, 2023). *This is the first gap addressed in this dissertation.*

Extending this gap, there remains limited clarity on the collaborative processes and dynamics through which capabilities are procured and developed to facilitate CBMI. (Brown et al., 2019; Hina et al., 2022; Hofmann, 2019; Konietzko et al., 2020). While collaboration is recognized as a critical enabler for CBMI (Bocken & Konietzko, 2022; Khan et al., 2020; Santa-Maria et al., 2021b), it remains unclear how organizational structures and partner configurations enable collaboration and support capability building for CBMI (Brown et al., 2021). In particular, the ways in which collaborative relationships foster value co-creation and how interdependencies between actors are coordinated to support CBMI remain underexplored (Aarikka-Stenroos et al., 2022; De Angelis et al., 2023; Köhler et al., 2022). *This is the second gap addressed in this dissertation.*

1.2.2 Unclear consequences for the environment

Beyond the lack of clarity and challenges surrounding implementation, there is little empirical evidence of the actual environmental benefits that CBMs have been proposed to bring. This can be attributed to a primary focus on conceptualizing CBMs, the lack of uptake and widespread scaling of CBMs beyond a few niche actors, and a narrow focus on only the efficiency and material effects of circularity.

As previous research on CBMs has primarily focused on conceptual aspects of CBMs (e.g. Breuer et al., 2018; Lüdeke-Freund et al., 2018; Ritala et al., 2018) and the potential of these business models (Brehmer et al., 2018), "there is a lack of rigorous evaluations of tangible changes, such as resources conserved or regenerated" (Pinkse et al., 2023, p. 12). Potentially stemming in part from the lack of widespread implementation of CBMs, the actual impact of CBMs has been largely overlooked (Fichter et al., 2023). This is particularly concerning as many companies in the CBMI process do not conduct evaluations prior to the implementation of CBMs (Das et al., 2022). As consumption continues to rise (Circle Economy, 2024), the implications of such disruptive business models need to be explored in how they can contribute to a more sustainable society (Snihur & Eisenhardt, 2022).

The facilitation of CBMs can require additional resources such as increased transport or energy inputs, and the implementation of specific circular strategies may only be environmentally beneficial in certain industries, company sizes,

organizational cultures, consumer cultures, geographic regions, etc. For example, extending the product life of clothing through reuse can be effective as it requires little energy inputs to facilitate (van Loon et al., 2021), while extending the life of custom industrial motors through repair creates higher impacts than recycling due to the resulting decreased energy efficiency (Jerome et al., 2023). Due to product-specific attributes and potential trade-offs in the implementation of circular principles throughout a product's lifecycle, the impacts of CBMs are not always clear. It is therefore important to assess the tangible impacts of CBMs from a holistic and system perspective. *This is the third gap addressed in this dissertation.*

Furthermore, the mainstream and primarily technocentric narrative of CE suggests that economic growth can be decoupled from resource use (Calisto Friant et al., 2020; Kirchherr, Yang, et al., 2023) and this is the mentality of companies in implementing CBMs that there should be win-win solutions (Tosi et al., 2024). However, there is no evidence of absolute decoupling of economic growth and resource use at a global scale (Hickel & Kallis, 2020; Kallis et al., 2025), and calculations of emissions reductions connected to circular strategies vary significantly across scenarios (Aguilar-Hernandez et al., 2021). Furthermore, there is no clear indication of decoupling on a company level and it remains unclear how CBMs may trigger rebound effects in production and consumption—unintended consequences where efficiency measures offset the resource savings intended by circular strategies (Metic & Pigosso, 2022; Zink & Geyer, 2017). Beyond understanding the impacts of CBMs, there is a need to understand which contexts and conditions of CBMs may provide sustainability benefits (Böckin et al., 2022). *This is the fourth gap addressed in this dissertation.*

1.3 Objectives and Approach

I explore the problems of ambiguous implementation and unclear environmental consequences of CBMs in my research by first exploring how organizations implement CBMs through CBMI, and secondly by assessing the environmental impacts of CBMs in comparison with business-as-usual. The primary aim of research is therefore to understand how CBMI can be operationalized to deliver positive sustainable outcomes.

To realize this, I first analyzed how companies are currently developing and applying circular strategies where I focused particularly on the capabilities needed to implement and manage transitions toward CBMs *(gap 1).* In the exploration of the capabilities needed for CBMI and how they are procured and developed, I also explore the role of collaboration and partnership relations *(gap 2).* While many companies do not achieve the ideals of CE, they were nevertheless important to

analyze to understand the status quo of implementation and how processes of CBMI could be improved to align better with sustainability goals.

Secondly, I analyzed the environmental impacts of product lifecycles as part of CBMs versus traditional business models to understand if CBMs do accomplish reduced impacts across various environmental indicators *(gap 3)*. This was important to show transparency and accountability for CBMs beyond a material approach and with a holistic and systems perspective to understand potential sustainability tradeoffs. This furthermore provided insights into what actual CBM strategies and related factors most impact relative sustainability outcomes *(gap 4)*.

Through these research pathways, I realized another unaddressed critique of CE in that its efficiency focus on win-win solutions perhaps hinders deeper societal transformation towards real sustainability needs (Corvellec et al., 2022; Leipold et al., 2022; Tosi et al., 2024) as it does not explicitly address overall increasing consumption (Bocken et al., 2022). In focusing on the recirculation of resources, it does not question the unlimited growth narrative or volumes of production and consumption (Korhonen et al., 2018). As I increasingly began to question the utility of CBMs as an important solution to address the ecological crisis, I decided to incorporate sufficiency perspectives and approaches to business in the final stages of my research to fulfill my aim of understanding how CBMI should be applied to support the sustainability transformation and changes our society desperately needs. This perspective is an outcome of my final paper and is reflected in answering the final research question.

1.3.1 Research questions

My dissertation therefore answers the following research questions:

RQ 1: What are the capabilities needed for the implementation of CBMs, and how does collaboration enable their development?

RQ 2: How do consumer behavior and business model factors affect the environmental impacts of CBMs?

RQ 3: How can CBMs be reimagined for greater sustainability potential, and what role do sufficiency strategies play in this reconfiguration?

1.3.2 Research papers

As shown in Figure 2, Papers I and II focus on understanding how CBMs are implemented while Papers III and IV focus on the assessment of CBM impacts from a life-cycle perspective. Paper V then critically reflects on the sustainability of CBMs by introducing a sufficiency perspective.

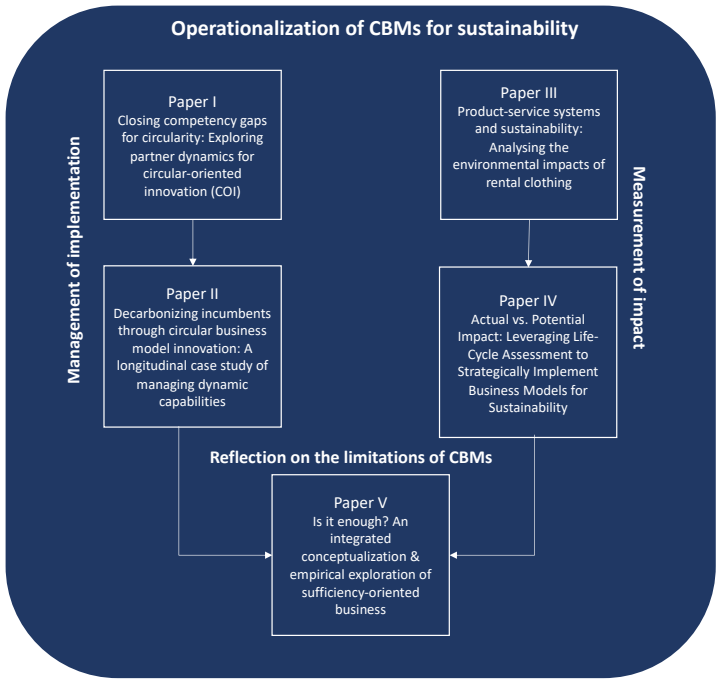

Figure 2 Overview of papers

Paper I: Closing competency gaps for circularity: Exploring partner dynamics for circular-oriented innovation

Paper I analyzes the implementation of circular strategies through the external collaboration of a gap exploiter model (also known as a resale model; see section 2.2.3 for the conceptual background) with three linear companies. This paper provides insight into supportive collaboration processes to help enable the companies' transitions towards CBMs—focusing on the motivations for companies to engage in partnership and the type of competences needed for CBMI. It also identifies business model characteristics for the gap exploiter model and how this structure enables partnership for CBMI.

As external partnerships are one pathway to operationalize CBMs, exploring and understanding the dynamics of such partnerships provides insight into how companies can create mutually beneficial value through collaboration as well as to

close competence gaps. This paper also shows practical examples of how circular strategies of CBMs can be realized in three different established firms.

Paper II: Decarbonizing incumbents through circular business model innovation: A longitudinal case study of managing dynamic capabilities

Paper II explores how an incumbent manufacturer initiates and manages organizational change for developing a CBM of a service/performance model (see section 2.2.3 for the conceptual background) to meet its net zero ambitions. It analyzes the processes, structures, and individual interactions along different phases of the CBMI process to understand their role in the development of dynamic capabilities. The research highlights that CBMI requires strategic capabilities of anticipating future customer needs before customers recognize such needs, codeveloping and deploying proactive solutions, fostering a cultural mindset shift, and reconfiguring relationships in the value chain.

This paper focused on diving deep into an internal perspective of organizational change as opposed to the primarily external perspective in Paper I. Paper II therefore applies a longitudinal approach to explore the organizational microfoundations. Aspects of internal and external collaboration are also explored on the periphery as to how they support the capability development required for organizational change processes for CBMI.

Paper III: Product-Service Systems and Sustainability: Analysing the Environmental Impacts of Rental Clothing.

Paper III examines an empirical case of the environmental impacts of a CBM of an access model (see section 2.2.3 for the conceptual background) compared to a traditional linear model. It accounts for the effects of consumer behavior in relation to the business model through fourteen scenarios and quantitatively evaluates the associated life-cycle impacts. The research highlights that the environmental potential of the analyzed CBM is heavily dependent on the use intensity of the product, how CBMs may or may not replace consumer needs or purchasing patterns, and how consumers travel to engage with a CBM.

This paper provides an understanding of how an existing CBM is facilitated, and how aspects of its business model and relationship with consumers create a higher or lower impact.

Paper IV: Actual vs. Potential Impact: Leveraging Life-Cycle Assessment to Implement Business Models for Sustainability

Paper IV provides an overview of the known environmental impacts of CBMs based on life-cycle assessments. Assessments on CBMs show mixed results where they have been found to have similar, higher, or lower impacts than traditional business depending on various contextual aspects. The research finds that there are no

consistencies in impact across CBMs for particular industries nor across particular value capture strategies of pay-per-use, pay-per-time period, etc.

The paper therefore identifies and highlights the factors that significantly affect the environmental potential of CBMs that companies should test before deciding on implementing a CBM. Primary factors include: consumer behavior and use of products, interpretation of product life, its length, and end-of-life alternatives, pricing of product offerings, and overall infrastructure and transport.

Paper V: Is it enough? An integrated conceptualization & empirical exploration of sufficiency-oriented business

Building on the understanding of the limitations of CBMs for environmental impacts from Papers III and IV, Paper V strengthens the sustainability orientation of CBMs through the application of a sufficiency perspective. Sufficiency-oriented businesses are therefore conceptualized and explored, where their relationship with CBMs and circularity are also defined in that CBMs can enable sufficiency in production and consumption in conjunction with changes to the normative and organizational structure of the business and its relationship to society.

The paper therefore puts forth that CBMs need to integrate sufficiency principles for effective sustainability outcomes, and that by its nature, CBMs can also contribute to sufficiency outcomes for sustainability.

Table 2. Contribution of Papers to RQs

Research Questions	Answered by Paper
1. What are the capabilities needed for the implementation of CBMs, and how does collaboration enable their development?	*Papers I, II*
2. How do consumer behavior and business model factors affect the environmental impacts of CBMs?	*Papers III, IV*
3. How can CBMs be reimagined for greater sustainability potential, and what role do sufficiency strategies play in this reconfiguration?	*Papers I-V*

1.3.3 Research scope & delimitations

This dissertation focuses on the implementation of circularity at a business model level. While a business model perspective does relate to the product design, it does not explicitly look at the product aspect. Rather, it looks at various structures and systems that business model innovation relies on to become operational and viable. It therefore looks at how companies may choose to work with partners or those in its value chain to help implement a new business model, as well as diving deeper into employee dynamics and initiatives that happen in conjunction or to catalyze CBMI. Although the research is oriented around the business model concept, it does not ignore its dependencies and interrelationships with other infrastructural aspects surrounding it.

As circularity has been deemed as important for many sectors (e.g. electronics, batteries and vehicles, construction and buildings, textiles, packaging, and more) outlined in the EU's Circular Economy Action Plan, this thesis draws upon empirical examples from a range of sectors, types of companies, and variation of CBMI to have a broad perspective of the operationalization of CBMs. Evaluating companies on a spectrum has been empirically rich in noting contextual factors that may influence the implementation and impact of circularity. This thesis however has focused on technical CBMs rather than biological CBMs, where technical refers generally to inorganic or synthetic materials and products that are cycled through a production system, while biological refers to materials and products that can be consumed and/or safely returned back to the biosphere (Mestre & Cooper, 2017; Salvador et al., 2023).

Geographically, cases have been taken from the global north due to the availability of public information to find the cases. This is not to say that such models do not exist in the global south, but rather that some of the strategies and even the terminology or jargon of circularity and its narrative for business may be called and discussed in other ways that it is not highly searchable with the terms used in this dissertation. It should be noted that companies in Sweden were selected as illustrative cases in the first three articles—this was for several different reasons. Firstly, as this research is conducted at a Swedish university and was supported by funds from The Foundation for Strategic Environmental Research (Mistra) and The Swedish Environmental Protection Agency (Naturvårdsverket), a Swedish context was of interest to all stakeholders. Secondly, Swedish consumer contexts (explored primarily in Papers I and III) were interesting to explore due to Sweden's generally high levels of consumption (Kallis et al., 2025). Paper II is also an interesting case as a B2B international company with headquarters in Sweden, where part of the strategy and development of CBMI can be influential in other parts of the world. Lastly, Sweden offers various types of companies working with circularity, as a recent report found that 63% of publicly-listed companies in Sweden are working with circularity strategies in some or most aspects of their business (Bajuk & Linder,

2024). Papers IV and V both include a case from Sweden, but also integrate companies in other countries. This was important in Paper IV to have a mix of companies in other companies to learn about contextual factors important for the impact of CBMs. Meanwhile, Paper V is not only restricted to Sweden as companies integrating sufficiency and circularity is a new empirical and practical aspect—making the overall availability of empirical cases very limited in general. This article therefore prioritized highly illustrative cases of such businesses implying the need for other companies outside of Sweden.

To summarize, this research focuses primarily on:

I) Company experiences in implementing CBMI– where business models play a central role in the research. However, other elements surrounding business models and the roles of these and their interactions to facilitate CBMI are also explored, such as collaboration.

II) The environmental impacts of CBMs, as discussed primarily through the application of life-cycle assessment methodology.

This is explored across a range of different company types, sectors, and CBM types (this is discussed later in the methods in Table 4). While the primary focus is on Swedish empirical cases, other international company data is also explored.

1.4 Disposition

This dissertation is comprised of six chapters and five journal articles. Three of the articles have been published, and two are in the peer-review process. In the next chapter of this thesis, I present the conceptual foundations that my research builds upon (Chapter 2), followed by an overview of my research approach and methodology (Chapter 3). Next, I summarize my research findings across my five papers (Chapter 4) and discuss their implications as well as share my reflections on my research (Chapter 5). To conclude the thesis, I summarize my research and contribution as well as provide general recommendations (Chapter 6).

2 Theoretical and Conceptual Foundations

This section begins by introducing the concept and origins of the CE, followed by an exploration of its relationship to sustainability. It then examines the various discourses surrounding the CE, particularly in relation to holistic and technological perspectives on sustainability. The discussion proceeds to highlight the role of business models in operationalizing the CE for sustainability transformations. This is followed by a conceptual overview of business models and business model innovation as a process for advancing CE implementation from a company perspective. The section concludes by outlining key CBM archetypes.

2.1 The circular economy as an umbrella concept

As mentioned in the introduction, as many as 221 definitions of the CE can be found (Kirchherr, Yang, et al., 2023), but I draw upon the definition of the CE in that it is an economic system that aims to maintain the value of resources (e.g. materials and products) in production and consumption processes by utilizing reuse and recovery strategies to extend resource utilization and shift away from the 'end-of-life' concept (Kirchherr et al., 2017).

While the CE has been portrayed as an innovative approach for a sustainable society (as, for example, popularized by the Ellen Macarthur Foundation and shaped through practitioner involvement (Korhonen et al., 2018)), its underlying ideas about resource limits and its impact on the natural environment have been discussed for decades (Calisto Friant et al., 2020). Some foundational aspects that are core to circular principles are, for example, the idea of closed systems. Boulding (1966) related to Earth being closed and finite in terms of resources, using the metaphor of a single spaceship where materials must be circulated and "man must find his place in a cyclical ecological system" (p. 7). The idea of closed-loop production systems and utilizing service loops to reuse goods and recycle materials was also developed by Walter Stahel in the mid-1970s (Stahel, 1994), and the design concept of cradle-to-cradle, or closing materials cycles in production processes was developed by William McDonough and Michael Braungart in the 90s (Meyer & Schneider, 2019).

Building on the idea of circular systems of Boulding, Pearce & Turner (1990) utilize the term 'circular economy' to describe the circular relationship of the environment and the economy where "everything is an input into everything else" (p. 37). Various other principles have contributed to the formation and conceptualization of CE, amongst some are the concepts of ecodesign, biomimicry, lean manufacturing, industrial symbiosis, and product-service systems (Bocken et al., 2016; Korhonen et al., 2018; Meyer & Schneider, 2019; Mont, 2002).

Due to the various concepts that have become related through a shared focus on resource productivity, the CE is often considered an umbrella concept (Blomsma & Brennan, 2017; Moraga et al., 2019). Understanding the CE as an umbrella concept is useful as it enables a broad understanding of different related strategies and their synergies that can be adapted and applied to specific contexts (Holmes et al., 2021). While acknowledging the existence of different facets and narratives of circularity (discussed further in section 2.1.2), this thesis adopts a broad conceptualization of CE and extends it to CBMs as an umbrella concept that includes related areas such as servitization.

2.1.1 Linkages between the CE and sustainability

As the CE is considered an umbrella concept, its relationship with sustainability is often blurred where its similarities, differences, and contributions are not clearly distinguished (Corvellec et al., 2022; Geissdoerfer, Savaget, Bocken, et al., 2017; Korhonen et al., 2018).

The diversity of perspectives on how CE contributes to sustainability is perhaps due to the range of definitions for CE as previously mentioned, as well as the plethora sustainability definitions. One of the most commonly cited and applied understandings of sustainability comes from the UN's *Our Common Future* report (Brundtland Report) which tied in sustainability with development goals—defining sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). It reflects on global 'needs' as well as mentions limits in terms of the Earth's carrying capacity. The report refers to the interconnection of environmental, social, and economic dimensions of sustainability, later coined as the triple bottomline (Elkington, 1997). However, the definition of sustainability development from the report has also been criticized due to the contradiction of 'sustainability' and 'development' together, as well as for its ambiguity—particularly concerning what should be considered as 'needs' and by whom, as well as how limits are defined (Dryzek, 2021; Hauschild et al., 2020; White, 2013).

Definitions and conceptualizations of sustainability are contested, where sustainability is considered an 'elusive' concept that is used by different people and/or fields in different ways (White, 2013). This is perhaps due to differences in values as well as the complexity of boundaries and interactions between environmental, social, and economic dimensions. In understanding perceptions and related elements of sustainability, sustainability has been characterized as 'weak' and 'strong' (Ayres, 2007; Irwin et al., 2016), where weaker sustainability has been conceptualized on the idea that natural capital can be substituted by human-created capital; focusing primarily on economic growth and technological solutions. Strong sustainability upholds the idea that natural capital cannot be replaced and focuses on ecological preservation and resilience.

More recent terms such as 'absolute sustainability' are rising in recognition to conceptualize sustainability to encompass activities that are conducted within the Earth's limits, or planetary boundaries (Hauschild et al., 2020; Rockström et al., 2009). This contrasts with 'relative sustainability', which from a sustainability assessment perspective, indicates if one alternative is more sustainable than the other without indicating if either is truly sustainable within ecological limits (Bjørn et al., 2020). While ideas regarding limits and Earth's carrying capacity are not new, as e.g. mentioned in the Brundtland report, as well as already in 1798 by Thomas Malthus with concerns for exceeding the capacity of the planet to feed a growing population— the idea of absolute sustainability suggests linking the understanding of sustainability with concrete limits of Earth system thresholds as defined by the planetary boundaries (Rockström et al., 2009; Steffen et al., 2015).

Interwoven within the complexities of defining sustainability within the planet's limits are defining a safe operating space and just boundaries for humanity— where sustainability should include a fair distribution of resources for overall well-being (Jackson, 2009; Raworth, 2017; Summers & Smith, 2014). However, defining this aspect requires consideration of different dimensions of justice and involves subjective decisions, such as how to allocate resources and determine what constitutes essential needs (Hjalsted et al., 2021; Rockström et al., 2023). The concept and application of sustainability is complex in its interactions between environmental, social, and economic aspects— making it difficult to define.

A review of the CE and its connection to sustainability has highlighted various perspectives on their interconnections, finding that the CE has been conceptualized as "a condition for sustainability, a beneficial relation, or a trade-off" (Geissdoerfer, Savaget, Bocken, et al., 2017, p. 767). Essentially, perceptions of CE vary on it being one condition for sustainability, a main solution, a necessary condition but not in isolation, as well as a beneficial relationship and a relationship with tradeoffs. The diverse perspectives on the conceptual relationship between CE and sustainability are further discussed in the next section through a summary of discourses of CE and how they relate to sustainability dimensions.

2.1.2 Discourses and conceptualizations of the CE

The various influences that have molded CE conceptualizations have naturally created different discourses of the CE, where each discourse advocates for certain approaches and strategies based on the perception of the utility and effectiveness of the principles of circularity. Such as sustainability has been characterized as 'weak' and 'strong', some have also suggested a 'strong' and 'weak' circularity (Beulque et al., 2023). For example, weak circularity adopts a technocentric perspective while strong circularity adopts a holistic perspective.

Historical and current strategies, approaches, and perspectives can be understood through four discourses on circularity: *fortress*, *technocentric*, *holistic*, and *transformational*. A discourse is a "shared way of apprehending the world" that is foundational to how we communicate— they are useful to understand the assumptions and judgments that comprise our perspectives and that are often taken for granted (Dryzek, 2021, p. 9). As the conceptualizations of CE vary, it is therefore useful to analyze the discourses of CE in how they relate to sustainability as well as practical strategies and approaches. An overview of these discourses is described in Figure 3, adapted from Calisto Friant et al. (2020). These discourses have been divided by their skeptical or optimistic perspective on the relationship between technological innovation and the prevention of ecological collapse, as well as their segmented or holistic approach to social, economic, environmental, and political aspects (Calisto Friant et al., 2020). For example, only the reformist and transformational discourses of the CE offers more holistic perspectives of the social dimension of sustainability. In general, the CE has been criticized as focusing primarily on the environmental and economic dimensions of sustainability, not explicitly recognizing or contributing to social sustainability dimensions such as inter and intra-generational equity, equity across diverse groups, nor financial and well-being equity (Murray et al., 2017; Purvis et al., 2023). While some have pointed out the potential social benefits of the CE, its contribution to this dimension remains rather unsubstantiated (Clube & Tennant, 2020). It is important to acknowledge the discourses of the CE not only to understand its utility in addressing material and resource use, but also in how the CE relates to the deeper interactions of environmental, social, and economic dimensions (Holmes et al., 2021).

The CE discourses are useful to explore from the perspective of how various actors see the purpose or goals of CE for sustainable transformation, such as in relation to the triple bottom line. Furthermore, the discourses are useful as a lens to categorize the variety of approaches and strategies under the CE. These discourses also support an understanding of how other perspectives for sustainable transformation come into play with the CE narrative— such as strategies of sufficiency and questions of growth. I discuss these discourses by primarily drawing upon Calisto Friant et al. (2020)'s framework and drawing parallels between sustainability discourses by Dryzek (2021).

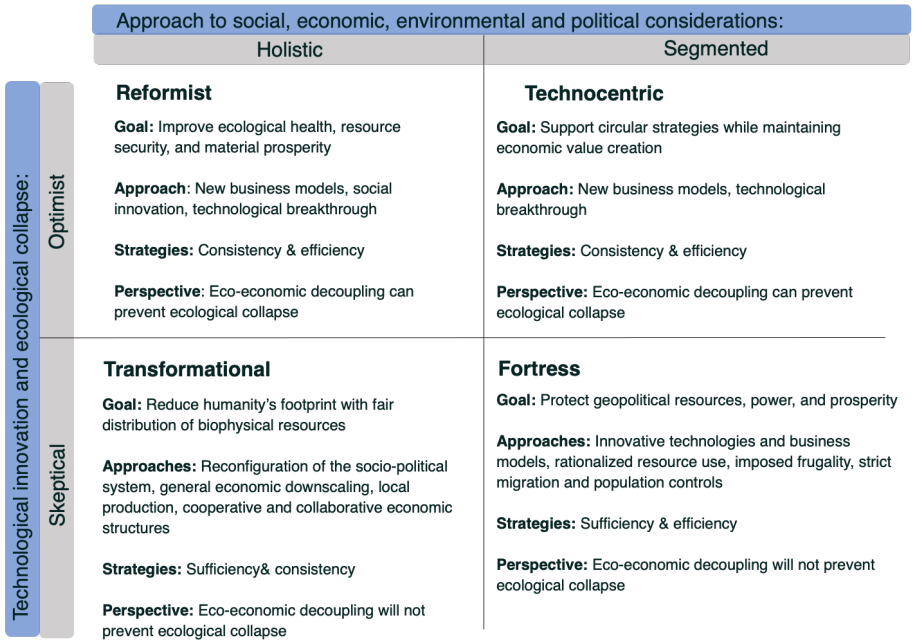

Figure 3 Discourses of CE. Adapted from *Calisto Friant et al. (2020)*

A segmented and optimist perspective characterizes much of the discourse on the CE in a *technocentric* perspective where "technological innovation can enable eco-economic decoupling to prevent ecological collapse" by creating win-win solutions on an economic and environmental level (Calisto Friant et al., 2020, p. 11). This discourse sees technological advancements, innovation, and new business models as solutions to sustainability challenges, without regard for social justice. The technocentric perspective aligns with 'Promethean' perceptions of sustainability in that technology and the market can resolve environmental issues (Dryzek, 2021).

A more holistic orientation of an optimistic perspective is the *reformist* discourse, which upholds the idea and importance of technological innovation while also emphasizing the importance of behavioral and social change. The reformist perspective has a broader view than the technocentric perspective beyond economic value and has the intention to also improve ecological health rather than just reduce negative environmental externalities (Calisto Friant et al., 2020). The reformist discourse aligns with perspectives and conceptualizations regarding sustainable development as mentioned earlier, as well as eco-modernization (a systems approach to address the complexity of sustainability challenges) where dimensions of the triple bottom line appear to reinforce each other (Dryzek, 2021). In this sense, this discourse is rather optimistic that economic growth can continue while

resolving environmental and social issues. The reformist perspective acknowledges that current societal systems need to be reconfigured or reformed, for example, to include greater social inclusion— but does not question their validity.

Both the *technocentric* and *reformist* perspectives are optimistic that ecological collapse can be prevented without any downscaling of production and consumption, which aligns with the ideas of 'weak sustainable consumption' or approaches that are efficiency and technology-focused (Lorek & Fuchs, 2013). These perspectives advocate for strategies such as industrial symbiosis, product-service systems (PSS), ecodesign, and various R-strategies (Calisto Friant et al., 2020) that are primarily focused on efficiency and consistency strategies. Efficiency strategies are motivated by productivity and entail producing with minimal resource intensity, while consistency strategies focus on substituting resources for less environmentally damaging resources and resource flows (Huber, 2000; Robra et al., 2020; Schäpke & Rauschmayer, 2014).

On the opposite end of optimism for the socio-economic solution discourse are the skeptical discourses of *fortress* and *transformational.* These challenge underlying structures and take more of a radical perspective in relation to sustainability. The segmented skeptical perspective of the fortress discourse puts forth the idea that there are no alternative economy options than the current structure in which "socio-technical innovation cannot bring absolute eco-economic decoupling to prevent ecological collapse" (Calisto Friant et al., 2020, p. 11). This perspective offers the view that beyond innovative technologies and business models, controlled management of resources and imposed limits on resource use and population are critical. This discourse is non-inclusive and neglects social justice discussions, and can be linked to the sustainability discourse on limits and survival where top-down approaches are perceived as essential to address ecological limits (Dryzek, 2021).

Lastly, there is a skeptical and holistic perspective of a *transformational discourse* for CE that an alternative economy is needed since socio-technical innovation alone cannot achieve absolute eco-economic decoupling. This perspective advocates for a general economic downscaling along with a fair distribution of biophysical resources through reconfiguring the current socio-political system (Calisto Friant et al., 2020). The transformational perspective could be associated with 'strong sustainable consumption' as described by Lorek & Fuchs (2013), or a "need for a reduction in overall resource consumption instead for product-based individual consumption" (p. 38). The transformation discourse aligns with green radicalism sustainability discourses—which call for transformations in individual consciousness as well as social structures and institutions and require collective action to address the complexity of sustainability issues (Dryzek, 2021).

Both the *fortress* and *transformational* discourse also include suggestions for sufficiency. Sufficiency strategies advocate for 'enoughness' and the fair distribution of resources across ecological, social, and economic dimensions. They

seek to balance quantity and quality and prevent excessive affluence that leads to resource depletion and ecological damage (Jungell-Michelsson & Heikkurinen, 2022; Lehtonen & Heikkurinen, 2022). Such strategies involve reducing total resource consumption while acknowledging lower and upper threshold limits to promote well-being and strengthen social justice (Persson & Klintman, 2022). While the fortress perspective aims to achieve sufficiency from an environmental and economic perspective, it neglects the consideration of fair distribution and social equity in reaching lower limits for well-being and genuine needs. For this reason, I do not include this perspective to align with my definition of sufficiency. However, I believe it is important to address that narrow conceptualizations of sufficiency and its association with top-down management and imposed limits do exist in some discourses, as summarized by Calisto Friant et al. (2020). In contrast, the transformational perspective advocates for general economic downscaling and sufficiency practices with an acknowledgment of global inequities in resource consumption (Calisto Friant et al., 2020).

The CE discourses are important to reflect on in my work, as the narrative I draw upon has differed across my articles. Papers I and II have applied a primarily technocentric narrative, Papers III and IV as a mix of technocentric and reformist, and Paper V as a mix of reformist and transformational.

2.2 Implementing CE on a micro-level: The role of business models for CE and sustainability

As highlighted in the introduction, industry plays a key role in operationalizing and scaling circular solutions. Despite differences in CE discourses, nearly all acknowledge the importance of new business models to help resolve sustainability challenges. Business models indicate how organizations create, deliver, and capture value (Richardson, 2008), and are important as a type of innovation that can change existing ways of production and consumption, scale other radical innovations, and support sustainability transitions (Bidmon & Knab, 2018; Markard et al., 2012; van Waes et al., 2018). As a non-technological innovation, business models have the potential to scale and commercialize new sustainable technological innovation (Bidmon & Knab, 2018). While technological innovation can involve improvements in products and processes, non-technological innovation encompasses organizational elements such as management practices, production approaches, organizational structures, and internal relations (Mothe & Thi, 2010). By reframing and redefining value, new business models can provide stability for radical innovations and reshape established market structures, norms, and expectations (Bidmon & Knab, 2018; Kallio et al., 2020). As business models both influence and are influenced by ecosystems, institutions, technologies, and user practices, they

require the engagement of various societal stakeholders to coevolve and create new types of shared value to foster sustainable transformation (Foxon, 2011; Hannon et al., 2013; Schaltegger et al., 2022).

Integrating circular principles into business models to develop CBMs therefore requires various changes in and surrounding the product, connection of the company to its partners and other actors in the value chain, as well as customer relationships. CBMI requires a "systematic and transdisciplinary view" where CBMs should be explored in relation to other types of innovation such as product design, changes in the value chain, and digitalization (Pieroni et al., 2019, p. 201).

The next section begins by defining and examining the concept of business models and outlines how it has been used in this research. It then presents an overview of CBMI and introduces key CBM archetypes.

2.2.1 Why business models?

A business model has been defined in many ways, both as a tool and guide but also as an analytical construct. It is used in this research as an analytical construct to help understand how circular strategies can be implemented in companies. Business models are most often conceptualized by how they create and capture value through various types of activities (Osterwalder & Pigneur, 2010; Zott et al., 2011). They can also be understood as a business's organizational architecture (Teece, 2010).

In practice, business models are not always clearly defined but instead emerge through the interaction of various elements such as key resources, activities, etc that together sustain company operations. Business models are useful both as an explanatory concept and a strategic tool that can help shape how value is created and captured within organizational structures and processes (Snihur & Eisenhardt, 2022).

Research on business models stems from the strategic management field (see e.g. DaSilva & Trkman, 2014; Teece, 2010), and has a rather broad perspective as a business model relates to many choices within an organization. This dissertation follows the perspective of business models not as a theory or theoretical stream itself but as a "connecting point of several theories" where the significance of business model research lies in its capacity to "explain and enable interconnections among theories" (Ritter & Lettl, 2018, p. 7). Business models are often described through the business model canvas framework, which consists of 9 fundamental blocks: value proposition, customer segments, customer relationships, channels, key resources, key activities, key partnerships, revenue streams, and cost structure (Osterwalder & Pigneur, 2010). This framework is a key tool in explaining business models and business model innovation in my research as it provides "a shared language" for discussing and conceptualizing business models (Osterwalder & Pigneur, 2010, p. 12).

Research on business models has focused on different aspects, as shown in Figure 4. Each perspective is fruitful for different applications, and is used in this dissertation to outline the contribution of my articles towards business model research. For CBMs, previous research has focused rather on the rationale, or the *'why'* of CBMs and their value (see left column of Figure 4). This has been done by detailing circular product design strategies (e.g. Bocken et al., 2016) and archetypes (e.g. Lüdeke-Freund et al., 2019; Whalen, 2019) as well as the logic behind such CBMs' creation, delivery, and value capture (e.g. Nußholz, 2017).

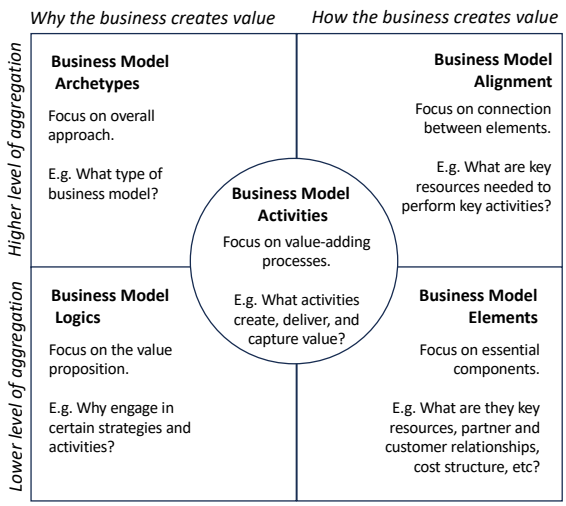

Figure 4 Streams of business model research. Adapted from *Ritter & Lettl (2018)*.

The '*how*' (right side of Figure 4) to create value for CBMs has been discussed primarily from a theoretical standpoint with little attention to the actual implementation. This is where my research focuses, in terms of understanding what is needed to implement a successful CBM through specific *elements* (such as key partners, resources, and customer relationships) as well as how the elements relate or connect (such as matching particular resources and capabilities with intended value-creation activities), termed *alignment* here. Alignment, or the interplay of elements is important as this is what creates the strategy of the business itself (Ritter & Lettl, 2018). As business models as a concept have also moved strategic management research beyond firm-centric perspectives of traditional strategies and towards more of an ecosystem approach to innovation (Snihur & Eisenhardt, 2022), understanding alignment is particularly important as the facilitation of new business models such as CBMs requires collaborative aspects that this dissertation illuminates through partnerships, changing value chain relationships, and internal collaboration across functions. In exploring CBM elements and alignment, my research also describes and integrates particular business model *activities.*

For example, all papers in this dissertation detail business model activities to some extent—such R-strategies utilized. Paper I identifies specific CBM elements to facilitate CBMI, primarily focusing on a resale business model, while Paper II focuses rather on the alignment, or the various connections between elements and activities (explored through microfoundations and capabilities) to facilitate CBMI. Papers III and IV look at the elements and activities as inputs to a life-cycle assessment as well as overall alignment to understand the impact of CBMs. Paper V also looks at the alignment or how various elements surrounding business affects the ability to implement sufficiency strategies.

As discussed in the introduction, little focus has been made on the 'how' surrounding the implementation process of CBMs as well as the 'how' CBMs contribute to sustainability. This 'how' question for CBM research begs for insight into the innovation process itself, or business model innovation.

2.2.2 Business model innovation for circularity

CBMs are operationalized through circular business model innovation (CBMI), where a company innovates its business model to include circular strategies as a critical element in creating, delivering, and capturing value. This entails integrating strategies of slowing, closing, and narrowing resource loops (Bocken et al., 2016) to create new revenue, primarily through new revenue models.

CBMI can occur in the creation of new companies, or in the innovation of existing firm's business model(s). This can be accomplished through processes of creation, transformation, diversification, and/or acquisition that can affect the entirety of the business model and the interrelations between its elements (Geissdoerfer et al., 2020). The process of CBMI involves, for example, the integration of R-strategies (see Figure 6) as strategic activities in the business model. These strategies, while increasing resource utilization, may also act as key activities for revenue. For example, companies can focus on selling fewer products but meet their revenue needs through providing repair and remanufacturing services. Revenues in CBMs can be derived in various ways, from traditional product sales, services, leasing, subscriptions, resource recovery, and sharing platforms (Parida & Frishammar, 2024).

While the outcomes of CBMI can result in a single or diversified portfolio of business models, the process of CBMI itself "can affect the entire business model or one or more of its elements, the interrelations between the elements, and the value network" (Geissdoerfer et al., 2020, p. 8). This is important to note that my research, like most empirical cases of CBMI, does not reflect a full transformation of the business model. Rather, CBMI appears to most commonly involve adjustments to various elements.

The process of CBMI is challenging as it requires new routines and processes to integrate a company's core competences, often requiring strategic collaboration to access or acquire external resources(Bertassini et al., 2021; Reim et al., 2021; Santa-Maria et al., 2021b). This requires new ways to facilitate and communicate value. While I draw mostly upon the idea of value creation, capture, and delivery (Richardson, 2008) the innovation process can also be referred to as innovation happening in the content (activities), the structure (linkages/sequences of activities), and governance (control/responsibility over an activity or activity system between company and network) (Amit & Zott, 2012). This aligns with the perspective of observing business model activities, elements, and alignment as shown in Figure 4.

While traditional business model innovation is often motivated by firm survival to increase competitiveness and/or maintain profit, CBMI intends to increase circularity. Reasons for increasing circularity can be motivated by various factors––intention to optimize resource use, reduce environmental impact, consumer pressure or interest, legislative pressure, as well as economic potential. The economic advantage of CBMI differs across contexts as well as how one calculates the benefits (e.g. looking at long-term or short-term benefits and return-of-investment).

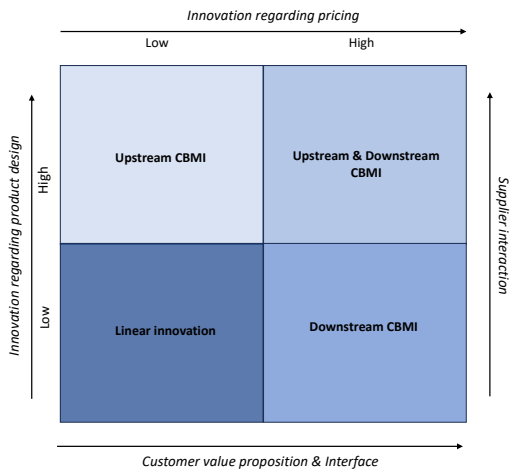

Figure 5 Upstream vs. Downstream CBMI. Adapted from *Urbinati, Chiaroni, Chiesa (2017).*

CBMI has the potential for higher profit returns than pure process or product innovation (Geissdoerfer et al., 2020) and can occur upstream and/or downstream (see Figure 5).

Upstream CBMI primarily focuses on adopting circular design principles in the product itself and with supplier relations, along with efficiency-focused procurement and production (Pieroni et al., 2020; Urbinati et al., 2017).

Downstream CBMI focuses on adopting circular principles in the use and reuse of products—extending beyond product design and innovating through different ways of offering value function through various pricing mechanisms, e.g. through new revenue schemes and customer interfaces (such as product service systems (PSS) and pay-per-use, or collaborative consumption models) (Pieroni et al., 2020; Urbinati et al., 2017).

2.2.3 Circular business model archetypes

CBMs have been conceptualized in various ways, but commonly observed archetypes are the long-life model, access models, service/performance models, and resale models. While not discussed explicitly, these CBM archetypes can utilize various R-strategies. Archetypes are useful to encapsulate typical examples or patterns, where CBM archetypes illustrate different strategies for implementing circularity. This dissertation utilizes these CBM archetypes (illustrated in Figure 6) and described below, to conceptualize its empirical cases as discussed later in the methods and findings sections.

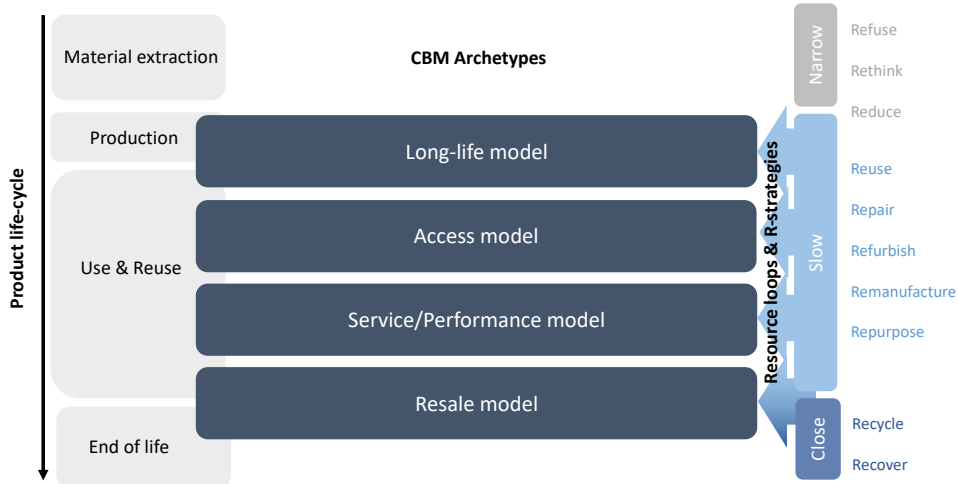

Figure 6 Relationship of CBM archetypes with product life-cycle and resource loop strategies

2.2.3.1 CBMs focused on upstream innovation

As *long-life models* offer long-lasting products, innovation should initially occur with the design of the product itself (Bakker et al., 2014; Bocken et al., 2016) along with material procurement and production. Products should be designed for long use and extended lifetimes. This can be accomplished through a few or a combination of several circular design strategies such as design for physical and emotional durability, modularity and/or upgradability, as well as design for maintenance and repair, refurbishment, and remanufacture (den Hollander et al.,

2017). Long-life models can use premium pricing (Bocken et al., 2016) for revenue creation, along with add-on services for maintenance and repair. While this dissertation considers this CBM to primarily fall under upstream innovation because its long life is dependent on the design itself, it can also be considered as downstream innovation as it requires the innovative ability to extend the product life through various types of R-strategies.

While this thesis does not place *industrial symbiosis* under the category of a CBM due to its implementation of circularity on a meso rather than micro-level (Chertow, 2000; Ghisellini et al., 2016)— it has often been stated as a CBM archetype (Bocken et al., 2016a; Pieroni et al., 2020). I, therefore, mention it here as it is valuable for companies to engage in as an activity for circularity where firms can use the waste from another nearby manufacturing facility as an input to one of its processes. It is therefore considered upstream innovation as it requires changes to how a company conducts production processes.

2.2.3.2 CBMs focused on downstream innovation

Access models, service/performance models, and resale models are considered downstream CBMI as they focus on facilitating the reuse of already-made products. While access and service/performance models may also have elements of upstream innovation in that the products may be designed for long life, these models are considered to focus primarily on downstream innovation in extending the use-life of products. Furthermore, all three of these CBMs can be developed without the original intention of products to be made for such models.

Access models provide consumers access to products where ownership remains with a provider that also takes responsibility for maintenance. These models have also been described as the same or having the same characteristics as sharing and collaborative models (Curtis, 2021; Curtis & Mont, 2020; Hamari et al., 2016) as well as use-oriented product-service systems (Tukker, 2015). As this thesis uses CE as an umbrella concept, it therefore categorizes these under CE, as found also by Bocken et al., 2016; Henry et al., 2020; Moreno et al., 2016; Rosa et al., 2019.[*]

[*] While product service systems (PSS) have their own distinct background and development of the concept (see e.g. Mont, 2002; Tukker, 2004), I use this category of business models under the umbrella of CBMs in my research. While conceptually PSS focus specifically on servitization, and CBMs focus on reducing resource use through various methods—both have the overall aim of reducing resource inputs. CBM archetypes of slowing loops often use servitization as a strategy or business model type to achieve resource reduction theoretically, which is why I primarily use this under the same concept. Despite nuances in the specificity of definitions, academic language, as well as practitioner language, often tie these concepts together as PSS to be somewhat synonymous with CBMs in many concepts (see eg. use-oriented and result-oriented business models discussed as two types of CBMs by Frishammar & Parida (2019). PSS is also used in technocentric and reformist narratives, and it is perhaps due to different narratives of CE that some researchers choose to keep PSS

Access models are facilitated and primarily discussed as leasing and rental models, where consumers pay-per-use of the product or per a certain time period as well as periodically such as through a subscription. Although access models do not involve a transfer of ownership, their revenue is primarily product-focused.

Service/performance models provide a certain result or function through service(s) where ownership of the product(s) remains with the provider along with the responsibility to maintain and repair. Service/performance models are not focused on specific products, but may include, for example, several products in the offering of a service or result. Here, consumers can pay for a certain time period or periodically for an agreed time period such as through a subscription. These CBMs are also often referred to as result-oriented product-service systems (Tukker, 2015), although this dissertation also places these BMs under the umbrella of circularity as done also by Bocken et al., 2016; Henry et al., 2020; Moreno et al., 2016; Rosa et al., 2019.*

Resale models acquire and/or recover potentially obsolete materials or products and resell them directly or first apply various R-strategies (e.g. repair, remanufacture, etc.) before reselling. These models can be facilitated where companies provide the recovery and resale— capturing value through direct re-selling or the offering of recovery services. Alternatively, companies can offer suppliers a product marketplace, e.g. through a platform to resell, where value is captured through platform fees (Henry et al., 2020; Pieroni et al., 2020; Rosa et al., 2019; Whalen, 2019).

and CBMs as fundamentally different. However, this thesis discusses PSSs under the CBMs as illustrated in the above discussion of the CBM archetypes of access models and service/performance models.

3 Research Design & Methodology

In this chapter, I summarize my research approach and methodology, beginning with a reflection on the scientific positioning and philosophical foundations that have influenced my research. This is followed by an overview of my research approach and method used across my papers, with particular emphasis on case study design. I summarize my methods for data collection and analysis and conclude with reflections on ethical considerations and research quality.

3.1 Scientific positioning of the research

This section outlines the nature of my research as well as discusses my scientific positioning and inherent underlying assumptions regarding the nature of reality, knowledge, the role of a researcher, and relevant methods.

3.1.1 Interdisciplinary and transdisciplinary research

In contributing to research on sustainable production and consumption, my research employs an interdisciplinary, and sometimes transdisciplinary approach. Interdisciplinary research involves the interaction of two or more disciplines that integrate perspectives and approaches to solve a particular problem (Sakao & Brambila-Macias, 2018). An interdisciplinary approach is particularly useful as it encourages researchers to reflect on established ways of thinking and bring awareness to inherent assumptions and constraints within their fields— while remaining open to combining different approaches and perspectives to generate understanding (Moran, 2001). I view interdisciplinarity as both being a trait within an individual itself (combining various academic and practitioner backgrounds to formulate an interdisciplinary perspective), but also as a characteristic of the research itself in that it consists of working with others from different disciplines and therefore different ontologies, epistemologies, and methods for research to address the research problem.

This dissertation also engages in a transdisciplinary approach in part of the research through its involvement of non-academic actors such as companies in affirming the gaps pursued in this research are also ‘real world’ problems. While definitions of

transdisciplinarity are disputed (Sakao & Brambila-Macias, 2018), I use the definition by Pohl (2011) where transdisciplinary research involves "transcending and integrating disciplinary paradigms" through assessment and reorganization of these disciplines to address societal issues and includes both academic and non-academic actors (p. 619). Transdisciplinary research focuses on societally relevant problems and is intended to create mutual learning processes amongst different academic disciplines as well as societal actors to create solution-oriented knowledge that is transferable to both academia and society (Lang et al., 2012; Schaltegger et al., 2013). For example, in Paper II, I engaged in several discussions to collaboratively frame the research problem with the case company to plan for mutual learning—where I later presented my findings back to the company to provide solution-oriented insights to support handling of organizational tensions in the CBMI process as well as to receive affirmation that my findings were representative of reality.

Addressing sustainability challenges requires interdisciplinary and transdisciplinary research approaches that respond to "urgent, complex, and persistent" real-world problems (Jerneck et al., 2011; Regeer et al., 2024). In such contexts, research is often perceived as more impactful when it is phenomena-driven rather than theory-driven, and researchers typically draw upon methods and theories from other disciplines (von Krogh et al., 2012). As an interdisciplinary work, this research integrates literature from different fields. The research draws on perspectives from strategic management to enhance understanding regarding organizational processes for CBMI, providing insights into how circular and sustainable innovation may follow or diverge from traditional innovation processes. The research also draws upon life-cycle thinking to assess the environmental impacts of CBMs and to strengthen the understanding of the utility of CBMs for more sustainable production and consumption. From a transdisciplinary perspective, the research is grounded in a practical need to clarify how CBMs are implemented and whether they meaningfully contribute to sustainability transformations.

While interdisciplinary and transdisciplinary approaches are often called for in sustainability research (Ahlström et al., 2020), this is not without methodological and epistemological challenges nor critiques from disciplinary fields. As problems are co-developed in transdisciplinary research, this can create challenges where the problem-framing changes and evolves throughout a project, creating difficulty in maintaining a stable research focus and sometimes leading to outcomes that define the problem rather than find a solution (Ahlström et al., 2020; Lang et al., 2012). In interdisciplinary research, the use of theories from multiple disciplines can also raise questions of transferability that must often be justified. It also demands sensitivity to contextual differences and the recognition of the value of phenomena-driven research. At the same time, this type of cross-disciplinary engagement can strengthen the integration of existing theories in extending them to other fields (von Krogh et al., 2012). Despite the challenges of interdisciplinary and transdisciplinary

research, such work is critical to addressing sustainability challenges. As sustainability problems are often described as 'wicked problems' and/or 'grand challenges' that transgress discipline boundaries, an interdisciplinary and transdisciplinary approach is necessary to find solutions across natural and social sciences and transcend 'disciplinary tunnel vision' (Ferraro et al., 2015; Jerneck et al., 2011; Næss, 2010).

3.1.2 Critical realism

As the nature of my research is interdisciplinary and transdisciplinary, critical realism offers a philosophical foundation that resonates with many aspects of my research. A researcher's philosophy of science indicates an understanding of assumptions across ontology (nature of reality), epistemology (nature of knowledge or how we know reality), and methodology (Bell et al., 2022). Critical realism is particularly fitting for sustainability challenges, as it is based upon the ontological perspective of realism and the epistemological perspective of relativism with judgmental rationality (Bhaskar, 2016; Buch-Hansen & Nielsen, 2020). Critical realism therefore acknowledges that there is a reality that exists outside of what we know, and that our understanding or knowledge of such a reality does not change reality itself. In addition, critical realism recognizes that knowledge is socially constructed and context-dependent, but researchers can evaluate knowledge claims using rational criteria. Similarly, I acknowledge a reality that exists (e.g. ecological crisis, challenges to transition towards CBMs), but that general knowledge regarding these realities is socially constructed based on the methods and perspectives we currently hold and therefore limited and imperfect where new knowledge can always expand or change our current knowledge of these realities.

Critical realism reasons that reality has three domains: the empirical, the actual, and the deep domain (Buch-Hansen & Nielsen, 2020). The empirical domain consists of experiences and observations, the actual primarily of events and phenomena, and the deep as structures and mechanisms. The deep domain and its structures and mechanisms therefore influence or have different effects on the actual domain which is not directly observable but what can be researched. Critical realism has a particular interest in understanding the structures and mechanisms and how these result in the occurrence of certain events and phenomena on the actual level (Buch-Hansen & Nielsen, 2020). For example, it is useful in application to sustainability challenges as events and phenomena (actual domain) influencing climate change can be examined across biological, sociological, cultural, and other mechanisms (deep domain) (Næss, 2010). From a sustainability perspective, critical realism is useful for relating the natural and social world as it ontologically asserts a material reality with an epistemological perspective acknowledging the social dimensions of knowledge (Cornell & Parker, 2010). While not widely applied to management studies, critical realism can be useful in exploring mechanisms that affect particular

strategic organizational outcomes, as well as exploring how social structures, culture, and agents interact and influence one another on an organizational level (O'Mahoney, 2019).

However, in reflecting on what is reality within organizations themselves, I believe that some of my perspectives diverge from critical realism and resonate more with a constructivist perspective. From this view, some aspects of reality within the organization are constructed by my interpretations where I perceive a specific version of social reality (Guba & Lincoln, 1994; Mir & Watson, 2001). For example, in Paper II, a process of CBMI is observed as I perceived this to be in the case company moving towards a service/performance model. However, the terminology 'CBMI' was not used by the research participants in describing what was happening in the organization. Constructivism does have a large degree of overlap with critical realism (Buch-Hansen & Nielsen, 2020; Mahoney & Vincent, 2014), in which it is understood by both that social phenomena are produced through social interaction that is constantly subject to change and revision (Bryman, 2012). This, for example, could relate to the many perspectives in defining circular economy with its 200+ definitions (Kirchherr et al., 2017; Kirchherr, Yang, et al., 2023), and the changing meaning and roots of circularity as a concept historically.

The purpose of pointing out nuances between critical realism and constructivism, however, is primarily to reflect on the perspectives of the fundamental reasons for research. Critical realism focuses primarily on causal mechanisms, which does not fully reflect my research in the management of CBMI (Papers I and II) as I do not evaluate causal relationships. Furthermore, in terms of the purpose of inquiry of research, critical realism is more associated with explanation while constructivism is associated with understanding. My research heavily draws upon case studies, which, as a method of inquiry, focuses more on understanding the activity and context of a case (see more details on case studies in section 3.2.1) (Stake, 1995). Critical realism in some instances is perceived as more experimental whereas constructivism is based more on the interpretation and discussion of a plurality of ideas (Guba & Lincoln, 1994; Lincoln & Guba, 2003). Critical realism, however, upholds the perspective that although we as individuals are affected by our social and cultural environment—— we have agency to resist or transform them. In contrast, some forms of constructivism place greater emphasis on the embeddedness of individuals within structures that downplay individual agency to enact change (Buch-Hansen & Nielsen, 2020; Leung & Chung, 2019). As my motivation behind conducting this dissertation is to contribute to knowledge to enact change for a sustainability transition, the purposes of critical realism align most with my research although I resonate to a degree with elements of constructivism.

In applying critical realism perspectives to methodology, critical realism advocates for pluralism in research methods due to the understanding that reality is layered (Mahoney & Vincent, 2014; Næss, 2010). Critical realism primarily supports exploratory research and explanation in understanding structures and mechanisms

(Bhaskar, 2016). For example, it may support qualitative methods first to obtain "rich explanations of existing mechanisms in the phenomenon of interest" followed by quantitative if more understanding is needed to change or test mechanisms (Lawani, 2020, pp. 320–321). In understanding aspects of implementation as well as impacts, critical realism is relevant as it supports research questions such as how, why, and what circumstances should occur (Buch-Hansen & Nielsen, 2020; Leung & Chung, 2019). For example, how do CBMI processes unfold and in what conditions do CBMs offer environmental advantages over business-as-usual.

3.2 Research Approach & Methodology

I employ both qualitative and quantitative methods in my dissertation, where qualitative data was particularly supportive to address gaps 1 and 2 in my research of addressing the ambiguity of implementation processes, while a quantitative approach was useful to address gaps 3 and 4 to systematically evaluate the environmental impacts of CBMs.

An overview of the research approach and methods employed for each paper are shown in Table 3. In the next section, I discuss the importance of case study design for my research, followed by a summary of my methods of data analysis and collection.

Table 3. Overview of research design & methods

Papers	Research Design	Phenomena of interest	Method (collection)	Method (analysis)	Data Collection	Conceptual/ theoretical anchoring	Primary RQ Contributions
I	Embedded case study	- Drivers of collaboration for circular innovation - Competences for operationalizing circular innovation	- Interviews (n=13) - Document data (n=11) - Participant observations: site visits (n=2)	Qualitative content analysis- NVIVO software	2021	Resource-based view; organizational learning	RQ 1 (Capability development)
II	Longitudinal Case Study	- Development of dynamic capabilities for CBMI - Organizational microfoundations	- Interviews (n=20) - Document data (n=51) - Participant observations: meetings (n=16) site visits (n=2)	Qualitative content analysis- NVIVO software	2022-2024	Dynamic capabilities	RQ 1 (Capability development)
III	Life-cycle Assessment (LCA) & Case study	Environmental impact of CBM vs. linear model	- Survey (n=57) - Questionnaire - SimaPro ecoinvent database	Life-cycle assessment (LCA) – SimaPro software	2020	Life-cycle thinking	RQ 2 (Environmental impacts)
IV	Systematic literature review	- Environmental impacts of business models for sustainability - Significant factors affecting impacts	- Database search: Scopus, Web of Science, EBSCO	- Systematic literature review - Qualitative and quantitative content analysis- Excel	2021-2023	Life-cycle thinking	RQ 2 (Environmental impacts)
V	Integrative literature review & multiple case study	Business sufficiency strategies	- Database search: Scopus and Google Scholar - Documentary data (n=31) - Interviews (n=4)	Qualitative content analysis- NVIVO software	2024	Postgrowth/ degrowth	RQ 3(CBMs and sufficiency)

3.2.1 Case Study Design & Overview of CBMI Cases

While case studies are often referred to as a method, I adopt the perspective that they are rather an approach or research design where a case is an explorative and descriptive inquiry that is useful to develop 'rich' and 'thick' narratives of particular phenomena in a specific real-life context (Flyvbjerg, 2006; Yin, 2014). A case study is, therefore, a "form of research" and "defined by interest in individual cases, not by the methods of inquiry used" (Stake, 2005, p. 443). Case studies are useful for understanding "the complexities and contradictions of real life" by creating nuanced views of reality (Flyvbjerg, 2006) (p. 237), in which various elements and mechanisms can be explored. They are therefore applied to understand specific phenomena and can also play a role in extending and building new theories. Case studies consist of studying a single case or multiple cases, in which a case is considered a 'bounded system' around a phenomenon of interest (Bell et al., 2022; Stake, 2005). Boundaries surrounding a case are determined by the researcher to delineate the context.

A case study approach was particularly useful for my research to address the need for understanding how CBMs are implemented in practice. By selecting and analyzing different cases of CBMI, this dissertation could support knowledge of patterns that may arise in different contexts regarding challenges, strategies, capabilities, and other factors related to implementation and impact. Furthermore, previous research has highlighted the importance of 'business model imitation' for the implementation of CBMs, where many firms use examples of cases of CBMs for inspiration or learning (Frishammar & Parida, 2019). This implies that case studies are also useful from a practical perspective that can highlight strategies and factors that contribute to the success or failure of CBMs.

I observed various cases of CBMI as shown in Table 4. Papers I and II observe CBM diversification, where "the current business model stays in place, and an additional CBM is created" (Geissdoerfer et al., 2020, p. 8) as they draw empirical insights from incumbent companies. Paper I observes how a resale model (termed gap exploiter in the paper) acts as a business partner to three incumbent companies to support the implementation of circularity through new business models or through the adaptation of the current business model to include circularity. Paper II observes how capabilities are developed for CBMI in the process of an incumbent moving towards a service/performance model.

In Paper III, data from a company with a CBM was used as a case to conduct a life-cycle assessment (LCA) and quantify the environmental impacts. In Paper IV, various LCA studies of CBM cases are analyzed. In these articles, CBMs include the application of various R-strategies which is shown to be facilitated primarily through access and service/performance models. Paper V observes CBMs in alignment with sufficiency principles, exploring examples of how long-life models

and service/performance models can support companies to facilitate sufficiency strategies for sustainable outcomes. Table 4 provides an overview of the papers and the empirical cases of CBMI.

Within case studies, one can employ a variety of methods. For example, Papers I and II collect data through interviews, documents, and observations and employ analysis through qualitative content analysis, while Paper III collects data through a survey and questionnaires coupled with inventory data which is analyzed primarily through a life-cycle assessment. These methods are further discussed in the following sections.

Table 4. Overview of papers and cases of CBMI

Papers	CBM type(s)	Company type(s)	Sale type	Industry segment	Location (headquarters)
I	Resale	1 SME & 3 incumbent	B2B, B2C, B2B2C	White goods, furniture, insurance	Sweden
II	Service/Performance	Incumbent	B2B/B2B2C	Construction equipment	Sweden
III	Access	Start-up	B2C	Fashion	Sweden
IV	Long-life, Access, Service/Performance	Mixed	B2B, B2C, B2B2C	Agriculture/food, consumer goods (energy and non energy using), mobility, industrial equipment	14 cases in EU, 3 cases in Asia, 1 case in US
V	Long-life, Service/Performance, Resale	1 Start-up, 2 SMEs	B2C, B2B	Outdoor goods, fashion, furniture	2 in UK, 1 Australia

3.2.2 Methods of Data Collection

As shown in Table 3, I engaged with different sources and methods of data collection— through interviews, document data, literature databases, participant observations, and a survey and questionnaires. The variety of sources was important to support the triangulation of data and capture multiple perspectives (Welch & Piekkari, 2017).

3.2.2.1 Interviews

Papers I, II, and V relied primarily on interviews for data. Interviews are particularly useful for exploring and understanding various phenomena or "richly textured accounts of events, experiences, and underlying conditions or processes" as well as understanding the attitudes and sentiments of interviewees (Smith & Elger, 2014, p.

119). Interviews allowed me to explore the perspectives of employees within organizations actively working with CBMI processes in the case companies of Papers I and II— contributing to various insights in understanding aspects such as motivations for engaging in circular strategies, needed structures and capabilities to support CBMI, types of relationships and collaborations needed internally and externally to implement CBMs, as well as challenges in implementation. For Paper V, interviews allowed me to gain insight into practical examples of how companies engage in sufficiency strategies.

Interviews were conducted in a semi-structured manner, allowing me to actively listen and engage with interviewees. Semi-structured interviews allow interviewees to bring up aspects they deem as naturally linked to original questions, and where follow-up questions were important to further explore such areas. This enables the researcher to understand particular themes from the interviewee's perspectives (Brinkmann & Kvale, 2018). In this process, it is important to also follow prior determined themes to gather information on specific events and processes that were critical to analysis (Smith & Elger, 2014).

3.2.2.2 Document data

Document data includes a range of written documents from different sources that can be public documents, organizational documents, or media outputs such as news articles or posts from social media (Bell et al., 2022). This data was collected through select documents surrounding my case companies to complement interview data. Document data was collected primarily through researching publicly available information disseminated by case companies. Documents included public company reports, information from press briefs, relevant informational social media posts, and/or website information for Papers I, II, and V. In addition, internal company documents such as presentation slides and meeting minutes as well as other internal communication briefs were collected via a computer provided by the construction equipment case company in Paper II. Collected documents primarily supported content for understanding the context, and were used, for example, in the formation of specific interview questions to interviewees in some cases. They were also used in analysis and were coded along with interviews.

3.2.2.3 Literature database

Database searches were key for the collection of relevant literature utilized as the primary sources of data in Papers IV and V. These searches were conducted by applying specific combinations of keywords along with Boolean operators to identify relevant results within a reasonable scope.

Paper IV employed a systematic literature review to collect peer-reviewed research of life-cycle assessments (LCA) comparing CBMs with traditional business models. The databases of Scopus, Web of Science, and EBSCO were utilized for the literature sample. All three databases were utilized and cross-checked for overlaps

to ensure a comprehensive search (Wanyama et al., 2022). 32 keyword strings were tested before identifying a specific keyword string that was utilized across the three databases in two rounds of literature collection.

Paper V conducted an integrative literature review (Snyder, 2019; Torraco, 2005) to identify sufficiency business strategies from literature in different research communities to conceptualize a framework for sufficiency-oriented businesses. Relevant literature was retrieved from Scopus and Google Scholar.

3.2.2.4 Participant Observation

Participant observations were utilized to collect data through ethnographic methods in Papers I and II. This data supported triangulation and complimented interview and document data. Ethnography is a method that utilizes a researcher's observations and involvement with people in particular social settings. They are particularly useful in organizations to learn about "what actually happens" and "how things work" (Watson, 2011, p. 204). Ethnography involves active researcher participation and often over extended periods of time (Van Maanen, 1979) where texts are developed through a researcher converting their experiences and observations.

I employed ethnography in my research to both provide narrative understanding and descriptive aspects to the context (Papers I and II), but also in some cases to note and reflect on insinuations and tensions based on how interviewees spoke or in the observing interactions between people (Paper II). For example, in Paper I, I recorded observations while on a site visit at the main evaluated case company (a resale model), where I found that the company engaged with resale strategies of many more types of products than what I had known based on document and interviewee information. I was also able to see how the case company worked in terms of functional arrangements, where, for example, I saw how it had a dedicated employee section for just one of its partners. In Paper II, I engaged in ethnography through observations through regular meetings with key informants in the case company which not only provided informational updates, but allowed me to perceive contrasting opinions. I also gathered insights through site visits that, for example, involved a tour of the production facility to observe how products are manufactured as well as at an internal company conference where I could join employee discussions and hear a variety of perspectives on the company's ongoing transformation towards a CBM.

While my recorded observations do not make up a significant part of the data, documented ethnographic observations were useful to help understand the context as well as to question or reflect on the accounts of interviewees (Smith & Elger, 2014).

Figure 7 Photos taken during site visits. Image on the left is of used, spare, electronic parts for repair and refurbishment purposes (data collection related to Paper I). Image on the right is from a construction equipment machine show for an internal sales and technology group (data collection related to Paper II).

3.2.2.5 Survey and Questionnaires

A survey and questionnaires were used to collect data to support the LCA in Paper III. A survey was sent to customers of the clothing rental case company through the company's email list of previous and current customers to collect qualitative and quantitative data to gain anunderstanding of their consumer behavior. The survey first explored the participant's typical purchasing and use behavior of clothing, followed by questions about their engagement in clothing rental at the case company, and how their engagement affects their usual purchasing behavior. There were 57 respondents of the 856 customers in the company's newsletter at the time of data collection. While not statistically representative, the company indicated that it had many one-time customers that remained on the newsletter, in which the respondents of the survey were likely to be more active or repeat customers and perhaps a more representative sample. The intention of the survey was not to receive statistical significance, but rather to rely on a basic understanding of information to be used as inputs for the LCA of that study, rather than relying solely on secondary data. The results of the survey were therefore used in conjunction with secondary data to make assumptions regarding certain inputs to the assessment, such as use frequency of products, distance traveled by consumers, types of transportation used, and other factors.

A series of questionnaires was also sent to the CEO of the clothing rental case company to collect data on the company's customers, product inventory, and business activity. This data was both qualitative and quantitative and informed by the CEO as well as the company's digital sales system. It involved the collection of data such as the average number of rentals per user, company laundry activity, general dress material, number of rentals per garment, and average rental time frame.

3.2.3 Methods for Data Analysis

In my research, I primarily employed qualitative content analysis. In addition, I conducted a systematic literature review, as well as a life-cycle assessment (LCA).

3.2.3.1 Qualitative Content Analysis

Papers I, II, IV, and V utilize qualitative content analysis, a systematic method to reduce collected data in a manner that ascribes meaning to the material through the classification of data via coding. Coding structures data into various dimensions, themes, or categories as well as subcategories and so forth (Schreier, 2012). This is accomplished through an iterative process of developing data-driven descriptions that are further developed, refined, aggregated, and reviewed to ensure descriptive and interpretive validity. These codes are then interpreted to develop broader themes or meaning to the data that answer the research questions (Clarke & Braun, 2017; Fryer, 2022). There are various approaches to coding that include more systematic ways to code, or more open and reflexive approaches as well as processual and visual approaches to coding and analysis. These can be applied inductively or deductively, or both, where the coding framework can be informed by theory or generate theory.

Through qualitative coding, 'thick' descriptions or narratives can be produced that provide contextual details and allow readers to discern the transferability of the findings to other contexts (Langley, 1999; Lincoln & Guba, 1985). In my research, I employ a mix of inductive and deductive approaches to coding across my papers using the qualitative data analysis software, NVIVO. In some instances, I employ Excel in conjunction with NVIVO.

3.2.3.2 Systematic Literature Review

Systematic literature review involves the searching (through database searches), evaluation, and synthesis of data. It can be considered as both a research design, as well as a method. I employ a systematic literature review in Paper IV by drawing upon the Reporting Standards for Systematic Evidence Syntheses (ROSES) flow process of searching, screening, categorization, critical appraisal, and synthesis to structure analysis (Haddaway et al., 2018).

The aim of the systematic literature review was to identify studies that had conducted impact evaluations (through LCA) of the impacts of CBMs, and to summarize patterns in terms of the business model or other factors that most significantly affected the environmental impacts of CBMs. The systematic literature review process was used to support the evaluation of the relevance and quality of collected literature starting from 1,722 records to a final 17 articles that were then analyzed through content analysis.

3.2.3.3 Life Cycle Assessment (LCA)

I utilized the method of LCA in Paper III to assess a case company's rental clothing business model compared to a traditional sales model. The LCA was conducted using SimaPro software. I also draw upon LCA methodology and principles for analysis in Paper IV.

LCA is a quantitative method that assesses the impacts of an identified product or service throughout its life cycle by accounting for the inputs and outputs to the environment from raw material extraction to processing and production, distribution, use, and end-of-life. LCA is particularly useful to understand environmental trade-offs in the value chain and to avoid making product or service design changes that shift the environmental burden between life-cycle stages (Baumann & Tillman, 2004; Kjaer et al., 2019). For example, if a design improvement is made in one part of the life-cycle that improves the environmental impact, it may create a higher impact in another stage—therefore increasing the overall impact of the product or service. LCA is therefore useful to analyze the environmental impacts across all stages.

LCA consists of a four-step process that includes the definition of the goal and scope, an inventory analysis, impact assessment, and interpretation as outlined by the ISO 14040 standard. The results of an LCA are presented as environmental impacts that are categorized into three broader areas of damage to human health, damage to ecosystems, and damage to resource availability. These have several subcategories such as global warming potential, water use, freshwater ecotoxicity, human toxicity, and others. The number of subcategories depends on the method decided by the researcher in the impact assessment step of the LCA (EC-JRC-IES, 2011).

3.2.4 Ethical considerations

Conducting research inherently requires ethical consideration and attention to ethical principles. As such, this research follows ethical principles of reliability, honesty, respect, and accountability based on the European Code of Conduct for Research Integrity (ALLEA, 2023). These principles have been operationalized through intentional research design and transparency throughout the research

process from data collection, management and storage, analysis, and communication of results.

Ethical integrity is particularly important regarding the participation of individuals in data collection. In accordance with Lund University's guidelines and criteria for requiring ethical review, my research did not require approval from the Swedish Ethical Review Authority as it did not involve any sensitive personal data or information that could harm or burden participants. Participants of the research were selected as representatives of the case companies in which they provided their own as well as general company perspectives regarding research themes surrounding CBMI.

There are four key ethical considerations concerning participants: researchers need to procure informed consent and ensure they avoid causing harm, invading privacy, and using deception (Bell et al., 2022). These considerations were addressed through transparent and responsible research practice. Participation was voluntary and all participants were informed of the purpose of my research prior to engagement. Participants provided informed consent for the audio recording, transcription, and use of interview and observation data for the purposes of my research. Participants were also informed of their rights to refuse to answer certain questions. Confidentiality was maintained where data was transcribed and anonymized with the names of participants and contact information stored in separate documents from the data. However, in Papers II and V, I used organizational roles to later label interviewees and in the writeup of the manuscript. This was important to provide context and enrich the findings. Here, quotes utilized were carefully reviewed to ensure no harm would come to participants such as reputational risk or professional consequences. Quotes utilized in the manuscripts were also reviewed and approved by the participants.

Some of my papers also explicitly name the companies used as cases, in which permission was received before writing the results, sharing information, as well as in the final stages of writing with the option to anonymize before sending the manuscript to a journal for review. In other cases, companies names are not disclosed but there is still enough contextual information that readers could guess potential companies. In these instances, companies also provided informed consent (through either the CEO, Cofounder, or legal team) and reviewed the company information disclosed in the manuscript.

All data was stored and managed on Lund University servers and equipment and followed guidelines stipulated under the General Data Protection Regulation (GDPR).

3.2.5 Reflections on research quality

There are diverse perspectives on what constitutes good quality research, as well as what should be relevant criteria for quality research. This is primarily a challenge for qualitative research as it includes a plurality of research paradigms and methods (Easterby-Smith et al., 2008). Some qualitative researchers adopt or translate criteria from quantitative research to qualitative, while others argue this overlooks the value of qualitative research (Tracy, 2010). In alignment with critical realism perspectives, as well as due to the use of both quantitative and qualitative data in my work— I agree with the vision of Welch & Piekkari (2017) and see the need for pluralism in criteria and researchers to engage in reflexivity to identify criteria and judge the contexts in which research is valid. However, I do see the value of using terminology such as validity and reliability, which can be further understood as internal validity, external validity, and reliability (Yin, 2014). These criteria mirror Lincoln & Guba's (1985) research criteria of credibility, transferability, and dependability which create research "trustworthiness". I will discuss these criteria in a mixed manner in relation to my research.

Internal validity can be understood as the credibility of research, in which a triangulation of methods is deemed as an important foundation (Lincoln & Guba, 1985; Tracy, 2010). As discussed above, I employ a mix of methods in my research to ensure credibility and draw upon multiple perspectives to deepen comprehensive understanding. For example, in data collection for my research utilizing qualitative data— interview data is complemented with secondary data from documents, as well as participant observation in some of my research. The subjectivity of interviewee accounts ia therefore reinforced with considerably objective documents as well as my own subjective observations. Triangulation in data collection is also applied in the systematic literature review by utilizing three different research databases. In modeling for the LCA, data for the inventory phase is triangulated from a survey, questionnaires, secondary data from literature, and the LCA software database.

From the perspective of Yin (2014), and relevant to the LCA I conducted—internal validity refers to the validity of the relationship between causal mechanisms and the outcome which needs to be justified through pattern matching and/or explanation. In the LCA I conducted, I therefore employed a dominance analysis, sensitivity analysis, and variation analysis. This helped to confirm what life cycle stages of the analyzed business models contributed the most to the environmental impact categories, tested critical data and data variation between my modeling choices, as well as alternative scenarios—offering explanations for the causes of particular impacts in the study.

External validity can be related to the transferability of knowledge generated by the research. However, external validity as defined by Yin (2014) refers primarily to the generalizability of results, while transferability is more nuanced in which readers

should be able to discern the transferability rather than the researcher (Lincoln & Guba, 1985; Tracy, 2010). As I primarily utilize a case study approach to research, the knowledge produced is rather contextual. While there are arguments that case study research can be generalized (Flyvbjerg, 2006), I feel that the conceptual understanding of the criteria of 'transferability' as a quality indicator for qualitative research is more suitable for my dissertation. To ensure the transferability of my results, I therefore employed a 'thick' description and detail of my results as well as the context they are derived from— this allows others to determine the transferability of my results to their respective contexts (Lincoln & Guba, 1985; Tracy, 2010). All papers provide detailed accounts surrounding the phenomena and the case(s) of interest. Although several case studies were utilized throughout the dissertation, these were primarily analyzed in isolation. A broader cross-sectoral comparative study would have strengthened the findings or increased comparison between cases could improve the understanding of implementation factors and capabilities.

Reliability, also known as dependability or consistency is important for quality research (Lincoln & Guba, 1985; Yin, 2014). This can be established through transparency in the documentation of methods employed by the researcher to enable replicability. To ensure the reliability of my research, I have maintained clear documentation of my research methods and management of my data (as described in the ethical considerations section), as well as engaged in formal and informal review processes of my manuscripts. For example, I have engaged in informal peer review sessions amongst colleagues as well as presented my research at different academic conferences. All my papers as well as conference contributions have also undergone formal blind peer review processes.

4 Findings

In this chapter, I present my findings by first discussing the capabilities needed for the implementation of CBMs and how they are procured and developed through partnerships and collaborative processes (RQ 1).

I then present the environmental impacts of CBMs from a life-cycle perspective, discussing how consumer behavior and business model factors affect their environmental potential (RQ 2).

Lastly, I discuss how CBMs can be reimagined for greater sustainability potential and discuss the application of sufficiency strategies in CBMs to overcome some of the limitations of purely efficiency-focused strategies (RQ 3).

4.1 Capabilities and collaboration dynamics for CBMI

In Papers I and II, I examine the operational and strategic capabilities required for CBMI. In this dissertation, operational capabilities are differentiated from strategic capabilities, where operational capabilities are also referred to as 'ordinary' capabilities that support the organization in "doing things right" while strategic capabilities are organizational capabilities that support "doing the right things" (Teece, 2017, p. 696). Operational capabilities refer to every day, foundational capabilities (sometimes referred to as competences), while strategic capabilities are higher-level capabilities that can influence or reshape operational capabilities.

Strategic capabilities require deploying activities at the right time and in conjunction with other transformational organizational processes. These strategic capabilities are commonly referred to as dynamic capabilities that are critical to developing and organizing ordinary capabilities to facilitate how a company allocates its resources in response to internal and external changes (Teece, 2017). Dynamic capabilities can be developed through a zooming-in and zooming-out approach, where zooming in focuses on internal company development of competences and knowledge for circularity, and zooming out is key for creating value and collaborating across the business network or ecosystem (Dagilienė et al., 2024; Hofmann & Jaeger-Erben, 2020). As zooming-out approaches are equally important for the development of capabilities for CBMI, collaboration becomes a key aspect of the process.

My research identifies the operational capabilities needed to facilitate circular strategies through external collaboration (Paper I) as well as identifies the structures, processes, and individual interactions that need to transform and shift to develop an organization's strategic capabilities for CBMI (Paper II). Both papers provide a layered understanding of organizational capability development for CBMI where Paper I shows how collaboration can provide missing capabilities and Paper II highlights that companies need to procure and develop their internal capabilities over time to create strategic capabilities for long-term success.

4.1.1 Acquiring and building operational capabilities

Operational capabilities are explored in Paper I through the examination of the services that a partnership with a resale company provides to three different incumbent companies: a furniture company, an insurance company, and a white goods company. Partnership serves as a strategy to implement circular strategies in the incumbent companies through procuring or co-developing capabilities with the resale company, and results in outcomes such as new business models and revenue schemes as well as long-term partnerships supporting the modification of the core business model.

4.1.1.1 Partnerships

Operational capabilities were procured through different types of partnerships that varied from embedded to transactional partnerships, where the resale company acted as an innovation intermediary to not only provide operational capabilities but to also facilitate learning opportunities and capability development for its partners. Despite discussions that such relationships were partnerships, they were rather asymmetric where the resale company acted primarily as the service provider and the other companies as its customers. As such, the resale company offered different contractual relationships to its partners to support CBMI development. This included, for example, traditional consulting service charges that provided the furniture company with access to digital infrastructure as well as support in developing knowledge and skills for product recovery capabilities. In its partnership with the white goods company, the resale company used standardized 50/50 revenue-sharing contracts, where both companies split the revenue from resold products after the deduction of handling costs. This contract also covered access to digital infrastructure and data. In the long-term partnership with the insurance company, the resale company charged service fees on a per-transaction basis, corresponding to each individual repair or recovery performed. Additional fees were applied for value-added services such as sustainability reporting and the use of digital infrastructure.

Collaboration for CBMI was perceived by the incumbents as an exploration mechanism to kickstart the experimentation of new processes and create new revenue streams, but also for exploitation opportunities such as reducing costs and waste through the assessment, repair, and improvement of current operations and capabilities by enabling reuse. Collaboration was viewed as relatively short-term for the furniture company and the white goods company, serving primarily to bridge capability gaps while the companies built up their own internal capacities. The white goods company engaged in a partnership to access external capabilities despite possessing some product recovery capabilities internally—this was due to a strategic choice to avoid diverting resources from their core business model. In this sense, collaboration functioned as a risk-mitigation strategy, allowing companies to test the viability of new initiatives before deciding to create the internal competences or allocate resources for it. In contrast, the partnership with the insurance company was structured as a long-term collaboration, with the company choosing to outsource the capabilities required to implement and maintain its circular strategies. To support this, the resale company assigned dedicated employees to work on the insurance company's operations, embedded within its offices over the long term.

Collaboration is therefore important with the facilitation or start of new circular initiatives, but can also be useful long-term if some companies do not have the desire to develop their own capabilities and prefer to outsource. Such partnerships and collaboration can therefore enable resource sharing and organizational learning for incumbents for CBMI. This is not to say it leads to transformation, but rather the inclusion of circular strategies and elements of CBMs into the companies. While not all companies aim to become fully autonomous in CBMI processes, collaboration provides a platform for selective capability development. This perspective offers a more process-oriented understanding of how CBMs can be practically implemented.

4.1.1.2 Operational capabilities & collaboration mechanisms

Operational capabilities are provided to partners through different collaboration mechanisms and are described utilizing collaboration categories by Gebhardt et al. (2021) of information sharing, joint planning and decision-making, contractual and economic practices, resource sharing, and joint knowledge creation. Combined, these mechanisms support capability sharing and development, and enable the implementation of CBMs.

The key operational capabilities sought by partners in collaboration to facilitate circular strategies were: digital infrastructure creation and product data tracking, physical space, infrastructure & recovery skills, and reuse and resale market knowledge. The capabilities are described below in conjunction with the collaboration mechanisms.

Digital infrastructure & product tracking

As CBMs should ideally extend resource value through the reuse of materials, parts, and products, this creates complexity in the movement of materials both upstream and downstream of companies. Digital infrastructure such as digital platforms are critical to support the tracking of products and components such as parts replaced, number of repairs or types of repairs conducted, assessment of incoming goods, and various other data points—essentially acting as an information and asset management system.

This type of digital platform was what the resale company offered to its partners as a foundation for its other services. As such, digitalization served as an operational capability for CBMI, but also as a capability that supported collaboration. The resale company's digital platform played a central role in facilitating collaboration by enabling information sharing, supporting joint planning, and guiding contractual arrangements. It tracked product-level revenue generation while also providing feedback on product types and the volume of products that needed to be resold. In addition to product management, the stored data was useful for calculating potential saved emissions from engaging in repair and recovery activities, which was shared with partners to utilize in their sustainability reporting. Additionally, the digital platform captured insights on product usage and consumer behavior that supported in fostering joint learning and knowledge creation among partners to support scaling resale models in relation to the market.

Physical space, infrastructure & recovery skills

As parts and products should in theory return to manufacturers for repair and recovery, this requires additional and other physical space separate from new inventory. This physical space is needed specifically for storage, repair, refurbishment, and resale itself. The white goods company and insurance company relied on the resale company's physical infrastructure, demonstrating a model of resource sharing in which shared facilities, tools, and repair capabilities were centralized by the resale company to support multiple partners independently, without the need for direct interaction between them. The furniture company, while drawing on the resale company's product recovery knowledge and capabilities, had a unique setup of connecting with a waste center and "secondhand mall" to procure physical space to facilitate recovery and resale activities.

Logistics infrastructure, primarily for reverse logistics and take-back systems, also requires coordination with the physical space allocated for recovery and resale operations. Joint planning processes coordinated logistical aspects between the resale company and its partners where the scope of collaboration was defined on whether full return management services or specific support services should be procured depending on the partner's specific CBMI intentions.

Repair and recovery capabilities were sought by partners to facilitate resale, as products must be evaluated not only for their current value but also to determine whether and how they can be recovered. For consumer goods, recovery processes can range across products that, in most cases, have not been designed for repair or second life. Consumer goods handled by the resale company ranged from products such as phones, computers, robot vacuums, popcorn machines, furniture, clothing, bikes, and more. While the resale company had some streamlined processes to repair and recover certain product streams like mobile phones, other products required experimentation to recover—particularly as the resale company was not a direct manufacturer. Joint knowledge creation through experimentation in recovery processes was an important aspect of collaboration between the resale company and furniture company in particular, for example in finding solutions regarding the maintenance of hygiene in furniture that had textile components. The resale company co-developed product evaluation routines and quality criteria to support the partner's internal capability development for recovery. These activities occurred through hands-on engagement, facilitating mutual learning and enabling the partner to build its own routines for resale and repair decision-making.

Reuse and resale market knowledge

In addition to the technical skills required for product recovery, there is a need for strategic knowledge on how to approach reuse. This includes assessing the economic value of products, identifying optimal secondary markets, and understanding the dynamics of the resale market. Consumers purchasing from resale markets typically expect much lower prices, even if products can be new—requiring capabilities to develop appropriate pricing, platform selection, and communication to consumers. The resale company addressed this by leveraging a combination of sales channels, including its own e-commerce platform, a physical store, and several third-party resale platforms to reach different market segments.

Reuse and resale market knowledge was primarily provided through contractual relations, for example, in the case of the white goods company, the resale company didn't openly share this knowledge but embedded it within the services it provided to the company. In the case of the furniture company, the resale company shared resale market knowledge through joint learning processes and information sharing, partially informed by digital infrastructure.

4.1.2 Developing strategic organizational capabilities for CBMI

Strategic organizational capabilities are explored in Paper II through the examination of an incumbent construction equipment manufacturer and how it innovates towards a service/performance model. This was done by looking at the constellations of central individuals, processes, and structures (termed microfoundations) that shape how strategic organizational capabilities develop over

time. Phases were observed through the innovation process where the company first developed technological capabilities for electric product development, followed by digitalization and service solution development, and then by sale experimentation and commercialization capabilities. In the evaluation of the microfoundations throughout these phases, higher-level strategic capabilities were identified for CBMI.

4.1.2.1 Microfoundations for strategic capability development and their inherent collaborative processes

Paper II highlights how microfoundations emerge both within and across the different phases of the company's CBMI process, collectively enabling the development of strategic capabilities necessary for transformational change.

Key microfoundations that were consistent throughout the CBMI process included a combination of supportive structures, adaptive processes, and individual-level contributions. Structurally, strong top management support, cross-functional collaboration, and purpose-driven teams were critical, alongside extended ecosystem relationships. In terms of processes, companies navigated competing priorities by aligning efforts across departments and teams, often relying on iterative experimentation and learning-by-doing to challenge existing routines and explore new approaches. Initiatives were piloted through new partnerships while allowing supportive processes to emerge later. Increased customer data on product use was also critical to inform and refine service and solution development. At the individual level, transformation leaders played a central role by stepping beyond formal roles to address capability gaps, fostering a sense of belonging in transformation processes, and driving mindset shifts necessary for enabling change.

The identified microfoundations highlight the importance of both internal and external collaboration processes in developing strategic capabilities, particularly given the need for new ways of thinking to cocreate solutions and new value chain relations in this context. While traditional partnerships remained important, collaboration in this case extended further down the value chain and encompassed not only direct customers but end users. These new relationships supported the development of new types of contracts for service/performance models. Increased collaboration with end users was found to be particularly important in the construction industry, as it enabled the company to develop a deeper understanding of how its machines are used on construction sites. This knowledge and the related data are essential for the company to deliver a competitive service/performance-based offering and efficient machine fleets. External partnerships were also important so that the incumbent could train and push certain capabilities to its partners and other actors in the value chain in order to focus on other strategic activities for CBMI.

Internal collaboration played a key role to combine internal capabilities and strengthen overall strategic capabilities for CBMI processes. The establishment of cross-functional teams helped to bridge internal organizational silos and catalyze new transformation initiatives. Comprised of individuals from different functional areas (e.g. technology, engineering, sales, sustainability, and marketing) these teams operated with a high autonomy but relied on strong top management support and clear strategic visions. Their collaborative efforts were instrumental in creating disruptive business models that aligned with CBM principles to shift the company's thinking away from product sales to service-based solutions. This approach also supported the transition toward electric machinery by replacing fossil-fuel-dependent equipment, requiring integrated individual capabilities to build a viable commercial strategy around a performance-based sales model.

4.1.2.2 Enabling strategic capabilities

Building on the microfoundations examined throughout the CBMI process in Paper II, the key strategic capabilities that emerged were: the management of organizational ambidexterity, anticipating customers' future needs, and facilitating an organizational and cultural shift in mindset. While these capabilities were derived from the results from Paper II, I find some parallels between Paper I and provide a few examples of such in the discussion of these capabilities.

Management of organizational ambidexterity

Developing and managing organizational ambidexterity is a key capability for organizations to implement CBMs from established business models. As discussed previously, CBMI often occurs in parallel to a company's existing business model (CBM diversification). This therefore requires companies to allocate new competences and resources to the new CBM through the acquisition of new resources (e.g. through external collaboration) or through diverting, allocating, or re-combining existing resources (e.g. through internal collaboration such as cross-functional teams) while still maintaining its original or core business model. This ultimately requires firms to have the capability to manage business models that operate on different business logics, which I explore in Paper II as organizational ambidexterity, or "the ability to be flexible in the organizational structure, as well as in having a parallel business model(s) and sharing resources and competences between them" (Paper II).

Organizational ambidexterity is important in particular for CBMI, as CBMs generally require higher upfront costs as well as longer time-frames for return-of-investment for the innovating company, where the revenue from the original business model of the company can help to support and sustain the CBM until it is viable on its own. For example, the construction equipment manufacturer's primary revenue relies on its traditional sales of diesel machines. The company needs to compromise resources between sustaining the company through this business model

and taking a leap to scale sales of its electric machines through a CBM, therefore requiring ambidexterity. Similarly, the furniture company from Paper I had to rely on its core business model to experiment with CBM, as its pilot of a secondhand store was not viable to sustain itself on its own.

Besides utilizing existing revenue as well as partnerships to create organizational ambidexterity, Paper II found that ambidexterity can be fostered in the culture of the organization, for example through flattening organizational hierarchies and structures and creating cross-functional teams to pool competences and bridge perspectives for solutions, ultimately to encourage open innovation while also maintaining strategic direction and support for individuals. Division of responsibilities and tasks to different groups and initiatives were also utilized and categorized between '*perform'* tasks which focused on the current business model, and '*transform*' tasks focused on CBMI-related processes.

Organizational ambidexterity was also fostered through offering continuous training and education of employees. Programs to upskill and reskill are important in the organization, particularly to empower individuals whose jobs have become or are becoming redundant due to the transition towards electric machines and solution services. This is important not only to retain employees, but also to boost support for the intended transformation of the organization and reduce organizational inertia and tension. Shifting individual and cultural mindsets is therefore important to support open-minded thinking and ease the challenges of transition, such as letting go of long-standing skills and knowledge related to fossil-fuel machinery, and encouraging new ways of thinking to develop solutions focused on services rather than products. This is discussed further in 'facilitating organizational and cultural mindset shift'.

Anticipating customers' future needs

CBMI often relies on new forms of customer relationships, particularly in access and service/performance models, which makes it essential for companies to better understand customer needs and behavior. Customer sensing and the capability to anticipate customers' future needs was particularly important for the construction equipment company in developing its service/performance model as it required an increased understanding of its products' users (its end users or customer's customers) and their machine use-cases and behavior.

Here, the company utilized sensors and increased digitalization to understand and improve the machine's uptime and productivity in conjunction with its end customer's "pain points" in their specific contexts. This provided data for the company to improve its service offerings and offer more comprehensive solutions in its effort to transition away from product sales and towards service/performance models. Digitalization enables the company to create digital marketplaces for parts and services, develop new ways to invoice services and manage subscriptions, create customer and end-user online portals, offer custom construction site data such

as recommendations to reduce carbon emissions for end users, as well as provide a range of specific machine support services and insights.

Digitalization capabilities were developed internally in the construction equipment company, with the formation of a specific cross-functional team tasked with developing digital solution services. Many of the services were piloted and tested with customers to improve the offerings. Closer customer relationships and new relationships with end users, as well as increased digitalization, were key factors in developing customer-sensing capabilities.

Facilitating organizational and cultural mindset shift

Capabilities to shift the organizational culture and mindset of individuals appeared as a recurring theme during CBMI processes. This transformation is essential not only within the organization itself but also across its value chain partners and customer relationships.

Internally, and in alignment with managing organizational ambidexterity, CBM requires a fundamental shift in the way of doing business. Paper II found that companies need to work on discussing the logic of circularity before the product and/or service is even ready for market, due to the time it takes to convince employees of the value. Employees in the construction equipment manufacturer feared that their customers would not see the value of new CBMs, as well as felt that the transition towards a CBM was changing the brand identity. For example, in an internal company conference I attended at the company, one of the employees asked the host of the breakout seminar "Have we changed our mind as a company? Are we a charging provider or a machine provider?". Another employee in the plenary session later also asked "Will [we] not sell machines anymore? Will [we] just be a rental company?". As companies such as this case company have developed brand reputation based on product quality, shifting towards access and service/performance models forces employees to rethink the purpose of the company and how this affects their individual roles. Similarly, the fear of maintaining brand identity and consumer expectations when transitioning and experimenting with CBMs was found in companies in Paper I, where they sought to alleviate this pressure by utilizing partnerships for their CBM experimentation.

Individuals within companies who are working directly with strategic decision-making and implementation for CBMs (and have a strong belief in the transformation) are also informally or formally tasked as individuals to convince the rest of the organization of the value of engaging with circular initiatives. This was found in both the furniture company in Paper I and the construction equipment manufacturer in Paper II where individuals who were allocated as part of a team to develop and implement CBMs faced much of the burden to advocate and educate for the transition. In the construction equipment manufacturer, "transformation" training was provided to engage various individuals from different departments and levels to develop soft skills in how to manage and support their teams and coworkers

to engage in alternative solutions to promote transformative action in the organization.

Externally of companies, customers need to be convinced of the value of CBMs. While CBMs are an attractive approach to the construction equipment manufacturer's end customers for the sale of electric machines (as service/performance models help offset end customers' high investment costs), this business model is not as convincing for the company's direct customers (such as dealerships). This is because service/performance models require the company to be more active in end-customer relationships that dealerships usually handle, making the company a partial competitor with its direct customers. Due to this, the value of such CBMs for its direct customers required new closer partnerships and agreements to convince them of the value of such business models.

The need for a customer mindset shift to support CBMs also came up in the resale company in Paper I, where the resale company found that customers had to be convinced of the value of second-life goods and manage price expectations.

4.1.3 Reflections on capabilities and collaboration across contexts

Despite differences in customer segments and industries, Paper I and II overlap in that the main operational capabilities needed for CBMI include digitalization and consumer/market knowledge. Digitization is essential not only for product tracking and data analysis for use cases and patterns, but also as part of potential services or service solutions sold to both B2C and B2B as well as B2B2C customers. Digital infrastructure and services are a key aspect to facilitate CBMI in the operations, but also as part of the product and/or service solution.

Consumer understanding is important for B2C companies as behavior plays a large role in the specific use cases but also patterns for return and reuse. Successful CBMs therefore require knowledge of consumer behaviors and practices not only in the design of products, but also in the pricing of products and services. While B2B and B2B2C companies can offer a better understanding of end-consumer use based on specific contexts or industries (e.g. for construction) as explored in Paper II, innovation towards CBM includes in these cases still involves deeper customer understanding to offer service and performance models. This is because solutions in this context require context specificity, where details such as customers' construction site layouts become important to facilitate service solutions that match the need.

Both papers demonstrated that piloting projects with partners and even customers enabled the companies to experiment with CBMs with lower risks while testing the new processes and relationships required. This helped to enable organizational ambidexterity and allowed companies in both papers to maintain their traditional business model while experimenting with CBMI. In Paper I, this approach was

particularly valuable for maintaining brand identity during early experimentation. In Paper II, it played a critical role in catalyzing new CBMI-related initiatives ahead of fully market-ready solutions, helping to maintain consumer and user trust.

4.2 Environmental impacts of CBMs

In analyzing the environmental impacts of CBMs, Papers III and IV show mixed outcomes where CBMs can have a higher or lower impact than traditional business models depending on various contextual factors. These factors are due to methodological decisions, consumer decisions, and business model decisions.

Paper III provides empirical evidence from a life-cycle assessment of how consumer behavior and business model design affect the environmental impact in an access model, where Paper IV expands this perspective by analyzing various assessments on types of access, service and performance, and long-life models to indicate leverage points in customer behaviors and business model configurations that play a role in the overall impact of CBMs from a life-cycle perspective. An overview of the life-cycle impacts of CBMs is first discussed in conjunction with the effects of methodological choices. This is followed by a discussion of influential factors on the assessment regarding consumer behavior and business model configuration.

4.2.1 Life-cycle impacts of CBMs

Paper III focuses in-depth on the life-cycle impacts of a formal rental dress company (access business model) in Sweden vs. a traditional sales model. Here, different functional units as well as environmental indicators show different outcomes of whether the CBM has a lower or higher impact than traditional sales. The reason for the difference in outcomes of functional units is due to the implications for system boundaries and the timespan considered, where it could for example include possible rebound effects or substitution of particular behaviors. This was shown through testing three different functional units amongst other factors, “one average use” of a formal dress, “4 years of consumer formal dress needs satisfied by purchasing”, and “4 years of consumer formal dress needs satisfied by use”. I selected these functional units based on the customer survey I conducted in the company, where respondents had varied responses in how they perceived the use of rental to either replace their purchasing of a dress, or just to replace a single use or wear occasion.

The most significant impact categories out of 18 indicator categories were freshwater ecotoxicity, marine ecotoxicity, and human carcinogenic toxicity potential. The impacts of CBMs vs a traditional linear business model are shown in

Figure 8 for freshwater ecotoxicity and human carcinogenic toxicity, with scenarios for the three different functional units.

The CBM scenarios were modeled with assumptions for the use of public transport, but are contrasted with the use of cars in consumer transport as well to indicate the significant differences in types of transport utilized. In addition, the "one average use" functional unit assessment tests scenarios with low, average, and high usage of clothing. The "4 years of consumer formal dress needs satisfied by purchasing" and "4 years of consumer formal dress needs satisfied by use" functional unit assessments test scenarios with differences between substitution rates (abbreviated as RR) of how CBMs substitute or complement traditional sales.

In evaluating the impacts across the three functional units, the benefit of CBMs were more apparent using the functional need of "4 years of consumer dress needs satisfied by purchasing", where it was assumed that participation in rental replaced a certain number of dresses that would have been bought over 4 years. This contrasts "4 years of consumer dress needs satisfied by use" that assumes participation in rental replaced a certain number of use occasions (meaning a new dress was not bought for each use occasion in the linear scenario) over 4 years. As the benefit of CBMs are more apparent in the longer time-frame perspective regarding the replacement of purchases in calculations, this is attributed to the change in the effect of substitution that CBMs can have in relation to business-as-usual. This implies that CBMs have great environmental potential for longer-term behavior change and substitution of business-as-usual with this perspective. In cases where engagement with CBMs replaces use occasions, the environmental potential is not as clear.

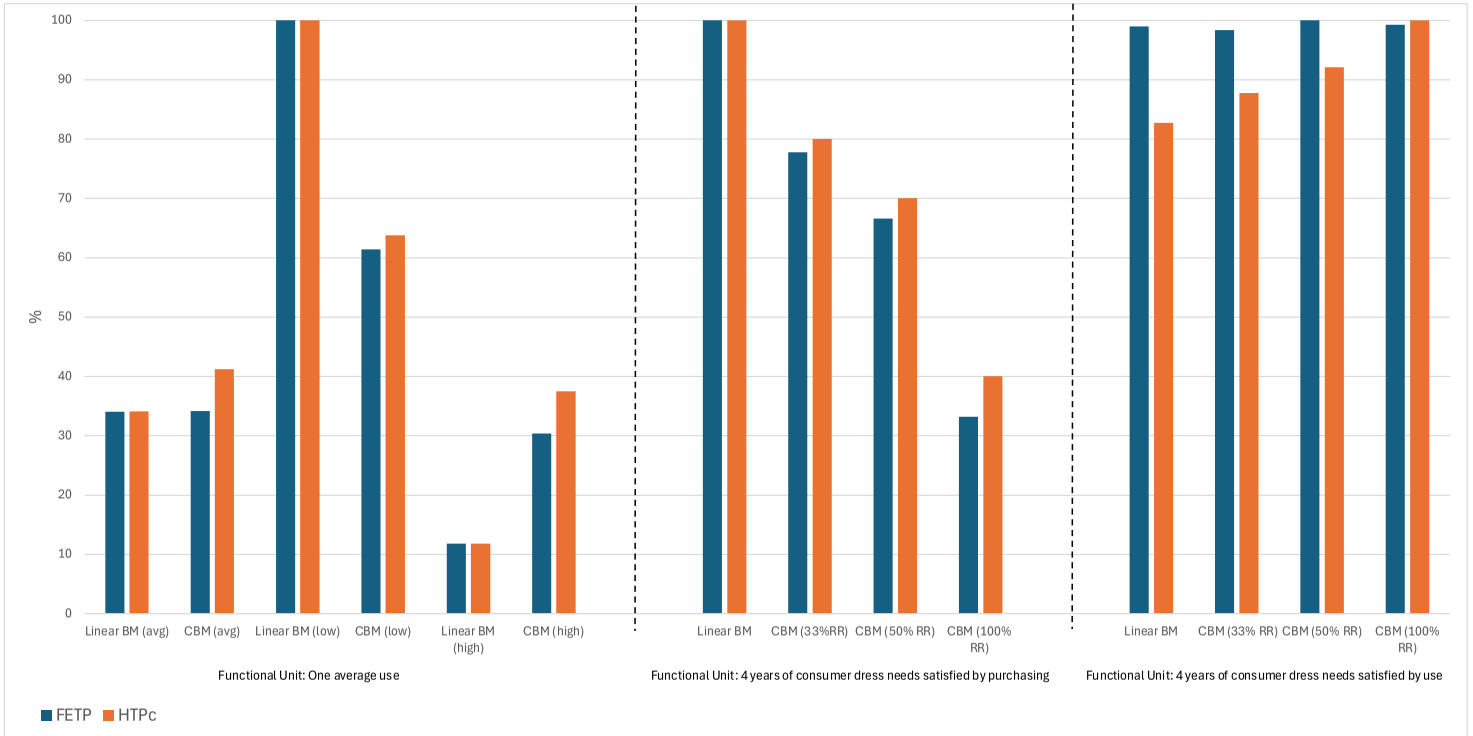

Figure 8 Characterisation results by the percentage of the impact of CBM vs linear BM scenarios for FETP (freshwater ecotoxicity) and HTPc (human carcinogenic toxicity) across the three different functional units. % RR refers to the replacement rate or assumed substitution of CBM engagement over sales. The highest scores are set to 100% and other values are set as a relative percent to allow comparison between the impact categories. Data summarized from findings in Paper III.

An indication of the highest and lowest contributing business model scenarios is summarized from Paper III and shown in Table 5. While the outcomes of the two functional units are consistent across impact categories, the last functional unit varied in contribution for each impact category.

Table 5. Example of varied impacts across functional units and impact categories where FETP refers to freshwater ecotoxicity potential, HTPc refers to human carcinogenic toxicity potential, and GWP refers to global warming potential

Functional Unit	Impact categories	Highest contributor to impact	Lowest Contributor to impact
One average use	FETP HTPc GWP	Traditional business model with low consumer use	Traditional business model with high consumer use
4 years of consumer formal dress needs satisfied by purchasing	FETP HTPc GWP	Traditional business model	CBM with 100% substitution
4 years of consumer formal dress needs satisfied by use	FETP	CBM with 50% substitution	CBM with 33% substitution
	HTPc	CBM with 100% substitution	Traditional business model
	GWP	Traditional business model	CBM with 100% substitution

In the analysis of several conducted studies of LCAs on CBMs, Paper IV shows mixed results in the environmental impacts of CBMs. Seventeen studies were reviewed, and 28 scenarios were evaluated among them. Just 6 of the 17 studies (equating to 11 of 28 scenarios) indicated that CBMs had lower impacts than traditional business models. These studies used only three or fewer environmental indicators—implying that if more indicators were accounted for such as in some of the other studies, there would be an increased chance of mixed results due to increased complexity and different impacts depending on the selected environmental categories. This is shown in Figure 9.

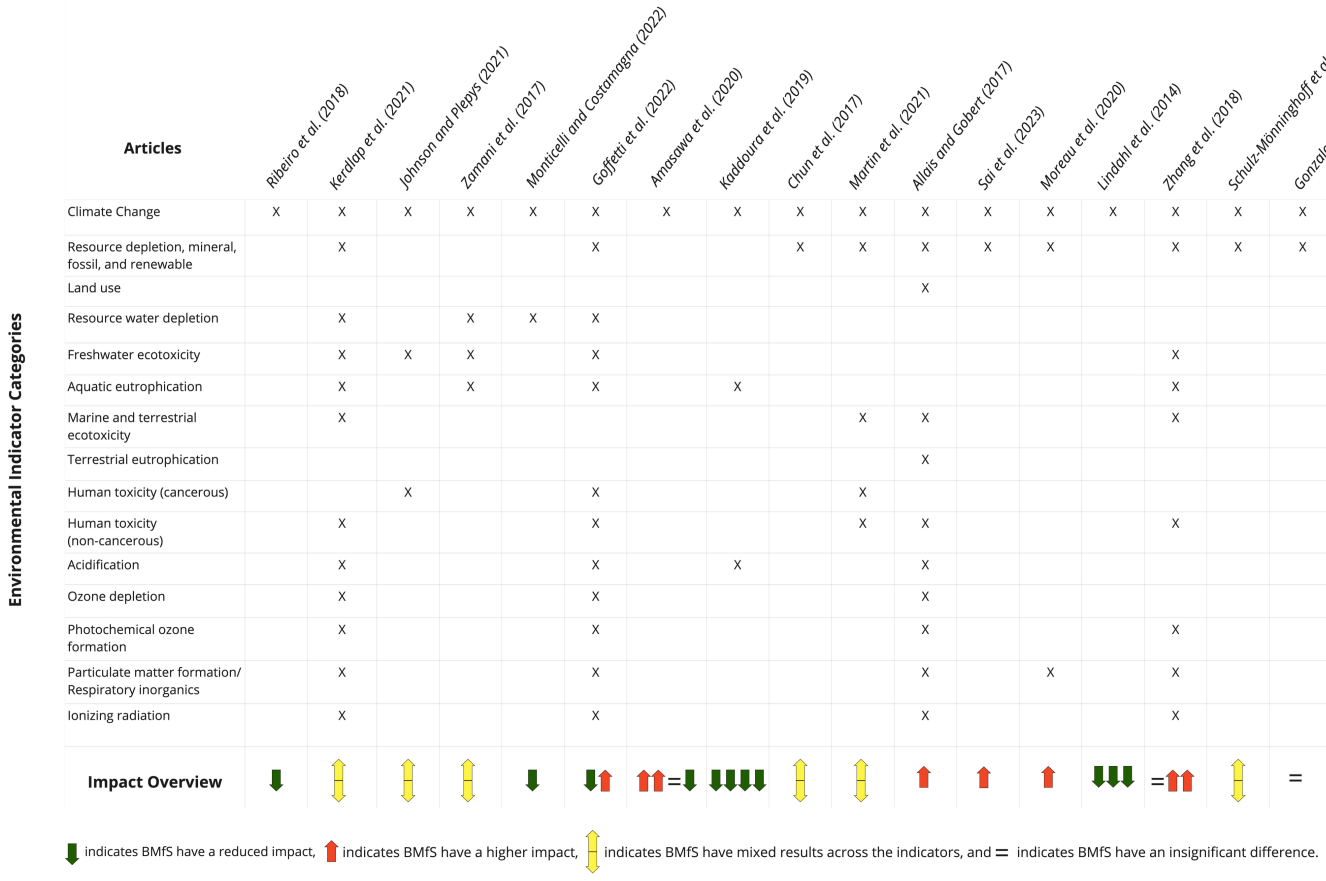

Figure 9 Overview of the environmental indicator categories used across the studies and associated overall impact (Taken from Paper IV)

4.2.2 Primary factors affecting the environmental impacts of CBMs

Through the use of life-cycle assessment, Papers III and IV affirm many of the influential factors on environmental outcomes of CBMs that have been mentioned qualitatively in literature. These factors can render a CBM to have greater or lower impacts than traditional business models, where Paper IV particularly highlights the importance of testing the sensitivity of the factors for specific company contexts. These factors relate to consumer behavior and elements of business model design and activities.

Paper IV points out that ideal CBM configurations cannot be determined, as the impacts are highly contextual. However, the research identified key factors that affect impacts the most, in which most of these factors related to access and service/performance models (through rental). Most of the identified factors involve how the business model affects customers, for example, how consumers are using products during rental periods, and how efficient the rental offering is in terms of the average proportion of products being rented at a given time. The duration of a rental period also played a role along with how companies price their rental transactions.

Paper III focused particularly on consumer use patterns and travel behavior to engage with the analyzed CBM, testing different use scenarios in how consumers use a CBM to substitute or compliment their purchasing or use needs, how they choose to transport themselves to engage with the CBM, and the number of times that customers use garments. This paper also categorized consumer types based on survey information, finding that in the self-identified consumer types of responders, there was little difference in the use intensity and the number of purchased dresses. However, the reported substitution rate of CBMs for purchasing differed with the lowest substitution rate as 47% for respondents who identified as consumers focused on buying the latest styles, and a 90% substitution rate for respondents who identified as consumers buying primarily sustainable alternatives.

4.2.2.1 Consumer behavior and engagement: substitution, usage patterns, & product rental time

Substitution of CBMs for traditional business models was evaluated in two different ways—by whether consumers substituted a certain quantity of dresses for rental, or if consumers substituted a certain number of wear occasions for rental. If consumers consider substitution by the number of dresses, then the CBM had lower impact. However, if consumers considered substitution with rental for different wear occasions, then the impact of substitution was varied for the total environmental impact. Essentially, the effect of increased substitution differed depending on how

consumers perceive what they are substituting, indicating that this perception, and how substitution is applied, affects the overall impact potential of CBMs (Paper III).

Paper IV highlights the importance of understanding various types of customers and use patterns in interactions with the business model. For example, access models could invite increased usage for non-traditional users, such as in the case of rental professional cameras, creating more overall impact. This highlights the importance of evaluating the scope of assessment, as while rental could lower the impacts of certain types of customers, the overall impact could increase if accounting holistically from a business model perspective for different types of customers (Sai et al., 2023).

For energy-consuming products, the use phase is particularly important where companies can, for example, create design features along with clear communication of ideal behaviors to perform when using the products, such as in the case of water purifiers (Chun & Lee, 2017). In cases of car or ride-sharing, the number of passengers in the car as well as the efficiency of the route renders such CBMs to have either a higher or lower impact than traditional sales (Amasawa et al., 2020). For non-energy consuming goods, CBMs can have a lower impact than traditional sales through increased product use.

How a CBM is structured, for example, in rental or lease periods could alter the overall impact. For example, Paper IV summarizes that companies with access models can offer longer leasing periods to customers to reduce travel frequency, as more customers accessing a product can increase the impact. Rental of fewer items over a longer period can reduce the travel impact.

4.2.2.2 Product life and end-of-life

As shown in Paper IV, it is unsurprising that the length of product life and its end-of-life opportunities have implications on the impact of a CBM. Generally, products with high production impacts should be made to have a longer service life (Kaddoura et al., 2019; Lindahl et al., 2014) however, this requires (e.g. for energy-consuming products) to maintain their efficiency during the long-life to have overall reduced environmental impacts, depending on how energy intensive the use phase is. There is also a mixed discussion of product lifespan in terms of longevity, compared to its service life. For example, Gonzalez-Salazar et al. (2023) found that leasing reduces the need to replace EV batteries (based on the lifetime mileage expectancy (in km) of the batteries), yet contradicts this by also stating that leasing does not extend the lifespan of the batteries—which perhaps can be interpreted to the time in years of battery life. This illustrates the question of how product life is discussed in terms of actual functionality, or the time perspective. Such perceptions are also important for example with consumer goods like clothing, where the lifetime can be long in terms of years, but its actual use in providing a function to clothe someone may be much shorter due to changes in trends, for example.

How products are treated post-consumer is also important for the implications of access or service/performance models as traditional sales can have a lower impact if products are simply passed on after use, such as in the case of prams (Kerdlap et al., 2021). Specific R-strategies may also be more impactful than others post-use, such as in the case of lithium batteries where repurposing was found to have lower impacts than remanufacturing and recycling (Schulz-Mönninghoff et al., 2021).

4.2.2.3 Pricing

While not yet explored in depth in conjunction with LCA, a few studies evaluated in Paper IV show that pricing for access models can affect the impact based on how it influences both consumer behavior, as well as the need to facilitate or increase the number of rental transactions for a company to reach its revenue needs. There were no consistent implications for how pricing affects impact, as one study on clothing found that higher rental prices reduced impacts as it required fewer transactions (Goffetti et al., 2022). Another study for digital cameras stated moderate pricing was important to encourage customers who frequently used cameras to only use rental and engage in longer rental periods— indicating that higher pricing of rentals would encourage these types of users to both engage in rental along with using their own cameras which would increase overall impact (Sai et al., 2023). In another study on industrial equipment, low prices for maintenance were recommended to reduce the environmental impacts (Zhang et al., 2018).

4.2.2.4 Infrastructure

The infrastructure needed to facilitate product use in access or service/performance model has importance for the impact as discussed in Paper IV. For example, in the case of tool rental, steel lockers were used to facilitate rental, where the lifetime of the lockers themselves as infrastructure to support rental was calculated as important for impact (Martin et al., 2021), indicating that companies should consider the need to create additional infrastructure has to be built to facilitate access and service/performance models due to its additional impact. Conversely, additional rental infrastructure, such as several rental locations or delivery points could decrease environmental impact if it reduces transport needs for servicing and customers (Allais & Gobert, 2017; Moreau et al., 2020; Sai et al., 2023), implying that offering more customer touch-points based on already existing infrastructure could be effective to reduce the impact of access and service/performance models.

4.2.2.5 Transport

The mode of transport taken made a significant difference in the impact, particularly as CBMs such as access and service/performance models require increased transport to facilitate the pick-up and return of rental. Paper III found that consumers who chose to drive rather than utilize public transport negated the potential for a lower impact from CBMs, and overall had a higher impact than traditional business

models. Consumers that utilize public transport or low-carbon transport such as biking or walking to facilitate rental could render CBMs an ideal option in some cases. This difference is shown in Figure 10.

Transport distance and mode of travel were also found to be a significant factor in Paper IV. This is in part dependent on consumer decisions and behavior (such as choosing to combine a trip to a rental store with other errands in the area or taking singular trips to participate in rental as discussed in Paper III), but is also influenced heavily by company decisions. As mentioned earlier, companies can offer longer rental periods to reduce customer travel. Companies can also rely on postal logistics and low-emission vehicles for rental deliveries. If offering delivery, vehicle loads should be maximized for transport efficiency.

To reduce distance between customers and stores, companies can choose to be in downtown regions, or enable customers to take public transport by choosing their physical locations near public transport hubs or high public transport access.

Besides the potential for increased impact from customer logistics, service and operations transport played an important role in the impacts of CBMs as well. The need for additional transport could be from the need to repair, clean, or maintain products that may be in other locations besides the main place of rental. Here, the extension of rental periods was again emphasized to encourage fewer transactions needed for each access provided to customers.

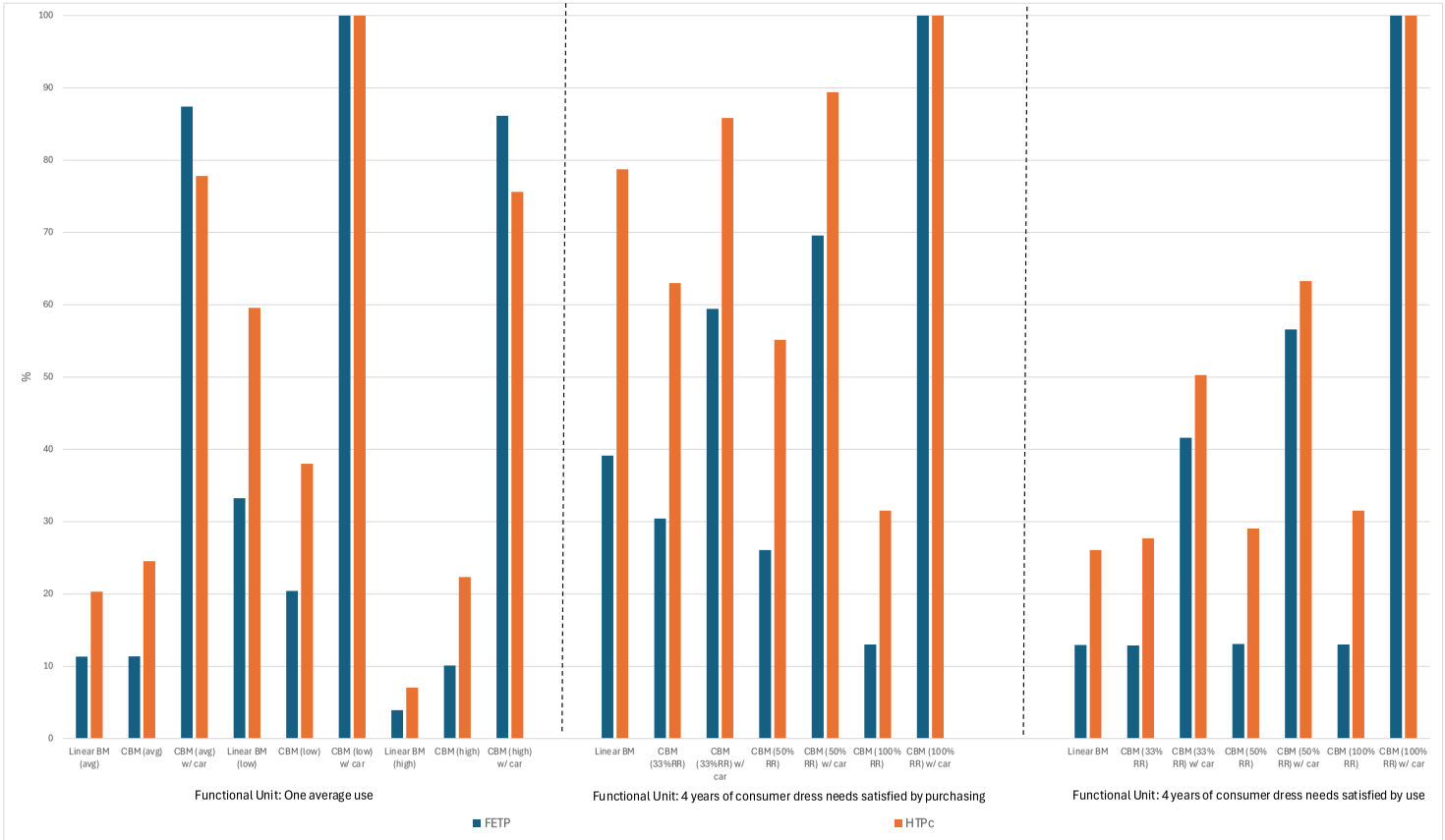

Figure 10 Characterisation results by the percentage of the impact of CBM vs linear BM scenarios including testing of alternative transport scenarios by car for FETP (freshwater ecotoxicity) and HTPc (human carcinogenic toxicity) across the three different functional units. % RR refers to the replacement rate or assumed substitution of CBM engagement over sales. The highest scores are set to 100% and other values are set as a relative percent to allow comparison between the impact categories. Data summarized from findings in Paper III.

4.3 Reimagining CBMs for greater sustainability potential

Mainstream discussions on CBMs, including Papers I-III, largely align with the dominant technocentric and reformist narratives of the CE without critically examining them. The idea of the "CE business case", which assumes that innovative governance can cocreate a restorative and regenerate ecosystem along with "intensive economic growth" (Schultz et al., 2025, p. 11) is often treated as a fact rather than an assumption. This type of dream of a win-win solution of achieving sustainability goals along with economic growth is rather, as Greta Thunberg puts it– just "fairy tales of eternal economic growth" (Thunberg, 2019).

This dissertation finds that the implementation of CBMs is highly challenging and demanding on organizations, and not always promising from an economic or environmental perspective. It also does not discuss the social perspective, as this is not an inherent aspect of CBMs and is another one of its limitations. Through this dissertation and from the findings of Papers I-IV, it becomes evident that CBMs require changes not only in how they are implemented and realized to support sustainable transformation, but also in broader institutional, structural, and cognitive aspects to enable such changes. This perspective orients this dissertation and my overall perspective on the CE within the transformation discourse—where there is a need for the reconfiguration of the socio-political system, general economic downscaling, local production, cooperative and collaborative economic structures (Calisto Friant et al., 2020).

What does this mean for CBMs to better align with sustainability ambitions? First, CBMs should continue to be evaluated for their environmental impacts— as well as include evaluation of social impacts. Paper IV indicated that there are still scant evaluations of the environmental impacts of CBMs. More evaluations may indicate broader patterns of what circular strategies and CBMs can reduce the impact in certain industries, products, or geographical contexts. This can create a greater understanding of the implications of particular CBMs for certain contexts. Based on Papers III and IV, it appears that long-life CBMs and maintenance practices offer the most potential for B2C cases. For B2Bs and B2B2Cs, service/performance models appear to have sustainability potential, but need to be further tested based on the industry and products. Companies intending to implement CBMs should conduct LCA evaluations prior to implementation to ensure that potential CBMs are designed for the lowest impact based on the particular context.

Second, CBMs that are found to have lower impacts than business-as-usual should fully displace unsustainable business models; not exist as a pilot or in addition to other business models. Sustainable CBMs need to cannibalize and/or scale to

displace unsustainable businesses. Third, CBMs should be operationalized through greater collaboration with customers and competitors, as found in Paper II. Due to the need for changing infrastructure and logistics as well as a collective mindset, collaboration with mutual interest and goals for sustainability is important to support the sharing of resources as well as for establishing greater overall visibility legitimization. Lastly, CBMs should question overall production quantities and potential rebound effects from efficiency strategies. CBMs should therefore integrate sufficiency principles and strategies, which are detailed in the next section.

4.3.1 The implications of sufficiency strategies for the sustainability of CBMs

As Papers III and IV found that the environmental impact of many types of CBMs proved to be inconsistent in their impacts, Paper V offers perspectives on sufficiency principles and how they can be applied to overcome some of the limitations of CBMs.

As research on sufficiency strategies for business is nascent, Paper V developed an integrated conceptualization of sufficiency-oriented business and explored this through empirical cases of companies. Three of the companies also had CBMs–an outdoor goods company, a jeans company, and a furniture company. In developing the framework for sufficiency-oriented businesses, Paper V showed that such businesses often used CBMs like long-life models, as well as access and service/performance models. While CBMs focus on minimizing waste and improving the quality of production (efficiency and consistency strategies), sufficiency strategies help CBMs to reduce the overall quantity or volumes of production. Although CBMs may intend to do this (for example, a service/performance model theoretically can enable fewer products to be produced)— these models often do not question production quantities, and often exist alongside traditional business models. Sufficiency principles and strategies question the overall need to produce and therefore complement circularity's focus on resource efficiency. Sufficiency principles are detailed in Paper V through a triple-layered framework that includes a strategic and operative dimension, a normative and organizational dimension, and a societal dimension. These dimensions are discussed in relation to their application and utility for CBMs to improve their sustainability potential in the following sections.

4.3.1.1 Strategic and operative sufficiency strategies

While previous research has discussed sufficiency in conjunction with CBMs, these perspectives have focused primarily on externally-oriented strategies—or strategies targeted purely to consumers (see e.g. Bocken et al., 2016; Bocken & Short, 2016; Niessen & Bocken, 2021). Paper V differentiates and explores between externally and internally-oriented sufficiency strategies, emphasizing that both are essential

for achieving absolute reductions in resource use. Internally-oriented sufficiency strategies focus on production and call for limited production or limited product ranges along with other types of production methods such as made-to-order or personalized production. These production strategies can be combined with CBMs as well as R-strategies. For example, the outdoor goods company and jeans company examined in Paper V limit the number of products they make on a weekly or yearly basis, as well as offer free or fair-priced repairs to support the longevity of their products. Externally-oriented sufficiency strategies focus on educating and nudging consumers to reduce consumption, where companies may send messaging like "buy less, buy better" such as the jeans company. Companies may also limit their marketing and discourage discounts and sales. For example, for several years on Black Friday, the jeans company has completely shut down their website and the ability for consumers to buy their products on this day.

While the environmental impacts of sufficiency strategies, whether implemented alone or alongside CBMs, have not been explored—the inclusion of sufficiency approaches in CBMs may offer increased environmental potential than CBMs alone as it requires a broader change for customers to think about their needs and for companies to think specifically on producing for needs. For example, the furniture company in Paper V sees the implementation of a service/performance model to have great potential to help reduce their absolute emissions (without carbon offsets) as they plan to produce less furniture and focus on repairing and remanufacturing the furniture they have in circulation. This is particularly noteworthy given that cannibalization (where a new CBM displaces the original business model) is often portrayed as a risk in CBM literature. However, from a sufficiency perspective, such transformation appears not only logical but necessary to scale more sustainable alternatives and move away from business-as-usual practices.

4.3.1.2 Consideration of normative and organizational structures

Beyond types of business models, production, sourcing and operations, and product approaches in alignment with sufficiency principles, the implications of normative and organizational structures are important to evaluate the sustainability potential of CBMs. Discussions on business models most often neglect to engage deeply in these aspects which include company ownership, governance, values, connection to profit, and size. As pointed out in Paper V, these aspects significantly influence the primary purpose or existence of the company and its values. This in turn is reflected in the strategic decisions made by companies that most often do not prioritize sustainability. For CBMs to have more profound implications towards sustainability transitions, they should exist to produce for genuine needs and address ecological and/or social concerns— ultimately prioritizing quality over quantity, avoiding profit maximization, and internalizing collaboration and shared responsibilities. CBMs can fulfill such values through organizations that have ownership and legal governance forms that allow for more democratic decision-making and stakeholder

engagement. More regionalized and smaller companies also have greater leverage to maintain control of strategy and intentional direction of the company. While CBMs should sustain the company, and should be profitable to the extent to displace less sustainable business models— profit should be used as a means rather than as an end.

Changes to these normative and organizational aspects of companies require a transformation across the collective mindset, the economy, and current systems. While CBMs alone and their strategies hold potential, they are inadequate on their own to ensure that we remain within planetary boundaries and the world's ecological carrying capacity. A sustainable transformation requires deeper engagement of the systems that business models are embedded in, as well as changes to collective norms and structures.

4.3.1.3 Connecting to society

For deeper implications for sustainability, CBMs need to consider the social dimension of sustainability in addition to the environmental dimension of CBMs. Integrating sufficiency perspectives also supports CBM development in this dimension, as principles of sufficiency entail a fair consumption space—where peoples' basic needs are met with decent living standards while avoiding excess consumption (Bärnthaler & Gough, 2023; UNEP, 2022). This requires companies to consider their relationships to society— or its community, employees, customers, and the environment. These relationships can be affected and shaped by organizational and operational decisions as discussed earlier, as well as influence on these dimensions.

To successfully implement CBMs for sustainability, companies need to strengthen communication and engagement with consumers to raise awareness for consumption patterns, as well as to provide education on proper product use and care. Beyond this, firms can foster a sense of community among consumers by facilitating the exchange of use cases, tips, and best practices related to specific products or services. While offering high-quality products remains important, companies with CBMs should avoid traditional marketing tactics such as aggressive sales and discounts. Instead, they can focus on promoting and providing guidance on repair, maintenance, and even DIY approaches to extend product lifespans. Building deeper consumer relationships through education and awareness is critical for addressing consumption-related issues. However, it remains unclear to what extent companies can remain viable without relying on continuous growth— highlighting the need again for organizational structures that can support companies to operate without continuously increasing profits.

Building on this, fostering strong employee relationships and prioritizing well-being are equally important for advancing sustainability within companies. Fostering strong employee relationships and promoting well-being are essential aspects of

sustainability within companies. The integration of sufficiency perspectives into companies calls for strategies that enable employees to achieve a work-life balance, for example, through flexible working hours. In addition, companies can and should cultivate shared sustainability values and encourage sufficiency practices within the workplace, such as minimizing work-related travel. Measures like capping top salaries or reducing wage disparities can further contribute to a more equitable and sustainable organizational culture.

Beyond building more meaningful relationships with customers and employees, companies must also embed themselves within broader communities—this means in the physical area that the company operates in and impacts as well as the intangible space where shared interests and values are cultivated. Such embeddedness can enhance collaboration and resource sharing for CBMs, both within local communities and across the wider business ecosystem. By aligning their core purpose with the needs of the local economy, companies can foster greater autonomy and contribute to the long-term capacity and resilience of the communities they are part of. This community-oriented approach can ground CBMs within more sustainable and socially rooted business practices.

5 Reflections

In this section, I reflect on my findings, limitations, and areas for future research through a broader discussion on language and terminology, innovation, implementation, and impacts of CBMs.

5.1 The role of language & terminology in how we perceive CBMs

Language and terminology are important to reflect upon in the context of this dissertation, as well as in their implications for sustainable production and consumption. This section reflects on the use of key concepts and terminology across the papers and dissertation, emphasizing the intentionality behind their application for both practical and strategic purposes.

In Paper I, I deliberately used the term *circular-oriented innovation* (*COI),* as I considered *circular business model innovation* (*CBMI*) to be somewhat misleading. The companies examined in this article were primarily implementing incremental, often low-hanging fruit strategies rather than fundamentally restructuring their business models around circularity. I therefore considered *COI* to more accurately capture the nature of the activities taking place. In contrast, in Paper II, I chose to use the term *CBMI.* This decision was informed by discussions with my co-author, through which we agreed to align more closely with the mainstream terminology used in the literature on circularity and business models. In examining other research on CBMI, I observed that it was often applied in similar ways as to how I had conceptualized COI in Paper I. For this reason, I decided to use CBMI in Paper II as I saw it beneficial to situate our research within this academic conversation. In retrospect, it would have been strategic to use CBMI rather than COI in Paper I as well, particularly to enhance coherence across the dissertation and to better align with the dominant discourse in the field. The shift in terminology use indicates my reflection process as it evolved throughout the dissertation on the nuances of circularity and the practical realities of empirical research.

Another nuance in terminology I find important to highlight in the context of this dissertation is the conceptual background and differences between PSS and CBMs. Although PSS and circularity have different origins, they have increasingly

converged in the context of CBMI (Tukker, 2015). As noted in Section 2.2.3, this dissertation deliberately utilizes PSS-derived archetypes (access and service/performance models) under the umbrella of CBMs. This decision reflects both their frequent positioning in academic and practical discussions as enablers of circular strategies, and their relevance to the empirical cases examined. While PSS and CBMs are not synonymous, as I differentiate in Paper IV, this framing was considered both appropriate and analytically useful for the purposes of this dissertation.

In Paper IV, I used the term *sustainable business model* in the early stages of writing. This choice was initially guided by its prevalence in the literature and its accessibility in terms of language and comprehension. However, upon further reflection, I revised the terminology to *business models for sustainability*, as I considered the former term to be conceptually misleading. The companies studied did not reflect sustainability at its core, rather they were businesses working to reduce their impact or operate in more sustainable ways. I therefore found *business models for sustainability* to be a more accurate and nuanced description of their efforts.

In Paper V, I explore sufficiency-oriented businesses. In this article, three of the companies employ CBMs that I described in my dissertation as long-life, service/performance, and resale which I have used to discuss my findings. While some research has conceptualized sufficiency businesses as an archetype of CBMs (Bocken et al., 2016; Bocken & Short, 2020; Pieroni et al., 2020), I do not hold this perspective as the conceptual efficiency-focused foundations of circularity clash with the principles of sufficiency. I have therefore chosen not to categorize sufficiency under a CBM archetype. However, as described in my findings, CBMs can help to facilitate sufficiency in business—although not in isolation. In Paper V, I also consciously use the word sufficiency for several reasons. While I position it to overlap to a large degree with the goals and principles of degrowth and postgrowth ideologies (and this is evident in the framework itself), I perceive sufficiency to have a more positive and digestible/palatable connotation than its counterparts. In consciously using this term over its counterparts, I see the potential for the concept to be normalized and understood better by enticing others to listen and engage with the concept before dismissing it based on its initial sound.

As I reflect on my research, I am not certain that I would revise the way I used language or framed the articles, as the terminological choices felt appropriate in their respective contexts and I continue to stand by the judgments I made. However, if I were to use a more conservative lens or critical lens, I would perhaps not utilize *sustainable* or *circular* in front of *business models* at all and instead focus on naming specific values or strategies in use. The use of terminology could be explored in future research— not only in terms of analyzing the discourse around the way that concepts are used (for example, if *sustainable business models* should be referred to as *business models*, and others labeled as *unsustainable business models*), but

also regarding how such terminology may influence policy, public discourse, and everyday individual consumer choices.

5.2 Reflections on innovation for sustainability

In this dissertation, I refer to innovation through CBMI— where innovation is part of the process of CBM implementation. However, to connect my research to other streams of literature, I discuss innovation beyond a business model perspective in this section and highlight the utility of collaborative perspectives as well as limitations and areas for future research.

My research has primarily focused on elements that comprise and surround CBMs, where the concept of a business model is central to analysis. The concept of business models is useful both in research and practice as it is easy to delineate elements that create, capture, and deliver value. However, I recognize that business model perspectives can be rather limited. Some perspectives of business models perceive them as rather undynamic, where they are unable to reflect real-world systems and complex processes (De Angelis, 2022). In relation to the contribution of business models to circularity, a firm-focused logic has also been met with skepticism as "collective and collaborative action" is needed to address the broad challenges of sustainable innovation (Fehrer & Wieland, 2021). I address some of the limitations of a business model-centric focus through the analysis of collaborative processes surrounding CBMI, as shown in Papers I and II. This dissertation affirms the inherently collaborative nature of CBMI in needing to move beyond a company's organizational boundaries to operationalize circular strategies, as found by Antikainen & Valkokari, 2016; Konietzko et al., 2020; Santa-Maria et al., 2021b.

However, the role of collaboration is not just found in CBM literature, but has been continuously highlighted as a key strategic process to develop organizational capabilities from more traditional strategic management perspectives such as the resource-based view (Barney et al., 2001; Barringer & Harrison, 2000; Teece, 2017) as well as in open innovation perspectives (Chesbrough, 2003). While I draw upon the resource-based view perspective in Paper I and briefly mention the connection of CBMI with open innovation, I would like to further discuss the concept of open innovation and use it to reflect on my findings on collaboration for CBMI. As this concept has begun to be increasingly utilized in the context of circular business model innovation (see e.g. Bocken & Ritala, 2022; Calabrese et al., 2024; Perotti et al., 2024) there is potential to further draw upon this area to inform and advance knowledge on innovation processes with sustainability intentions.

Open innovation encompasses the idea that internal knowledge, processes, and capabilities can be limited and that innovation and opportunities can be improved through sharing knowledge across organizational boundaries (Chesbrough &

Bogers, 2014). It acknowledges the need to consider both the *process* itself of transparency and openness, along with *content* that includes resource and knowledge sharing between organizations (Chesbrough, 2024). My research reflects this, in its exploration of collaboration dynamics between partners, as well as collaborative processes inherent in organizational microfoundations that support the development of operational and organizational capabilities. In doing so, it contributes to the literature on capability development and CBMI by nuancing the role and nature of external collaboration.

While previous studies have recognized the importance of collaboration for innovation (Brown et al., 2019; Hina et al., 2022; Hofmann, 2019; Konietzko et al., 2020), they often understate how 'outside-in' collaboration actively shapes firms' capabilities and redefines conventional value chain relationships. My findings highlight that collaboration can not only address capability gaps—either temporarily or longer term—but also create greater agency and momentum in changing the narrative, norms, and structures to facilitate CBMI. Moreover, I show that CBMs require new forms of collaboration across the value chain, including vertical and horizontal partnerships, but also extending to consumers and, in some cases, competitors. These emerging relationships often blur established boundaries between firms and stakeholders, as seen in Paper I, where the resale company referred to its customers as partners. In Paper II, the construction equipment manufacturer described how former dealers became competitors in offering equipment-as-a-service contracts, while also engaging directly with their customers' customers. Such examples reveal that collaboration in CBM contexts is not merely about establishing new partnerships, but about transforming how companies perceive and categorize actors in their value networks. This reconfiguration challenges traditional roles and invites a reconceptualization of collaborative dynamics for sustainable innovation.

While broader perspectives of CBMI are needed to understand the dynamic processes in and around companies, it is still useful to study the business model as a central unit of analysis (Chesbrough, 2019a). Although I mention some elements of open innovation for CBMI, I see the potential to engage further with the concept to support understanding of the viability and potential for deeper market transformation from CBMs. For example, in Paper I, it would have been interesting to dive deeper into the interdependencies of the resale model and its partners. The resale model, after 13 years of operation, just declared bankruptcy at the time of writing this dissertation in March 2025 (Borowska, 2025)—four years after I conducted the study. News on the bankruptcy stated that one of the main reasons was due to its largest customer, the insurance company, pulling its contracts with the resale company. This insurance company was one of the relationships I examined in Paper I, where the resale company had created a long-term partnership including a dedicated internal unit allocated to dealing with a part of the insurance company's claims on phones. While the ending of this relationship was not the only

reason for the resale company filing for bankruptcy as indicated in the news article– – the resale company was not viable with its current business model. My research, as well as research on open innovation, has heavily emphasized the importance and utility of collaboration. But cases such as this lead to questions on the risks of open innovation and interdependencies of collaboration for CBMs, or for circularity strategies in general. If companies build their business model revenues primarily on the reliance of waste streams that they do not have control over, this creates high risk and instability for companies or requires more waste to be produced that potentially creates higher impacts. This differs from industrial symbiosis challenges where dependencies primarily involve byproducts, as opposed to CBM cases where business models may be primarily built around the value of waste streams.

Exploring the interdependencies arising from circular resource flows between collaborating firms, alongside an analysis of CBM failure cases in relation to open innovation perspectives would be an interesting area for future research. What can be learned from the failures? When are open innovation and collaboration beneficial and necessary for scaling circular and sustainable solutions? How can it be applied to avoid tensions, dependencies, and potential failures? While I still advocate for the need for collaboration for CE as a more holistic approach across academia, industry, and local and national governments, I see the need for an increased understanding of effective and stable collaboration for all involved actors. Drawing upon circular ecosystem perspectives and literature could also be a useful lens to explore these questions (see e.g. Kanda et al., 2021; Moggi & Dameri, 2021) as well as answer broader questions of how collaborative interactions can facilitate sustainability transitions (see e.g. Kanda, 2024).

Building on the discussion of the role of open innovation in CBMI and the identified need for further research on collaboration, I would like to broaden the discussion on the role of innovation towards its sustainability transitions. In my research, I focus on the connection of CBMs to sustainability transitions in a limited sense connected purely to the environmental impacts through environmental impact categories under LCA (e.g. human health, ecosystem health, resource use). To a small extent, I discuss some cultural aspects regarding consumer behavior, as well as the connection of business to society when applying sufficiency perspectives. I do not address the broader implications of sustainability from a socio-technological system perspective as I focus centrally on companies to increase understanding and impact linked to specific contexts. As business model innovation, particularly that of incumbent companies, has potential to reproduce, legitimize, and scale new radical sustainable innovation such as CBMs (Magnusson & Werner, 2022; Stucki et al., 2023; Turnheim & Sovacool, 2020), I see the potential for future research to utilize socio-technical systems theory and apply a systems perspective to examine how CBMs interact with co-evolving elements such as technologies, user practices, institutions, and ecosystems (Foxon, 2011; Hannon et al., 2013), and how these dynamics influence CBMI create new norms in production and consumption and

contribute to sustainability transitions. Evaluation of these other elements and their role in innovation links to understanding elements surrounding the implementation of CBMs, as discussed in the following section.

5.3 Reflections on implementation as a practice

Through this dissertation, I have referred to the implementation of CBMs synonymously with CBMI. This means that implementation has been described primarily as a process. In this section, I discuss implementation as a practice to connect and explore future areas of research.

My research has concentrated primarily on organizational and operational perspectives on how CBMs are implemented by examining the capabilities needed for CBMI, as well as highlighting important elements of collaboration. While organizational perspectives include, to an extent, cultural elements within an organization— I see a particular need to further explore cultural aspects of CBM implementation from an individual perspective involving a cognitive, emotional, and behavioral lens. This is important not only from the perspective of employees within organizations, but also from the perspective of consumers, as both groups play a role in shaping the cultural conditions that enable or hinder CBM implementation. While I do explore consumer behavior to some extent in order to inform the LCA in Paper III, a detailed exploration of consumer behavior was beyond the scope of the research.

As my research progressed, and through engagement with diverse empirical and theoretical perspectives, I increasingly recognized the relevance of cognitive processes in sustainability research as well as change and transformation in general. I was inspired by the company in Paper II discussing the importance of mindset shift, as well as having reflections of such in my own work and life, and also became interested in social practice theory. Social practice theory analyzes practices as units of analysis where practices consist of materials, competences, and meanings (Shove et al., 2012). In thinking of this theory in relation to CBMs, I thought that strategies of circularity such as narrowing, slowing, and closing resource loops and what they entail (e.g. rental and repair) can be perceived as practices needed to implement CBMs. Strategy in organizational studies has also thought similarly in terms of strategy as a practice, for example, how strategy is constructed through what different actors do (Jarzabkowski, 2004). For these practices to occur, they are comprised of various *materials*, *competences,* and *meanings*. These elements need to interact to facilitate the practices for CBMI. In my research on the implementation of CBMs, I have discussed the *material* and *competence* elements. For example, I have identified physical capabilities needed to facilitate CBMI. I have also acknowledged the material aspects through utilizing LCA to understand the

resources needed, and inputs and outputs in each stage of a product and service lifestyle. My research has also looked at competences—through what capabilities are needed to implement CBMs from an operational and organizational perspective. While I discuss in the literature background the discourses of circularity and the different meanings it is perceived to have for circularity, I have not explored *meaning* in terms of what CBMs mean to companies and to consumers.

I see potential for future research on CBMs to draw upon social practice theory to explore how firms can support and institutionalize emerging consumer practices necessary for the success of CBMs for sustainability by focusing particularly on the element of meaning and how it interacts with materials and competences. Rather than viewing consumer behavior as an individual decision-making process, social practice theory can shift attention to configurations of materials, competences, and meanings that are co-developed by consumers and companies. This could shift focus away from firms' narrow efforts to influence consumer choices toward how they help shape the conditions that enable practices such as repair and reuse to become a norm rather than inconvenient alternatives.

The element of *meaning* is not only relevant for consumers, but also for companies and individual employees who play an active role in fostering, scaling, and legitimizing circular practices. The meanings associated with circularity may shape how companies position their offerings, how employees work in organizational change and transformation processes, and how internal strategies align with broader sustainability goals. Nesterova (2024) reflects that circularity requires a fundamental shift in mindset, requiring a different way of relating to nature, others, and everyday material engagement. As this dissertation also found that facilitating a mindset shift is a key strategic capability in CBMI transformation processes, this suggests the importance of companies placing equal or greater focus on the normative and cultural dimensions of circularity to support the mainstreaming of circular implementation practices. Beyond technical innovation, companies therefore need to work with innovating their organizational culture and communication. The need to engage with such practices is also reflected in Paper V, as it states the need to look beyond strategic operative activities to include reflection on normative and organizational structures as well as the company's relationships with society.

In needing to change the way that we produce and consume in society for a sustainable transformation, we need to address the cognitive aspects that shape our ways of being and thinking in relation to daily life as well as our impact on society and our planet. This is not just in fields surrounding sustainability problems, but also in innovation. For example, discussions on failures in open innovation cases indicate that implementation is more than just procedures that are shared but also have to do with organizational culture, mindset, and leadership (Chesbrough, 2019b, 2024). To advance circularity, firms must therefore consider how their internal

practices, culture, and communication strategies can contribute to the broader social embedding of circular norms.

Exploring more of the inner being and cognitive aspects may be useful when targeted to practices regarding circularity and production (for companies) as well as consumption (for consumers). As products are not produced and consumed in a vacuum (not physically nor socially) (Lorek & Spangenberg, 2014), they are part of socio-technical systems and regimes as mentioned in the previous section—indicating that change is needed beyond technical efficiencies and innovative business models, but also in consumption patterns and practices and ways of doing and being. While there is a body of work addressing, for example, the role of mindfulness in sustainability and climate change (Wamsler et al., 2018, 2021), there is potential for future research at the intersection of cognitive studies and practice theory. There are opportunities to explore cognitive and behavioral factors, as well as the broader practices that are constructed in society through materials, competences, and meanings. Integrating cognitive perspectives with practice theory could provide valuable insights into how cognitive skills like mindfulness and empathy interact with everyday practices (e.g. for consumers and employees) to support circular sustainability transformations. Future research could also investigate what meaning is associated with CBMs beyond purely economic motivations for companies and employees themselves, and how different reflections of meanings influence the success as well as the sustainability of the implemented CBMs.

5.4 Reflections on impacts

In this section, I reflect on the understanding of impacts as utilized in this dissertation, and the limitations as well as future research potential for impact assessment of CBMs.

5.4.1 Methodological reflections

LCA is useful as a systematic method for understanding the environmental impacts of particular product and service design decisions across a comprehensive range of indicators. Its range of indicators as well as consideration for the full product life-cycle has made it a widely utilized method, and it has been found to be more suitable for the evaluation of CE factors than other methods (Elia et al., 2017). However, it is subjective to assumptions made in data selection and modeling that are not always transparent. For example, during my analysis of LCA studies (Paper IV), I found ambiguous or unclarified system boundaries and comparisons that were not often justified. While subjectivity is impossible to avoid in this method, increased

transparency and disclosure of assumptions and subjective decisions should be clearly stated. This is particularly important if LCA results are perceived as objective quantitative assessments. While modeling decisions related to material choices may be more straightforward and easier to justify, the inclusion of assumptions based on consumer use patterns, particularly within CBMs, introduces a high degree of complexity and subjectivity due to the wide range of behavioral assumptions and interaction effects involved. For example, in Paper III, the testing of different functional units and scenarios to analyze the CBMs demonstrated how researcher subjectivity (specifically my own assumptions in regard to product use patterns) can significantly influence the LCA results and potential of CBM impacts. While I advocate for increased use of LCA for the assessment of sensitive factors surrounding product and business model decisions, I see this method as limited as its results require high nuance or expert analysis to understand the outcomes and translate them to strategic decisions.

With the time and data needed to conduct rigorous LCAs, I have also reflected on whether such results for the assessment of business models indicate novelty from what was assumed in qualitative research. The results of influential factors that most affect the environmental impacts of CBMs from the LCA studies (Paper IV) quantitatively affirm factors such as product-life extension and product use to be significant for the environmental potential. The LCA studies, however, also show inconsistencies in regard to what patterns regarding product use consistently show lower impacts for CBMs compared to traditional business models across different categories— indicating the importance that such generalized factors such as product-life extension may not be environmentally beneficial in all product categories nor contexts. The research also finds other interesting factors such as pricing and product rental duration to be influential amongst other factors, although no overall patterns were found. However, these findings could be strengthened with the availability of increased empirical evidence and LCA studies to enable clear identification and linkages of impact patterns of CBMs. While this was the original intention, there was too much nuance and not a significant number of evaluation cases to provide this. The research therefore highlights the influence of the identified significant factors, as well as methodological choices and subjectivity. I see more assessment cases are needed, with specific scoping, guidelines, and standardization to allow for genuine comparison.

5.4.2 Scope of impacts

Sustainability impacts can be defined rather broadly, and in this dissertation, I refer to them most specifically as environmental impacts. In this section, I would like to discuss some of the limitations and reflect on a broader understanding of the impacts for sustainability. I do so by first discussing rebound effects and business model

factors. This is followed by a discussion of absolute sustainability assessments and the limitations of methods for social sustainability.

LCA does not inherently account for rebound effects. Although it can be modeled and assumed, consideration and modeling for rebound effects are subjective. Rebound effects of CBMs are key to understanding sustainability outcomes as discussed earlier, since the efficiency focus of CBMs creates rebounds in terms of companies investing or engaging in business as usual or other more impactful activities (Metic & Pigosso, 2022). The rebound effects of CBMs in particular are not fully understood, and there are few studies evaluating the consequences of a particular company's CBM on consumer behavior as well as on company behavior. While discussed to an extent in Papers III and IV, I think these areas are highly key to examine deeper to really understand the impacts of CBMs. Without deeper reflection of rebound effects, impacts reflect a rather undynamic picture of their potential. Future research is still needed to increase understanding surrounding real consumer behavior and practices linked to engagement in CBMs, and account for potential rebound effects. This is useful not only to influence more sustainable behaviors, but also in the assessment modeling and increased understanding of the environmental impacts of such behaviors in relation to CBM product and service use.

Beyond understanding consumer behavior through rebound effects, there is a lack of clarity on how particular business model factors influence environmental impact. As identified in Paper IV, factors such as product inventory size and availability as well as profitability and pricing strategies could potentially play a role in whether CBMs displace or substitute traditional consumption. Specific factors could be analyzed and modeled in future research, although it would require an adaption to the LCA method or employment of other methods such as economic input-output life-cycle assessment (EIO-LCA) for a macro-perspective. In maintaining a company focus, a new method called business model-LCA or BM-LCA has the potential to improve some of LCA's current limitations in regard to assessing CBMs. BM-LCA aims to connect environmental impacts with economic performance where the physical inputs and outputs are connected to monetary flows (Böckin et al., 2022). The application and expansion of this method to more empirical cases would be interesting for future research.

In my research, I evaluate the environmental impacts of CBMs in relation to traditional business models. The comparative aspect of the LCA method and understanding impacts is important as it allows the findings to be contextualized to understand what business model is better in terms of particular environmental categories, as well as what factors can most affect the impact. However, this comparison, or relative sustainability assessment, does not consider planetary boundaries or Earth system limits. While it is useful in finding the better alternative, there is an assumption that better is good enough without understanding if the improvement is significant in terms of staying within the planetary boundaries. This

is where the importance of absolute sustainability, or sustainability within the planetary boundaries is highlighted with the method of LCA-based absolute environmental sustainability assessment (LCA-based AESA) (Bjørn et al., 2020; Hauschild et al., 2020). Rather than comparing a product or service to another, the comparison is made against a share of the environmental carrying capacity for particular impact categories. Expanding the use of LCA-based AESAs is essential for assessing whether companies' sustainability actions and strategies are effectively contributing to sustainability transformations and helping to prevent further ecological degradation. While there are still many limitations in understanding how to advance AESAs from a socially just perspective, I believe the future of assessments needs to increase this perspective.

I have discussed sustainability transitions and transformation and the role of CBMs for such throughout this dissertation. In discussions of sustainability, I have also clearly outlined that the social dimension of sustainability is important. However, my analysis in terms of assessment focuses purely on environmental impacts. Although I do discuss elements of social aspects of sustainability in discussions with sufficiency perspectives and CBMs, it is not a main part of my focus. This is one element I highlighted as a criticism of CBMs that I still do not see addressed and requires future research. While the original intention of Paper IV was to also include social assessments of CBMs, the results from the systematic literature review were few and inconsistent, and the scope was therefore narrowed to focus on environmental assessments. While social assessment methods exist such as social life cycle assessment (SLCA), it lacks considerably in terms of standardization, data quality, and availability compared to environmental LCA. It has also been criticized for its high level of subjectivity and risk of oversimplification of complex social issues. Future research is needed to firstly develop methodology related to understanding social impacts, and secondly to assess CBMs for their social impacts.

6 Conclusion

This dissertation concludes with a summary of the main findings, followed by the contributions of the research, and practical implications and recommendations.

6.1 Main findings

This dissertation sought to understand the disconnect between the sustainability potential of CBMs and their actual environmental outcomes. To address this, I explored how companies engage in CBM implementation and innovation processes (Papers I and II), followed by assessing the environmental impacts of such models compared with business-as-usual scenarios (Papers III and IV). These studies raised critical questions about the extent that CBMs can deliver meaningful reduction in environmental impacts as currently implemented. The research therefore draws in sufficiency perspectives to question the nature of CBMs and reframe them for greater sustainability potential (Paper V). As such, the research followed a trajectory from the investigation of organizational innovation processes, through environmental impact evaluation, to a conceptual critique informed by sufficiency principles.

Through five articles encompassing diverse company types and approaches, the dissertation examines how CBMI unfolds in practice—focusing on the operational strategic capabilities required, the role of collaboration, the conditions under which CBMs reduce environmental impacts, and their transformative potential when aligned with sufficiency principles. The primary aim of the research was therefore to understand how CBMI can be operationalized to contribute more effectively to sustainable production and consumption. To address this, the dissertation answers the following research questions:

RQ 1: What are the capabilities needed for the implementation of CBMs, and how does collaboration enable their development?

This dissertation contributes to advancing understanding of the capabilities needed for CBMI by analyzing how they are developed, deployed, and managed across different implementation phases and organizational contexts. While previous studies have highlighted the need to identify capabilities for CBMs, this research

offers a more granular view by tracing how operational and strategic capabilities emerge and evolve.

Operational capabilities are procured or developed through targeted collaborations that help firms overcome capability gaps in the early phases of CBMI. These capabilities range from digital tracking systems for product use, to physical capabilities like repair and recovery, and market knowledge for circular offerings. By examining specific partner and contractual arrangements, the dissertation identifies collaborative mechanisms and relationship types that facilitate the co-development of these capabilities for CBM implementation.

Building on these operational foundations, the research also examines the strategic capabilities necessary for enabling broader organizational transformation through CBMI and how they are developed through supportive structures, adaptive processes, and individual-level contributions. Despite inherent tensions between circularity and conventional business logic, the dissertation finds that strategic capabilities for CBMI align with those required for other forms of radical innovation—such as organizational ambidexterity, customer sensing, and cultural mindset shifts. Realizing these capabilities, however, requires increased digitalization, servitization, and collaboration.

Extending this focus on collaboration, the dissertation responds to calls for deeper insight into how collaborative dynamics are managed and evolve over time for CBMI. It emphasizes that transitions towards circularity unfold through complex configurations of hybrid organizational strategies, experimentation, collaboration, and capability development— where collaboration functions both as a strategy and a capability in CBMI. Collaboration was found to be vital not only for launching circular pilots, but also for building and maintaining the long-term capabilities required for operationalization. Established firms utilize external partners to alleviate the pressures of experimentation, maintain brand identity, support organizational learning, and provide critical operational support for CBMI. Internally, collaboration helped bridge functional silos to cut across organizational hierarchies and catalyze the development of new business models.

RQ 2: How do consumer behavior and business model factors affect the environmental impacts of CBMs?

This dissertation responds to the limited empirical evidence on the environmental impacts of CBMs by conducting an original LCA and synthesizing findings from existing LCA studies. While CBMs are often promoted as environmentally advantageous compared to traditional linear models, few studies have systematically assessed their actual impacts, and even fewer have tested the underlying patterns that shape these outcomes. This dissertation demonstrates that the environmental impacts of CBMs are highly context dependent, with outcomes varying significantly depending on business model configuration, consumer behavior, and methodological assumptions regarding product use. For example, one

analyzed case of a rental clothing company had lower carbon emissions than a traditional sales company, but had higher impacts in terms of human and freshwater ecotoxicity. This was attributed to shifting the burden of impacts across the life-cycle stage of the product towards increased transport impacts and decreased production impacts. This is just one example of the tradeoffs across impact categories of CBMs.

The dissertation further identifies critical business model and consumer behavior factors that significantly influence the environmental impacts of CBMs. These include factors such as customer substitution, pricing of services, and transport amongst others. By aggregating and analyzing a broader set of quantitative LCA data, the research advances current knowledge by offering a more nuanced understanding of the contextual and organizational factors that shape the environmental impacts of CBMs and that should be ideally tested and managed when implementing CBMs.

RQ 3: How can CBMs be reimagined for greater sustainability potential, and what role do sufficiency strategies play in this reconfiguration?

The dissertation contributes conceptually by reframing CBMs through the lens of sufficiency. CBMs can be reimagined for greater sustainability potential by moving beyond a primary focus on waste reduction and production efficiency towards an agenda that addresses the absolute scale of production and consumption. While CBMs are often promoted as strategies to decouple economic growth from resource use, they typically focus on optimizing existing systems rather than questioning the volume of goods produced or underlying growth-oriented logic.

CBMs must therefore integrate sufficiency-oriented strategies for more transformative sustainability outcomes. Although some CBMs, such as access and service/performance models, may appear to support sufficiency by theoretically enabling fewer products to be produced by offering alternatives to ownership—these models often do not question production volumes and usually exist alongside traditional business models. To fully realize their sustainability potential, CBMs must adopt both internally-oriented sufficiency strategies that question growth-driven production logic and externally-oriented strategies that influence consumer behavior.

While some existing research has linked CBMs to sufficiency, it has largely emphasized consumer-side approaches. This dissertation shows that a more holistic integration of sufficiency encompassing both organizational and consumer dimensions is critical. CBMs must adopt sufficiency-oriented strategies that critically assess production volumes, company scale, and growth imperatives. While CBMs can support sufficiency in consumption by offering long-life products and possibilities to repair or refurbish products, they must also consider how the organizational structure affects strategic decisions that most often encourage increasing growth and production. Furthermore, more localized and regionalized

networks for production as well as attention towards an organization's impact on community is needed. To fully align with sufficiency principles, CBMs must reflect on the organizational contexts and communities in which they are embedded, recognizing how these influence patterns of production and consumption.

To support increased sustainability potential for CBMs beyond the integration of sufficiency strategies, the dissertation also identifies the need for increased evaluations of both environmental and social impacts to identify which models and strategies deliver meaningful environmental reductions in specific contexts. The limited empirical evaluations of the impacts of CBMs constrain understanding of patterns of what circular strategies are most effective across different sectors, products, and geographical contexts. More assessments could support patterns of CBMs to understand where they can meaningfully contribute to sustainability in certain sectors.

At present, CBMs are implemented as pilots or niche luxury business models rendering them to have an insignificant influence on the market. CBMs that have lower impacts than traditional business models must be reimagined to be implemented at scale to fully displace unsustainable business models. Implementation should also be grounded in collaboration with customers, competitors, and communities, recognizing that transformative change requires shifts in norms and shared infrastructures—not just operational changes.

6.2 Contributions of the research

As interdisciplinary and transdisciplinary research, this dissertation makes several key contributions to the empirical and conceptual advancement of CBMs for sustainable production and consumption.

First, it provides rich empirical insights into the implementation of CBMs across multiple stages and timeframes, from the early initiation of CBMI to more mature and ongoing implementation efforts—capturing the dynamic and evolving nature of CBMI across different organizational and industry contexts. The research therefore moves beyond static perspectives of CBMI by contrasting innovation processes in different phases (Paper I) and providing a longitudinal perspective of how implementation unfolds and capabilities develop over time (Paper II). In doing so, the dissertation advances conceptual understanding of the enablers of CBMI by clearly distinguishing between operational and strategic capabilities, and demonstrating that these capabilities must be actively developed through collaborative relationships.

Second, the dissertation contributes conceptually by demonstrating how collaborative processes support CBMI, particularly through the development of

capabilities and the formation of value-creating partnerships. It deepens understanding of how partner dynamics facilitate value co-creation (Paper I) and how collaborative organizational microfoundations (supportive structures, adaptive processes, and individual-level contributions) support capability development for CBMI (Paper II). These insights integrate perspectives from strategic management into the CBM domain, strengthening theoretical linkages and highlighting how external collaboration and capability co-creation are central to the successful implementation of CBMs.

Third, the research provides novel empirical evidence of the environmental impacts of CBMs through both original and aggregated life-cycle assessments across different contexts. It demonstrates how user behavior and business model design shape the actual impacts of CBMs. Conceptually, the dissertation bridges LCA and CBM literature as well as methodologically contributes through the integration and consideration of factors such as consumer substitution rates for traditional business models, as well as the testing of how interpretations of product use affect such assessments (Paper III). By synthesizing LCA studies across business model types, the dissertation also conceptualizes a framework of impact leverage points that influence the environmental potential of BCMs. This framework advances existing knowledge on such factors by utilizing sensitivity factors from LCAs, and integrates contextual factors into the evaluation of CBMs (Paper IV).

Fourth, the dissertation extends the conceptualization of CBMs by integrating sufficiency perspectives. It extends previous conceptualizations with an isolated focus on consumer sufficiency strategies (externally-oriented) through the integration of sufficiency strategies towards production (internally-oriented) such as limiting production volumes and questioning business growth. This conceptual development reframes CBMs to contribute towards absolute rather than relative resource reduction (Paper V).

Specific article contributions are detailed in Table 6.

Table 6. Contributions of the research

Paper	Objectives	Paper contributions/originality	Contribution to RQs
I	Explore the drivers for collaboration for circular innovation and competences needed to operationalize circularity from a gap exploiter and three partners	- Conceptual development of competence & collaboration model to facilitate circular innovation processes through empirical observations - Dual perspectives in conjunction with comparative cases utilizing different implementation time-frames on partnerships for circular innovation - Conceptual development of resale business model/ gap exploiter model as innovation intermediary— extending beyond value capture motivations and including the role of stimulating innovation beyond company-level	RQ 1
II	Examine organizational microfoundations over time in an incumbent manufacturer to understand how they support the development of dynamic capabilities for CBMI	-Longitudinal and in-depth empirical investigation on CBMI in an incumbent manufacturer; unique perspective through original equipment manufacturer (OEM) for circularity - Conceptual development of a framework on how dynamic capabilities are enabled through microfoundations and applied in a CBMI process in conjunction with decarbonization efforts	RQ 1
III	Assess and quantify how user behavior and business model configuration influence the environmental impacts of a CBM	- One of few LCAs on CBMs; integration of LCA for CBM analysis - Conceptual and methodological development for LCA of CBMs through the integration of consumer perspectives and behavior -Testing of CBM substitution rates and comparison across three functional units and 14 consumption scenarios	RQ 2
IV	Aggregate environmental assessments of business models for sustainability to understand their impact, potential impact patterns, and influential consumer and business model factors that influence the environmental potential from an LCA perspective	- Streamlined impact summary of the environmental impacts of CBMs based on synthesis and analysis of aggregated LCA studies on business models for sustainability - Comparison of impact patterns across business model types, industries, consumer relations, and revenue schemes - Development of a framework on the leverage points for the impact potential of business models for sustainability	RQ 2
V	Conceptualize attributes of sufficiency-oriented business with particular focus on internal-oriented strategies and identify empirical examples	- Conceptual development of triple-layered sufficiency strategies framework that bridges sufficiency, post-growth, and degrowth perspectives into one framework for business strategies under sufficiency umbrella - Empirical contributions of sufficiency business examples; specifically including internally-oriented sufficiency strategies targeting production	RQ 3

6.3 Practical implications and recommendations

On a practical level, my research contributes to business by highlighting details of how companies operationalize circularity to capture their own value but also in supporting other companies to implement circular strategies (Paper I), and how companies can manage microfoundations or the structures, processes, and individuals to enact organizational and business model transformation towards net zero and circular goals (Paper II). These articles are particularly useful for incumbents or already existing organizations who seek to transition or innovate towards a CBM, as they are cognizant of the barriers and organizational inertia that must be overcome in existing operations and mindsets. Capabilities are needed not only on an operational and technical level, but also strategic. Here, there are also learning opportunities for municipalities and policy-makers to support collaboration and ecosystems amongst industry partners vertically and horizontally in the value chain.

My research also contributes to understanding the environmental impacts of CBMs, emphasizing that there is no one-size-fits-all solution, highlighting business model factors that should be tested through, for example, life-cycle assessment by companies before innovating towards a CBM (Papers III and IV). As there are many barriers to CBMI (shown in Papers I and II), the environmental outcomes should be worthwhile if organizations should engage in such radical organizational change. These implications are also important to policymakers, as they can support the stimulation of particular business model attributes and factors while disincentivizing non-ideal attributes.

As Papers III and IV indicate that CBMs may not bring the intended sustainability outcomes desired, Paper V showcases empirical examples of how organizations can still be successful with the addition of sufficiency strategies and with purpose-led businesses without the intention to grow.

Building on the research insights presented, and to advance both the implementation of CBMs for sustainability and the development of supportive policy, this dissertation offers the following recommendations:

Towards collaboration

- Policymakers should develop broader capabilities for circular implementation by funding competency-building initiatives across sectors that include upskilling and support for aspects such as repair and reverse logistics, as well as develop initiatives that provide structured support for circular experimentation and collaboration such as living labs.

- Businesses should continue to use joint ventures and pilot programs to build trust and create shared routines, but should move towards the development of long-term contracts beyond transactional partnerships and towards strategic alliances with shared sustainability objectives. Companies should continuously reinvest in training and educational programs to support collaboration, capability development, and shifting mindsets.

Incentivizing sustainable production and consumption

- Circular strategies need to be incentivized, and unsustainable practices disincentivized. Public procurement frameworks and criteria for circularity can be leveraged to reward businesses engaging in circular strategies with lower environmental impacts.
- Tax incentives such as reduced VAT should be applied to services that offer repair and other R-strategies, as well as for reused goods to reduce the financial barriers surrounding resource and product recovery and lower costs for consumers choosing to purchase from circular businesses.
- Regulations such as the updated Ecodesign for Sustainable Products Regulation (ESPR) (Regulation (EU) 2024/1781) that bans the destruction of unsold consumer products should be strengthened across sectors. Consequences for violation of such regulations should be economically stringent enough that it shifts industry norms away from high production and sale volumes.
- Cities can offer public and central spaces for reuse hubs, and/or provide rental rate reductions or subsidized lease pricing to companies in city centers that offer access models with demonstrated environmental benefit– – this could encourage reduced impacts associated with transport from these business models as companies could be situated in high foot-traffic and easily accessible public areas.
- Companies should design their products and business models to support consumer behavior to engage in repair and recovery strategies, and should involve consumers in design and feedback processes to ensure that their products meet genuine needs.
- Businesses and policy need to collectively change norms and narratives around consumption and quick gratification (e.g. 1-day shipping) towards emphasizing the benefits of slow consumption. Companies can utilize pricing and avoid marketing tactics that discourage impulsive and unnecessary consumption. Companies need to also reframe key performance indicators and criteria for success— for example, prioritizing employee well-being and product longevity over sales growth.

- Policymakers must shift from purely economic metrics to social and environmental indicators in national strategies.

Verifying impact and improving standardization

- Companies should employ assessment methods such as LCA for their business models to support strategic decision-making in how they offer products and services. Standardized LCA methods and guidelines should be utilized, where CBMs are evaluated against multiple environmental indicators and account for user behavior and geographic context.
- Policymakers should develop more stringent requirements on environmental product declarations (EPDs), as well as broaden the requirements for their application. Standards on EPDs could also be diversified to include assessments of business models.
- Policy should standardize data and digital infrastructure requirements to enhance transparency surrounding circular strategies and avoid unnecessary data collection and reporting.

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