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Overcoming the barriers to circular business model innovation through cross-border collaboration

Empirical focus on Finland and the U.S.

International Business
Master's thesis

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As global sustainability challenges grow, businesses are increasingly expected to transition from linear models to circular ones to minimize waste and resource use while maximizing value creation. However, implementing circular business models remains challenging due to institutional, market, value chain, and organizational factors. Collaboration, both internal and external, has emerged as a key enabler of circular business model innovation.

This study explores how collaboration, with a particular focus on cross-border collaboration between Finland and the United States, can help overcome the barriers of circular business model innovation. It investigates the key factors that influence and challenge circular business model innovation, the different collaborative approaches companies can use to implement circular business models, and how cross-border collaboration can be strengthened to support the circular transition.

The empirical research utilizes expert interviews and secondary data sources to examine these topics, through a lens of Finland–U.S. collaboration. The findings show that strategic alignment, trust, and supportive institutional frameworks are essential for successful partnerships. Cross-border collaboration enables companies to share risks, scale innovations, and access complementary capabilities.

By focusing on a bilateral context that combines Finland's circular economy leadership with the U.S.'s market scale and innovation potential, this study contributes to understanding how international collaboration can support circular transformation on a larger scale. The results offer practical insights for companies, legislators as well as trade promotion and provides a foundation for future research on global circular economy strategies and cross-border collaboration for circular business innovation.

Key words: circular business model innovation, circular economy, cross-border collaboration, Finland, United States

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Yritykset kohtaavat yhä kasvavaa painetta vastata globaaleihin kestävyysaasteisiin, kuten ilmastonmuutokseen, luonnonvarojen ehtymiseen ja ympäristön kuormitukseen. Tämän myötä liiketoiminnan odotetaan siirtyvän perinteisestä lineaarisesta mallista kiertotalouteen, jossa pyritään maksimoimaan resurssien arvo ja minimoimaan niiden hukka. Kiertotalousliiketoimintamallien käyttöönotto ei kuitenkaan ole yksinkertaista, vaan siihen liittyy monia haasteita, jotka kumpuavat instituutioista, markkinoista, arvoketjuista ja organisaation sisäisistä rakenteista. Yhteistyö niin organisaation sisällä kuin sen ulkopuolella on tunnistettu keskeiseksi keinoksi näiden esteiden ylittämässä ja kiertotalousinnovaatioiden vauhdittamisessa.

Tässä tutkimuksessa tarkastellaan, miten yhteistyö voi edistää kiertotalousliiketoimintamallien kehittämistä, keskittyen erityisesti Suomen ja Yhdysvaltojen väliseen kansainväliseen yhteistyöhön. Tutkimuksessa selvitetään, mitkä tekijät vaikuttavat ja haastavat kiertotalousmallien kehittymistä, millaisia yhteistyön muotoja yritykset voivat hyödyntää ja kuinka kansainvälistä yhteistyötä voidaan vahvistaa kestävä liiketoiminnan tueksi.

Empiirinen osuus perustuu asiantuntijahaastatteluihin ja täydentäviin toissijaisiin aineistolähteisiin. Tulokset osoittavat, että onnistunut yhteistyö edellyttää strategista yhteensopivuutta, luottamusta sekä institutionaalista tukea. Rajat ylittävä yhteistyö tarjoaa yrityksille mahdollisuuksia jakaa riskejä, yhdistää osaamista ja skaalata kiertotalousratkaisuja tehokkaammin.

Keskittymällä kahdenväliseen kontekstiin, jossa yhdistyvät Suomen kiertotalousosaaminen ja Yhdysvaltojen markkinaskaala sekä innovaatiopotentiaali, tutkimus lisää ymmärrystä siitä, kuinka kansainvälinen yhteistyö voi tukea kiertotalouden laajamittaista kehitystä. Tulokset tarjoavat käytännön näkökulmia yrityksille, lainsäätäjille ja vienninedistämisorganisaatioille sekä luovat pohjaa tulevalle tutkimukselle globaalien kiertotalousstrategioiden ja kansainvälisen yhteistyön saralla.

Avainsanat: kiertotalousliiketoimintamallien innovointi, kiertotalous, kansainvälinen yhteistyö, Suomi, Yhdysvallat

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1 Introduction

This thesis examines the role of cross-border collaboration in overcoming barriers to circular business model innovation (CBMI), with an empirical focus on collaboration between Finland and the United States (U.S.). The study introduces literature on CBMI, different collaborative approaches, and the internal and external barriers that affect CBMI. By exploring the role of cross-border collaboration for CBMI, the study guides relevant stakeholders in identifying strategies to implement and/or scale circular business models (CBMs) through collaboration. The following section presents the research background and motivation, as well as the research questions and structure of the thesis.

1.1 Background and motivation

The growing urgency for sustainability and resource efficiency has made sustainability a central focus of business strategies across industries and countries. Companies today face growing pressure from consumers, investors, and regulatory authorities to adopt practices that align with environmental goals (Strielkowski et al. 2021, 1–2). The traditional economic linear model, based on a “take-make-dispose” economy is reaching its limits due to the depletion and rising cost of non-renewable natural resources. This approach contributes to significant environmental degradation, including waste generation, resource scarcity, and greenhouse gas emissions, which threaten the stability of ecosystems and global supply chains (Tan et al., 2022, 2-3). This has led to the increasing interest in the circular economy (CE) model as a different way of looking at business and the economy. CE offers a regenerative approach that focuses on retaining the value of materials, products, and resources in the economic system for as long as possible while minimizing waste generation. (Ellen MacArthur Foundation, 2015, 3–8.)

An increasing number of businesses of all sizes are applying CE practices in different sectors and value chains. There is also a rise in private sector investment in CE potential. (UNECE 2023, 13.) Despite these promising trends and the acknowledgment of the vast benefits of circular models, the global shift to CE has only made marginal progress. According to the Circularity Gap Report (2024, 8), global circularity has actually declined from 9.1 per cent in 2018 to 7.2 per cent in 2023. This goes to show that even though the topic of circularity has reached “megatrend” status over the past years, concrete impacts are yet to be seen.

Companies play a major role in implementing CE globally. Business models are at the heart of every business, basically guiding how the company creates value by explaining the way it is taking its product or service, offering it to the market, and driving sales (Osterwalder & Pigneur 2005, 3).

Therefore, if a company transitions from a traditional linear business model to a circular business model (CBM), it changes its core way of creating value to also advancing circularity. Unlike linear business models that follow a take–make–dispose logic, CBMs aim to keep products, components, and materials in use at their highest value for as long as possible. CBMs aim to redefine growth by prioritizing the reuse, repair, refurbishment, and recycling of materials while creating value for the company. This shift not only minimizes waste but also establishes a regenerative system in which resources are continuously cycled, maintaining their value for as long as possible. (Geissdoerfer et al. 2018, 13.)

While the concept of the CE has been widely studied and well-established in academic literature, introduced already in the late 1970s (Geissdoerfer et al. 2017, 759), research specifically on CBMs remains more limited. While, the academic and practitioner interest in CBMs and their implementation, has increased in the past years (see e.g. Geissdoerfer et al. 2018; Centobelli et al. 2020; Ferasso et al. 2020) more discourse is necessary (Hina et al. 2022, 14; De Keyser & Mathijs 2023, 11; Rittershaus et al. 2023, 3). In their overview of literature on CE, Kirchherr et al. (2017, 228) conclude that: “much more emphasis on business models will be needed in future discourses if the private sector is supposed to lead the transition towards circular economy. A circular economy understanding lacking business models is one with no driver at the steering wheel in our point of view.”

However, many organizations are still hesitant to adopt CBMs due to the complex challenges involved in achieving scalable and lasting impact. These difficulties can slow down implementation efforts and limit broader commitment to circular strategies (Hina et al. 2022, 2; Corvellec et al. 2022, 424). The development of CBMs can face multiple barriers, ranging from technical limitations and insufficient training to high upfront costs and uncertain profitability. Institutional, regulatory, and socio-cultural challenges such as consumer habits and outdated business routines can also hinder progress. (De Jesus & Mendonça 2018, 78.)

Collaboration on the other hand has emerged as a key enabler of circular business model innovation (CBMI) (Lozano 2007, 370; Iacovidou et al. 2021, 24786), which is defined as the conceptualization and implementation of CBMs (Pieroni et al. 2019, 201). However, there is a gap in the literature of a comprehensive understanding of how collaboration advances CBMI across multiple levels and industrial domains. (Danvers et al. 2023, 2; Hina et al., 2022, 11; Köhler et al. 2022, 2701). It is therefore necessary to explore how collaboration in CBMI can be successfully carried out (Bigliardi

& Filippelli 2021, 15). As the global company Cisco's CSO stated, "We're not going to get to that [sustainable] climate future if there is no collaboration" (Sarda, 2024, 32:28).

The transition to CE requires systemic change, making it almost impossible for a singular company to achieve alone (Iacovidou et al. 2021 , 24785–24806). By pooling resources, expertise, and capabilities among different stakeholders, collaboration enables the development of innovative solutions that advance circularity while simultaneously generating economic value. More importantly, collaboration helps to overcome the unique challenges of CBMs, including technological limitations, insufficient infrastructure, and the need to shift consumer mindsets. (Porter & Kramer 2011, 64; Bocken et al. 2014, 54–55.) Collaboration thrives on diverse perspectives, using shared information and creative problem-solving to drive progress (Denise 1999, 1–6). When implemented effectively, collaboration enhances financial and human capital optimization, improves access to markets and knowledge, and leads to greater process efficiency and enriched creativity (Fadeeva 2005, 167–173).

Collaboration however operates on multiple levels. From within and between companies to broader cross-sector and cross-border collaboration. While the need for organizational level collaboration has been recognized, given the interconnected state of the world, there is need for collaboration across national borders to fully achieve CE (Barrie et al. 2022, 4). The large-scale implementation of CBMs requires cross-border collaboration, enabling knowledge exchange, policy alignment, and shared investment in sustainable solutions (Geng et al. 2019, 154). Due to the interconnected nature of global value chains, no single country can transition to circularity in isolation and therefore collaboration between leading economies and their businesses is crucial (Badza et al. 2024, 125).

Finland has positioned itself at the forefront of the transition to CE. In 2016, it became the first country to introduce a national CE roadmap, outlining key measures and commitments from both public and private sector stakeholders (Sitra 2016). Since then, Finland has continuously advanced its CE agenda, focusing on carbon-neutral solutions and positioning itself as a leader in low-emission innovation (Sitra 2024). Additionally, Finland provides the highest number of CE higher education courses in the world, reinforcing its role as a knowledge hub for CE (World Economic Forum 2021). However, Finland is a relatively small economy with limited domestic demand and scaling its CBMs abroad would make them more economically viable. Given the country's leading status Finland has the opportunity to become a part of important global value chains and promote Finnish expertise.

Across the Atlantic, the United States offers a large market with buying power and investment possibilities. The U.S. is also slowly recognizing the strategic importance of the CE and CBMs,

however not yet at the same level. On the policy side, laws like the Inflation Reduction Act (IRA), the Bipartisan Infrastructure Law (BIL), and the Creating Helpful Incentives to Produce Semiconductors and Science Act (CHIPS and Science Act), all push towards CE solutions. However, the country's approach to the CE is still lagging behind and more is needed to be done to capture its full potential. (UNECE 2023, 23.) Research by the Ellen MacArthur Foundation and Oliver Wyman (2024, 5) suggests that accelerating the U.S. transition to CE could bring significant benefits, including advancements in climate policy, national security, economic resilience, and industrial innovation. By implementing CBMs in prominent sectors like electric vehicles (EVs) and grid-scale batteries, the built environment, and electronic equipment, the U.S. could increase these sectors' economic value from an estimated USD 883 billion to 1.5 trillion. (Ellen MacArthur Foundation & Oliver Wyman 2024, 5.)

Against this backdrop, collaboration between Finland and the U.S. presents a unique opportunity to drive the shift towards CE. Finland's expertise in circular policy frameworks, education, and sustainable business models complements the U.S.'s economic scale, technological advancements, and industrial capabilities. However, realizing the full potential of this collaboration requires addressing the foundations of successful cross-border collaboration. Institutional differences, regulatory misalignments, and market uncertainties can hinder progress, while supportive policies, technological cooperation, and aligned incentives can facilitate more effective collaboration (Suchek et al. 2021). Understanding these factors is essential for developing strategies that enable Finnish and U.S. stakeholders to successfully drive CBMI through collaboration.

Academic research has yet to focus on cross-border collaboration in CBMI between specific countries, especially involving Finland (Lewandowski 2016, 22–24; Lahti et al. 2018, 11–15; Suchek et al. 2021, 3698). While comparative studies have examined CE practices across different countries and regions (e.g., Arbolino et al. 2022; Haswell et al. 2024), and Dąbrowski and colleagues (2019) have explored knowledge transfer in circular business practices, there remains a gap in understanding how specific cross-border collaboration can play a part in CBMI. Moreover, lessons drawn from Finland-U.S. collaboration can offer valuable insights for other countries and regions seeking to drive CBMI through international partnerships. This case can serve as a blueprint for advancing CBMI in different cross-border contexts. Finland is recognized as a global leader in circular innovation (Ellen McArthur Foundation 2015, European Environment Agency 2021, World Economic Forum 2021), while the U.S. offers significant market opportunities and technological expertise.

1.2 Research questions and structure of the thesis

This thesis studies the role of cross-border collaboration in overcoming barriers to CBMI, adding to the emerging topic of CBMs in literature and addressing gaps around how collaboration can drive CBMI. Specifically, it looks at collaboration for CBMI through a new lens of cross-border collaboration from the perspective of two relevant countries: Finland and the U.S. More in depth, the study investigates the factors that influence and challenge CBMI, what approaches to collaboration can be used for overcoming these barriers to CBMI, and how cross-border collaboration can be strengthened to drive CBMI. The research is guided by the following research question:

How can cross-border collaboration help overcome barriers to circular business model innovation?

To answer this, the research is further divided into three sub-questions:

- 1. What are the key barriers to circular business model innovation?**
- 2. What different collaborative approaches can drive circular business model innovation?**
- 3. How can cross-border collaboration be strengthened to effectively support circular business models?**

These three sub-questions all play a role in answering the complex research question. Sub-question 1 sets the base for the study. To understand how the barriers to CBMI can be overcome, the key barriers, both external and internal, must be identified. Also, if there are any differences in barriers between borders. The second sub-question explore different approaches to collaboration for CBMI. Since research around this area is limited, the goal is to identify the most relevant collaborative approaches for driving CBMI. Finally, the third sub-question takes a forward-looking perspective, addressing cross-border collaboration in specific, and how it can be strengthened to support CBMs in the future. This question considers cross-border specific collaboration opportunities or challenges between Finland and the U.S.

In the empirical part of the thesis, U.S.-Finland collaboration for overcoming the barriers to CBMI in specific will be studied. This is done through expert interviews and complementary secondary data. The empirical part aims to provide an understanding of the barriers to CBMI specific to these countries, and how they can be overcome through collaboration. It also addresses the current state of cross-border collaboration between the countries, and its opportunities and challenges. This approach will provide insights into the practical dynamics of cross-border collaboration in the context of CBMI

and to shape an understanding of how cross-border collaboration can be strengthened in the future. The structure of this thesis is as follows.

Chapter 2 focuses on current literature, theories and definitions relevant to the research question. Chapter 2 first provides the foundations of CBMI, setting the stage for deeper analysis of the topic. The key concepts behind CBMI: CE, business model innovation as well as CBMs are defined. Then the key barriers of CBMI that have been brought up in previous literature are identified and organized. The focus shifts towards collaborative approaches to CBMI by identifying different methods of possible collaboration. All of this is then synthesized in section 2.4. bringing out the key aspects identified relevant for the research question. The collaborative approaches are matched with barriers that they can help overcome, setting a preliminary framework for the empirical part of this study. Chapter 3 discusses the qualitative research approach of this study going in depth into the research method. This consists of introducing primary expert interviews and secondary document data, and their data collection and data analysis processes. Research ethics and the credibility of this study are also discussed. After this, the findings of the empirical research are presented in chapter 4. Finally, chapter 5 concludes this thesis with a discussion on the topic combining the findings of the empirical study with those of the literature review. Furthermore, theoretical and managerial contributions of this study are discussed as well as the limitations of this study and suggestions for future research.

2 Toward circular business model innovation: barriers and the role of collaboration

This chapter explores current literature discussing theories and definitions behind CBMI, key barriers to CBMI and different collaborative approaches to overcome them. The chapter is divided into four sections. The first section focuses on the foundations of CBMI, setting the stage for deeper analysis of the topic. The key concepts underlying CBMI are defined, and the implementation process is explained. The second section focuses on the external and internal barriers of CBMI that have been categorized into three different levels. The third section presents different approaches to collaboration identified in literature used in CBMI. Finally, the fourth section synthesizes the key aspects of the literature review to provide preliminary answers to the research questions prior to the empirical research.

2.1 Foundations of circular business model innovation

The transition from a linear economy to a circular one requires the implementation of business models that are based on using as little resources as possible for as long as possible, while still generating maximal value. These business models, referred to as CBMs are key to creating long-term resilience, new business opportunities as well as social and environmental benefits. (Geng & Doberstein 2008, 232; Gaur et al 2018, 887, Leder et al. 2023, 2.) CBMs are based on two underlying concepts: the CE and business model innovation. Both concepts are first introduced to then be able to understand how CBMs and CBMI work.

2.1.1 Circular economy as a driver of circular business model innovation

In an overview, CE is an economic model where the goal is to prolong the use of materials while also preserving or improving their value through services and innovative approaches. CE emphasizes design principles that prioritize durability, reparability, and recycling, aiming to separate economic growth from resource extraction. Therefore, CE is seen as an opportunity to meet current socio-ecological challenges, such as the climate crisis, scarcity of raw materials and loss of biodiversity. (Antikainen & Valkokari 2016, 6-8.) There are multiple ways of approaching CE, and this has resulted in ranging definitions for the concept. This study defines CE according to Geissdoerfer and colleagues' (2020, 3) definition as "an economic system in which resource input and waste, emission, and energy leakages are minimized by cycling, extending, intensifying, and dematerializing material

and energy loops. This can be achieved through digitalization, servitization, sharing solutions, long-lasting product design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.”

Although CE is often linked to sustainability, they are not always the same. Sustainability is a broader network that tries to balance ecological, economic and social objectives, also called the triple bottom line, equally. (Wecht et al. 2022, 66.) In contrast, CE is more narrowly focused on designing out waste, keeping materials in use, and regenerating natural systems. While CE contributes to environmental and economic aspects of sustainability, it does not inherently address social issues. The traditional linear way of production and consumption fails to support either approach by extracting, using, and discarding resources. (Schaefer & Crane 2005, 89) Thus, to achieve both the CE and sustainability, businesses have to transform the way they create and capture value. The key to this transformation is business model innovation. Instead of making small changes to the current systems, businesses have to rethink and redesign the way they operate. (Wecht et al. 2022, 66.)

As the concept of CE has developed, the principles of CE, prolonging materials whilst improving their value, have been applied to a range of frameworks and business model archetypes. These provide structured approaches for applying circularity in different organizational and industrial contexts (Leder et al. 2023, 2). For instance, business model archetypes such as product-as-a-service, resource recovery, or circular supply chains help companies design value creation systems aligned with CE principles. Additionally, the R-strategies are increasingly used in helping organizations to identify their level of circularity (Kirchherr et al. 2017, 224). These strategies are used to successfully implement the concept of CE into business concepts and consumer patterns. The globally adapted R-strategy originally consisted of three Rs: reduce, reuse and recycle (Sakai 2011, 87). However, during the years, the strategy has developed to a more complex one, falling into three categories (Kirchherr et al. 2017, 224), presented in Table 1. These strategies promote smarter product and material use while expanding a product’s lifecycle. (Kirchherr et al. 2017, 224).

Table 1 R-strategies (adapted from Kirchherr et al. 2017, 224)

Category	R-strategy	Definition
Smarter product use and manufacturing	R0 Refuse	Avoid using a product or material altogether by questioning its necessity.
	R1 Rethink	Use products more intensively through shared use or multifunctional design.

	R2 Reduce	Increase efficiency in product manufacture or use to minimize resource input.
Extending lifespan of product and its parts	R3 Reuse	Use a product again for the same purpose without significant modification.
	R4 Repair	Fix a faulty product to restore its original function.
	R5 Refurbish	Restore an old product to good condition by updating or replacing components.
	R6 Remanufacture	Use parts of a discarded product in a new product with the same function.
	R7 Repurpose	Reuse a product or its parts for a different function than originally intended.
Useful application of materials	R8 Recycle	Process materials to obtain the same (or lower) quality raw material.
	R9 Recover	Extract energy or materials from waste that cannot be reused or recycled.

It is important to also note the critical view on CE, because circularity by its own cannot be said to be always positive in terms of sustainability. A system that is 100% circular can actually exhibit greater environmental impacts than one that is not circular. For example, the refurbishing or remanufacturing of a product can sometimes use more material and energy than producing a brand new one. (Salvador et al. 2020, 10.) Beyond environmental trade-offs, economic and systemic challenges also exist. Circular solutions often involve high initial costs, uncertain profitability, and the need to restructure existing value chains, which can make implementation difficult, particularly for smaller companies (Hina et al. 2022, 2; De Jesus & Mendonça 2018, 78). Additionally, circular initiatives can disrupt established business practices and create rebound effects, where gains in resource efficiency lead to increased overall consumption (Corvellec et al. 2022, 424). These critiques underline the importance of assessing circular strategies in their specific context and considering both intended and unintended consequences. Given these complexities, the transition to a CE cannot rely solely on technical solutions or isolated practices. Instead, it requires rethinking the fundamental ways in which businesses create, deliver, and capture value. This is where business model innovation becomes essential. As companies attempt to integrate circularity into their operations, the design and

transformation of business models play a central role in translating circular principles into viable and scalable strategies.

2.1.2 Defining business model innovation

A business model describes the logic of how an organization creates, delivers, and captures value. It is typically defined by three key elements: value proposition, which defines what value the company offers and to whom; value creation and delivery, which refers to the resources, activities, and channels through which the value is produced and delivered; and value capture, which explains how the company generates income and sustains its operations. (Osterwalder & Pigneur 2005, 3; Bocken et al. 2014, 44.) Value creation is at the heart of any business with the aim to create value to customers as well as the company by seizing new business opportunities, new markets and new revenue streams. Business models are not only operational blueprints but also useful tools to analyze, compare, and assess company performance while also guiding management, communication, and innovation. (Osterwalder & Pigneur 2005, 3.)

In response to rapidly changing market conditions, technological advancements, and shifting societal expectations, companies are increasingly engaging in business model innovation. Business model innovation refers to the process of redesigning or transforming existing business models to better align with new opportunities or constraints. It involves altering the value proposition, modifying how value is created and delivered, or adapting the mechanisms of value capture (Ramdani et al. 2019, 89). Business model innovation is often driven by a combination of internal and external pressures, including the pursuit of competitive advantage, customer demand, technological disruption, and regulatory change. Business model innovation has become a key avenue for differentiation and growth due to declining returns on technology, increasing market complexity, and lower capital costs, making it easier to invest into new ideas. (Bocken et al. 2019, 2; Geissdoerfer et al., 2020, 3.)

Business model innovation is an iterative and non-linear process with often several phases of experimentation and refinement. The ideation phase involves identifying new opportunities or responding to external pressures such as technological shifts, sustainability demands, or changing customer needs (Chesbrough 2010, 355; Geissdoerfer et al. 2020, 3). This is followed by experimentation, where business model concepts are prototyped and tested, either internally or with selected stakeholders, to assess feasibility and desirability (Foss & Saebi 2017, 202; Bocken et al. 2019, 2). The implementation phase requires aligning internal structures, processes, and partnerships to support the new model. Finally, the evaluation phase is used to monitor performance, gather feedback, and guide necessary adjustments, making business model innovation a continuous learning

process (Frankenberger et al. 2013, 254; Bocken et al. 2019, 2.). The scope of business model innovation can range from incremental changes, such as enhancing resource efficiency or modifying distribution channels, to radical transformations, including shifting from product ownership to service-based offerings or redesigning the entire value proposition (Geissdoerfer et al. 2020, 4). The level of change often depends on the company's strategic intentions, available capabilities, and the degree of external disruption it faces (Bocken et al. 2014, 43).

2.1.3 Defining circular business model innovation

As sustainability considerations grow in importance, the traditional business model concept has evolved into that of the sustainable business model. These models aim not only to generate economic value, but also to integrate social and environmental dimensions into their logic of value creation and capture (Bocken et al. 2014, 43). Building on this development, circular business models (CBMs) have emerged as a specific type of sustainable business model that focuses explicitly on advancing the principles of the CE. While sustainable business models generally aim to balance economic, environmental, and social goals, CBMs are more narrowly concerned with closing resource loops, minimizing waste, and keeping products and materials in use for as long as possible. In this way, they offer a concrete pathway for businesses to implement CE strategies within their operations, while ensuring they are still economically feasible. (Bocken et al. 2014, 43; Geissdoerfer et al. 2017, 760-765; Blackburn et al. 2023, 253).

Not only do CBMs help organizations in achieving their sustainability initiatives, but they are also increasingly seen as a source of competitive advantage as well (Wells 2013, 29). CBMs are seen as a modification of the traditional business model concept, with certain characteristics and goals added to it. These modifications typically occur either in response to external pressures, such as environmental regulations, changing consumer preferences, or resource scarcity, or as part of a proactive sustainability strategy. CBMs often follow two main pathways of transformation 1) integration of sustainability-related concepts, principles, or objectives to the business model; or 2) including sustainability into the company's value proposition, value creation and delivery processes, and/or value capture mechanisms. (Geissdoerfer et al. 2018, 403.) In CBMs, value creation, in addition to aiming create value to the customers and company, is associated with “the maintenance of product and process, combination of resources and materials, purchasing upcycled waste, recycling of resources, dematerialization of products, and on-demand production process”. (Centobelli et al, 2020, 1741.) The value proposition is traditionally also concentrated on generating economic return

but with a circular business model, it also provides measurable ecological value alongside financial gain. (Bocken et al. 2014, 43.)

There are two critical strategic choices to be made when a company decides to transition to a CBM. First, a company should decide to what extent do they aim to improve circularity in their business model by company-driven internal processes, by collaborative processes with external stakeholders, or by both. Each approach provides different benefits and challenges to advancing circularity and are case-specific. (Bocken & Ritala 2022, 184.) Second, the company must decide how it will create value in line with the principles of CBMs. To support these decisions, CBM literature has identified four generic strategies for CBMs to achieve their goals (Geissdoerfer et al. 2020), as well as four partially overlapping logics for value creation in CBMs (Fehrer & Wieland 2021, 611).

An overview of CBMs is presented in Figure 1. The four identified strategies are: cycling, extending, intensifying, and dematerializing (Geissdoerfer et al. 2020, 7). Cycling refers to materials and/or energy being recycled within the organization system. This can be done through many of the R-strategies, such as through reuse, remanufacturing, refurbishing, and recycling (Bi et al. 2015, 265; Awan & Sroufe 2022, 21). Extending refers to the extension of the use phase of a product. This can be done through for example timeless and long-lasting design, marketing that encourages the upkeep and care of products, as well as repair of products. (Geissdoerfer et al. 2020, 7.) Intensifying refers to the use phase of the product being intensified. This can be done through for example sharing economy solutions or public transport. (Hamari et al. 2016, 2048; Geissdoerfer et al. 2020, 7.) Lastly, dematerializing refers to fulfilling customer needs and providing added value without physical hardware by substituting them with service and software solutions. This has to be done however with focus on reducing resource use so that the product-service system does not accidentally lead to increased resource consumption. (Henriques et al. 2023, 1.) More than one of the strategies, if not all can also be combined within one business model (Geissfoerfer et al. 2020, 12).

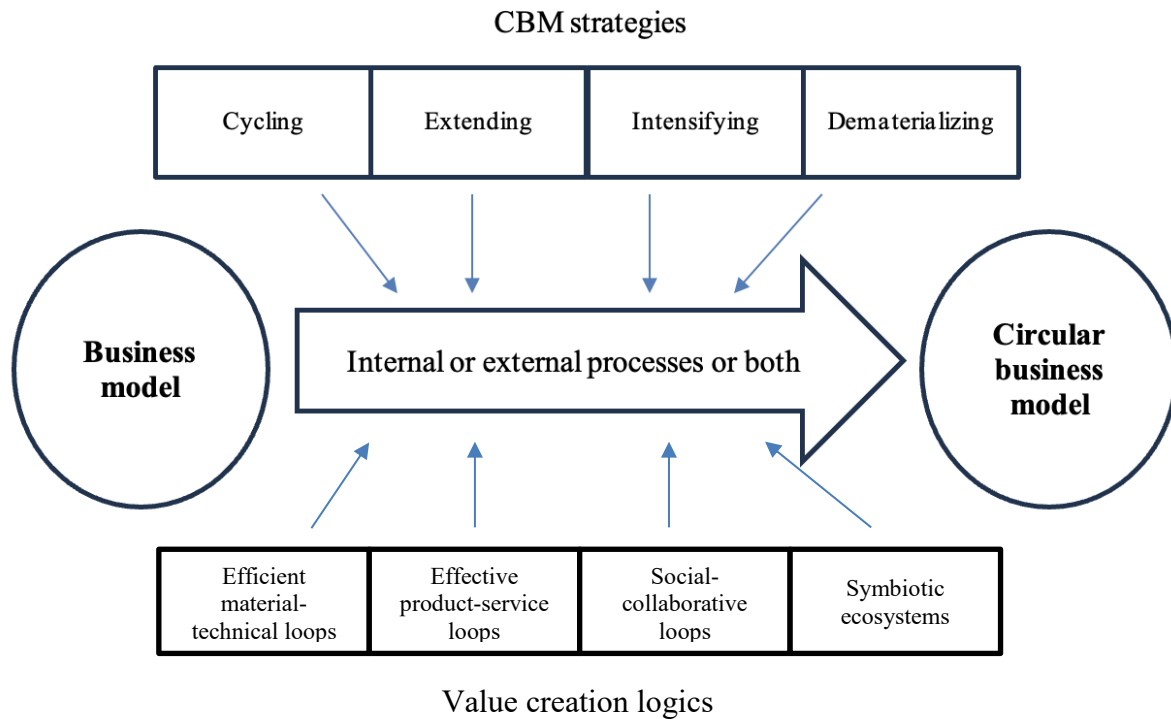


Figure 1 Circular business models (adapted from Geissdoerfer et al. 2018)

To complement these strategies, CBM literature has introduced four value creation logics that help explain how these strategies are implemented and scaled in practice. These strategies are: efficient material-technical loops, effective product-service loops, social-collaborative loops, and symbiotic ecosystems (Fehrer & Wieland 2021, 611). In efficient material-technical loops, value is created by closing, slowing, and narrowing biological and technical lifecycles. Closing loops refers to i.e. reusing materials to maximize production efficiency, slowing loops to i.e. prolonging the use of materials or goods, and narrowing loops to i.e. minimizing the resources needed in the production process. (Bocken et al. 2016, 309.) Cycling and extending are good strategies for efficient material-technical loops. Effective product-service loops create value through the replacement of product ownership with access to a product or service (Fehrer & Wieland 2021, 612). This logic can be tied together with the dematerializing strategy, utilizing product-service systems. In the social-collaborative loops, focus is on collaboration and sharing (Bigliardi & Filippelli 2021, 5). Value can be created through intensifying strategies like the sharing economy. Lastly, symbiotic resource loops create value by also focusing on cycling resources, but by collaborating with different players in their value creation logic. This is based on the thought that no single company can drive a successful CBM all by themselves and that broader institutional structures should be considered as well. (Fehrer & Wieland 2021, 612).

Understanding these value creation logics is important because they provide the foundation for how circular strategies are brought to life in practice. However, for these strategies and logics to be successfully implemented, companies must actively reshape or create business models to support them. This process is known as circular business model innovation (CBMI), just as business model innovation applies to traditional models, CBMI represents the process of designing and implementing business models aligning with CE principles (Pieroni et al. 2019, 201). Four different types of CBMI, showcased in Figure 2, have been identified in literature: circular start-ups, circular business model diversification, circular business model transformation, and circular business model acquisition (Geissdoerfer et al. 2020, 8).

Circular start-ups refer to the creation of entirely new business models that incorporate CBM strategies, such as those presented in Figure 1. This is done outside of an already existing company, with the new company having their own brand, resources, and employees. These start-ups are typically founded with circularity as a core mission from the outset, allowing them to build operations, products, and services around circular principles without the burden of legacy systems. (Henry et al. 2020, 13-14.) CBM diversification refers to the creation of additional CBMs within an existing company. The existing business model of the parent company stays the same, and the new CBM is implemented into the company as new business unit or spun off as a subsidiary. This pathway allows established firms to explore circular opportunities in parallel to their core operations, often targeting new customer segments or testing circular innovations in less risky, more flexible structures. Joint business model innovation projects, such as partnerships with start-ups or other firms, are also part of this category. (Chen et al. 2024, 2.)

CBM transformation refers to the modification of an existing business model to make it circular. The original business model can be either linear or only partially circular and is then modified to align fully with CBM principles. This type of innovation is often the most complex, as it requires changes across multiple business model dimensions, for example product design, value chain partnerships, customer interaction, and revenue models. All this needs to be done while also challenging existing organizational routines and mindsets. (Frishammar & Parida 2019, 9.) Lastly, CBM acquisition refers to strategic merger and acquisition activities that acquire an already existing CBM and integrate it into the company. The extent of integration varies depending on the strategic intent and compatibility between the acquiring and target firms. In some cases, the acquired CBM may be fully absorbed into the parent company's operations, with aligned systems, branding, and processes. In other cases, it may be kept as a separate unit or subsidiary to preserve its agility, brand identity, or experimental role. (Geissdoerfer et al. 2020, 8.)

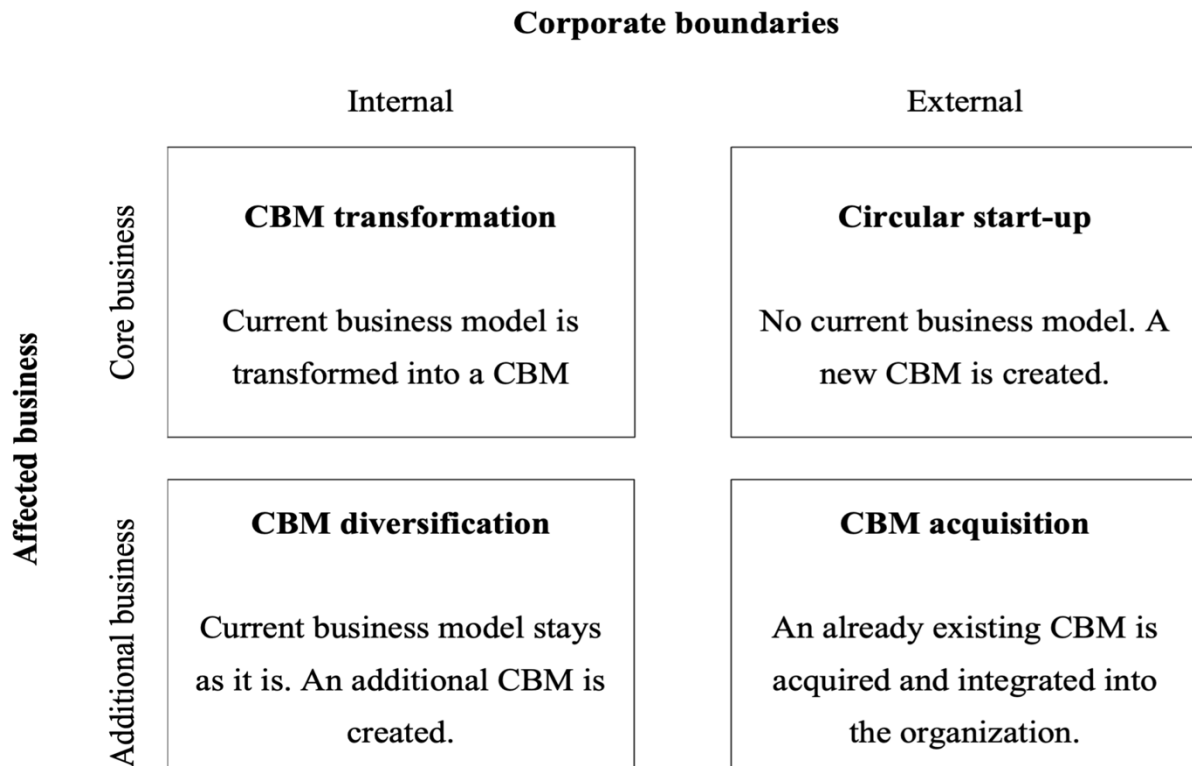


Figure 2 Circular business model innovation types (adapted from Geissdoerfer et al. 2020,7)

CBMs do not need to fully close material loops by themselves within their internal system boundaries. They can also be a part of a system of business models that together close a material loop. Therefore, CBMI is built around collaboration requiring communication, collaboration, and coordination with interlinked but independent stakeholders. (Antikainen & Valkokari 2016, 7.) In addition to external collaboration, internal collaboration within the company is also necessary. This is because different teams, such as product, manufacturing, and sales have to collaborate to be able to create and/or implement successful CBMs. (Guldmann & Huulgaard 2020, 3.) However, despite the growing interest in CBMI, many organizations remain hesitant to pursue this due to the complexity of achieving scalable and sustainable impacts. This hesitation stems not only from the structural demands of collaboration but also from the broader challenges associated with CBMI. (Hina et al. 2022, 2; Corvellec et al. 2022, 424.) As companies face pressure to adopt circular practices, the lack of clear benchmarks and the wide variety of CBM types and their approaches allow some to engage in symbolic or partial efforts while limiting their actions to small parts of their business activities and continuing to operate in a linear fashion (Stål & Corvellec 2018, 638). To understand what truly drives or hinders CBMI, it is crucial to examine the different factors that shape its development and implementation.

2.2 Barriers to circular business model innovation

CBMI is a complex process that is heavily affected by different internal and external factors. These factors influence whether and how companies are able to initiate, scale, and sustain CBMs in practice. CBMI can be challenged by internal barriers such as lack of technological capabilities, organizational culture, leadership, and limited access to knowledge and resources. At the same time, external conditions, such as policy frameworks, market demand, supply chain dynamics, and societal norms play a critical role as well. (De Jesus & Mendonça 2018, 78; Corvellec et al. 2022, 424.)

For this study, barriers with the potential of hindering CBMI are divided into three levels, pictured in Figure 3. These three levels are adapted from Guldmann and Huulgaard's (2020) study on CBMI. Their study initially introduced four levels for CBMI barriers, but the fourth level called the "employee level" will not be utilized for this study. The employee level has been removed since this study looks at CBMI from a broader and more generalizable perspective and was deemed too detailed and company/industry dependent when not studying a specific group of companies.

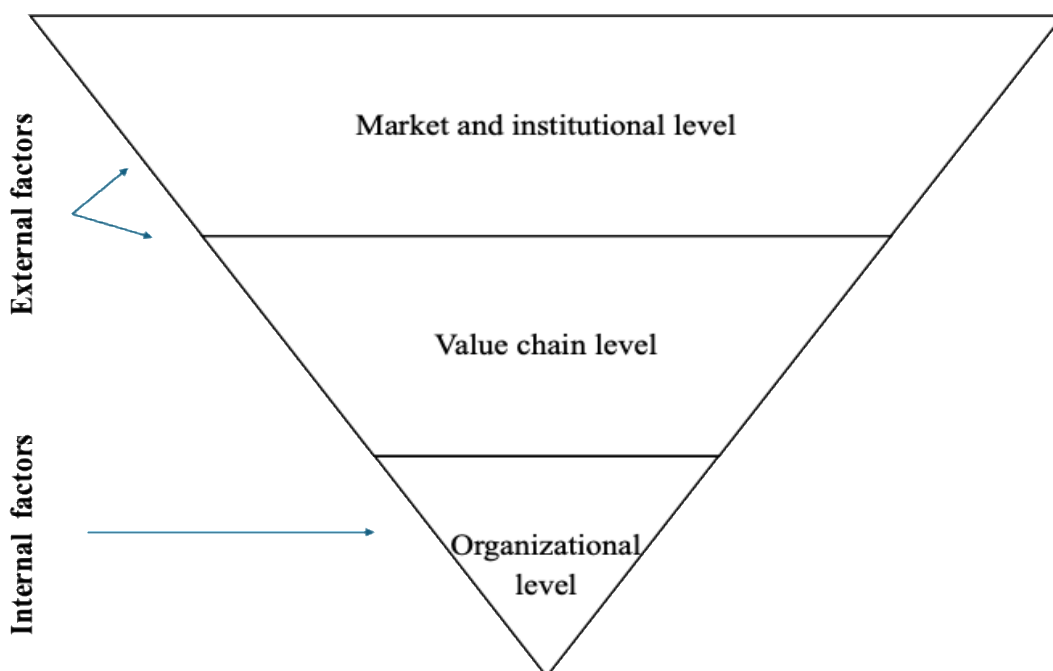


Figure 3 Different levels of barriers to circular business innovation

External factors are divided into market and institutional level barriers, as well as value chain level barriers. Internal factors are grouped into the organizational level. (Guldmann & Huulgaard 2020, 6.) It is important to note that the barriers for CBMs vary across industries and organizations. The factors that challenge one company's implementation of CBMs may in some cases even be the driving factors of another company. (Hina et al. 2022, 14.) This study aims to account for such variation by critically considering how barriers may differ in context and may even act as enablers in certain cases.

2.2.1 Market and institutional barriers to circular business model innovation

Market level factors, such as economic and funding factors are important in influencing CBMI. There is often little economic incentive for companies to use recycled materials, since oftentimes virgin raw materials are almost as cheap and seen as easier to handle in the manufacturing system due to more consistent quality (Rizos et al. 2016, 4). Banks can also be reluctant to fund the development and implementation of CBMs for a company. The lack of funding opportunities can be linked to the unclear market demand for CBMs, which is of big concern. (Guldmann & Huulgaard 2020, 6.) For example Guldmann and Huulgaard (2020) studied a startup that was unable to get funding from public environmental innovation funds for their CBM project. This was due to the funds being reserved for clean-tech solutions, which the start-up was not but instead focused on offering services to slow loops.

Another market factor, consumer demand, is seen as both a barrier and a driving force behind CBMI. With rising consumer buying power, consumers play a critical role in increasing circular product acceptance and therefore circular business model innovation (Sajjad et al. 2024, 2). Consumers are concerned with the environment and striving for a healthy lifestyle which leads to demand for responsibly produced products. (D'Agostin et al. 2020, 9-10.) However, not all consumers are eager to buy circular products. In the case of second-hand garments for example, some consumers have a negative perception of recycled or second-hand materials, linked to feelings of poor hygiene or contamination. Therefore, they are not as willing to pay the same price for circular products as for new ones, which can hinder companies' willingness to implement circular business models. (Pretner et al. 2021, 11.)

In addition to market forces, institutional influences play a crucial role in the successful implementation of CBMs (Hana et al. 2022, 9). Institutions consist of formally codified rules, in example policies and laws and informal ones, in example traditions and norms. Together, they make up the institutional environment that guides how economic actors allocate their resources and interact with one another. (Rweyendela & Kombe 2021, 1063.) Institutional environments can both drive and hinder the development of CBMI in companies. For example, the regulatory system of an institutional

environment can hinder CBMI by, for example, denying the reuse of certain products (Ranta et al. 2018, 72).

Institutions may be divided into three distinct but interdependent pillars: normative, cultural-cognitive, and regulatory. Through their indicators, these pillars make visible the rules, norms, and beliefs that influence social behavior. These three pillars have become widely used to explain sustainable activities on a business and individual level. (Ranta et al. 2018, 72.) The design of laws and regulations has been found to have an enormous influence on the speed of CBMI. (Rweyendela & Kombe 2021, 1063.) For example the role of national and international regulations and policies as the most critical factors in implementing CBMs has been highlighted, due to regulative tools' such as taxes and recycling policies' importance to CBMI heavily influencing the costs of switching to a CBM (Wrålsen et al. 2021, 8).

Most business studies focus on the regulatory pillar as it is seen as the most influential pillar on doing business (Scott 2008, 51). Overall, research indicates that effective legal and regulatory frameworks are necessary for the implementation of CBMs (Gunningham & Holley 2016, 285-286). However, Ranta and colleagues (2018) found that while the regulatory pillar (i.e. government regulations) play an important role in either supporting or hindering CBM practices, they are not enough on their own. The normative pillar (i.e. social norms) and the cultural-cognitive pillar (i.e. shared beliefs) can be just as strong, if not stronger in shaping how organizations adopt CBMs. Normative influences can be for example awarding businesses for their CE efforts and gaining social recognition. Cultural-cognitive influences tie closely with consumer demand and reflect how stakeholders and customers view recycled or reused products. (Ranta et al. 2018, 79.)

2.2.2 Value chain barriers to circular business model innovation

Transitioning to a circular business model can be seen as unattractive if the company has already invested large amounts of capital, time, and effort into their existing supply chains and factories. Building new circular systems that steer away from the current profitable supply chain might not seem like an appealing task. There is also worry about maintaining product quality and consistent flow of recycled or returned materials. (Guldmann & Huulgaard 2020, 6; Kinnunen & Kaksonen 2019, 158.) In many countries the recycling systems are not advanced, and the separation of waste is limited. Therefore, the reliability of supply of recycled goods is not as reliable as the one of virgin materials. Recycled materials are also dependent on past consumption patterns, making the supply less reliable. (Grafström & Aasma 2021, 6.) The more global and complex the value chain is, the more complicated the transition to a circular value chain is.

Collaboration is seen as an important if not the most important driver for CBMI. Coordination and collaboration with stakeholders within the value chain is crucial to achieve the sustainable outcomes of CBMs, for example resource optimization, closed-loop systems, innovation and knowledge sharing, or traceability and transparency. (Leder et al., 2023, 2-18.). These various stakeholders involved in the different stages of the lifecycle of a product or service are called value chain partners. Examples of value chain partners are for example suppliers, logistics and transport companies, retailers and distributors, waste management companies and reverse logistics firms. (Yousef et al. 2006.) Due to the importance of collaboration, the lack of collaboration and/or coordination in value chains can heavily hinder CBMI. Suppliers and/or service partners may be hesitant to participate in CE initiatives due their perceived riskiness or due to a mindset that does not prioritize sustainability. In some cases, new partners need to be found which can also be time-consuming. (Rizos et al. 2016.)

Building collaborations, requires time and resources and can therefore make some companies reluctant to involving value chain partners in the development of CBMs. Additionally, since clear standards on CBMs are not in place yet, these collaborations must rely heavily on trust, opposed to formal agreements following industry standards. The building of mutual trust between collaborating companies requires time and effort. (Guldmann & Huulgaard 2020, 6.) Organizations cannot rely solely on isolated or department-specific initiatives. Instead, they must adopt a more systemic approach to collaboration both internally across functions and externally with partners. This means moving away from independent ways of working and actively fostering cross-functional and cross-organizational dialogue, joint planning, and shared accountability throughout the lifecycle of the business model. (Bocken et al. 2016, 314.) The shift from solo operations to scaled impactful CBMs requires organizations to adopt structured approaches to working with partners. These approaches involve formalized processes, shared goals, clear governance mechanisms, and long-term commitment. For example, companies may co-develop roadmaps for circularity with their suppliers or use digital platforms to enable transparency and data sharing across the chain. This ensures that all parties are aligned in expectations, responsibilities, and outcomes, ultimately improving the feasibility and impact of circular initiatives. (Korhonen et al., 2018, 44.)

2.2.3 Organizational barriers to circular business model innovation

On the organizational level, management's environmental awareness, lack of understanding of sustainability demands, lack of involvement of sustainability within company strategy, and the lack of internal capabilities and skills for CE are all factors that hinder CBMI (Urbinati et al. 2021, 553). Organizational barriers often stem from the misalignment of CBMs with current linear business

models and current goals. Companies can struggle to change their ways of doing things due to long ingrained ways of working, and complex hierarchies and organizational structure. Management's reluctance to take risks can also hinder circular business model innovation. (Ravi & Shankar 2005, 1012.) Many companies and their management will focus on short- and mid-term financial incentives, prioritizing immediate returns rather than long-term sustainability efforts. (Guldmann & Huulgaard 2020, 7; Lacy & Rutqvist 2015, 28.) CBMs operate at different timelines than traditional linear business models and are therefore not able to provide the same return on investment as linear business models within the same time frame. Thus, CBMs should be evaluated on different terms and parameters that have yet to be determined. Due to their longer timelines and the novelty of CBM studies, there is yet quite little evidence clearly demonstrating realized financial benefits of CBMs to motivate management towards circularity. (Guldmann & Huulgaard 2020, 7.)

Larger companies are more likely to face internal barriers to CBMI than smaller companies. Employees in larger companies can be reluctant to promote the idea of circularity, possibly due to lack of management support. (Bessant et al. 2014, 1287.) In some larger companies, employees also have a hard time navigating existing structures and values that are deeply rooted in linear business thinking. Many find it easier to continue familiar ways of working and possibly approaching circular business with smaller steps. Additionally incentive structures often promote linear models, through rewarding sales volumes instead of circular alternatives like service contracts. (Guldmann & Huulgaard 2020, 8.) Just as with consumer demand, employee demand can either drive or hinder the transition to CBMs by creating pressure from within the company. Employee education on circularity and the circular economy is therefore key. Especially in larger companies the push for change relies heavily on management and the message they send to their employees through company values, incentives, and working structures. (Todeschini et al. 2017, 768.)

2.3 Collaborative approaches to circular business model innovation

As CBMI demands growing collaboration across organizational and national boundaries, collaboration becomes more than a strategic advantage — it becomes a necessity. Therefore, the ways in which collaboration can be carried out needs to be explored. If not managed correctly, collaboration on CE business initiatives can become of the main challenges in implementing CBMs and potentially hindering their success. (Bigliardi & Filippelli 2021, 15.) Successful collaboration can be explained based on two aspects: collaborative processes and structures. Collaborative processes refer to the creation and maintenance of mutually beneficial relationships. These processes can be for example crucial relational competencies, such as trust-building, and developing effective communication

systems. In CBMI, collaborative processes are important to ensure that knowledge and resources are being shared for mutual gain. (Danvers et al. 2023, 3.) Collaborative structures on the other hand, are rules that are designed and updated during a collaboration. Controls have to be set for shared decision-making, power, financial risk, and return. (Dyer & Singh 1998, 669.) These formal structures are important in the development and holding together a collaboration (Danvers et al. 2023, 3).

To support companies in managing these processes and structures, several tools and frameworks have been developed. Among them, collaborative business models and open innovation stand out as particularly relevant for advancing CBMI. These approaches provide practical and strategic guidance on how companies can engage with external partners, pool complementary capabilities, and accelerate the transition toward circularity. Therefore, this study will focus on these two concepts as key mechanisms for enabling successful collaboration in CBMI.

2.3.1 Collaborative methods for innovation

Just like companies utilize CBMs to focus on CE, collaborative business models are a tool for companies to approach collaboration. These models offer a way to enhance organizational resilience and competitiveness in a resource-constrained world (Korhonen et al., 2018, 44). Collaborative business models are valuable for CBMI — promoting innovation by enabling organizations to share resources, knowledge, and capabilities with partners, thus creating more efficient and circular value chains. These models also foster flexibility and adaptability, which are crucial in a rapidly changing business landscape. Collaborative business models consist of various building blocks, with three primary types: sharing, specialization, and allocation, each offering unique approaches to value creation, capture, and delivery. Table 2 provides an overview of these models and their distinct characteristics. (de Man & Luvison 2019, 2.)

Table 2 Comparison of primary collaborative models (borrowed from de Man & Luvison 2019)

		Sharing	Specialization	Allocation
Value creation	Economies of:	Scale	Skill	Risk
	Capabilities	Similar	Complementary	Overlapping
	Relationship of partners	Horizontal	Diagonal	Vertical
	Value creation potential	Predictable	Unpredictable	Increased predictability
Value capture	Mechanisms	Pre-agreed split	Each partner carries own revenue/cost	Incentives tied to performance
Value delivery	Interdependence	Reciprocal	Pooled	Sequential
	Level of integration	High	Low	Focused

The sharing model creates value by combining similar capabilities to gain greater scale or network. These collaborations are seen as horizontal, meaning that they operate on the same level of the value chain. The benefits of working together can be quite easily predicted due to the ability to identify economies of scale. (Dussauge et al. 2000, 120-123.) In the sharing model, partners use a pre-agreed split to capture value. The value delivery requires managing the interdependence and level of integration needed to achieve the desired economies of scale, skill, or risk. In sharing collaborations, the involved companies' similar capabilities need to be coordinated simultaneously in order to achieve set goals and to be able to run the collaboration as a shared business. Joint ventures, for example use the sharing model. Joint ventures happen, when two or more businesses decide to pool in their knowledge and create a new separate company. (de Man & Luvison 2019, 3.)

The specialization model focuses on economies of skill. In this model the companies combine their complementary capabilities to create an innovative offering that neither partner could have done alone. Therefore, these partnerships are diagonal, involving partners from different businesses. In this case the value creation is harder to predict since learning is necessary, and innovation outcomes are hard to foresee. (de Man & Luvison 2019, 2-3.) When it comes to value capture, in the specialization model, both companies bear their own revenue and/or costs. Partners can develop their own resources separately, but resources are then combined to create a new customer solution. (Dussauge et al. 2000, 120-123.)

The third collaborative model, the allocation model is built around sharing risks. Value is created by allocating risk-related responsibilities between partners in an optimal way. The allocation model can be used when partners have overlapping capabilities, but one partner is more proficient at a certain activity. (Hwang 2017, 699-701.) The tasks related to this activity are then allocated to the more

proficient partner in order to lower the risks and create greater combined value. Residual risks, meaning risks that no partner can affect individually with their competencies, are shared jointly. Value creation is more predictable, since each partner focuses on what it knows best. (de Man & Luvison 2019, 2-3.) In the allocation model, the generation of value is dependent on how well the partners manage individual and joint risks (de Man 2013, 32). Partners have similar operational processes as in the specialization model, with added crucial handoffs between partners. Activities should be coordinated on a continuous level, focusing mainly on the tasks related to the handoff. The specialization model is seen as the most widely adopted of the three models, with companies leveraging complementary capabilities to drive innovation. (de Man & Luvison 2019, 2-3.)

2.3.2 Open innovation for circular business model innovation

As CBMs are often connected with multiple external organizations and players, stakeholders and their involvement must be considered in the innovation process. (Eisenreich 2021, 1-2.) Knowledge flows to and from the organization from these external stakeholders are extremely valuable. These knowledge flows are the basis of open innovation, defined by Chesbrough and Bogers (2014, 24) as “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries.” Its key concept is the involving of internal and external stakeholders in the innovation process (Eisenreich 2021, 1–2). In relation to circular business model innovation, this means creating a network of collaborative relationships with external partners or customers to improve the implementation of circular businesses (Bigliardi & Filippelli 2021, 15). Open innovation helps overcome challenges of CBMI such as scaling up resource use and finding use for excess resources. On the other hand, the challenge with using open innovation models is losing control over the process and organizational coordination costs and risks. (Bocken & Ritala 2022, 186.)

There are two different types of open innovation: inside-out and outside-in open innovation. Inside-out open innovation makes internal information and knowledge accessible to external sources, whereas outside-in open innovation integrates knowledge collected from others to the company’s own innovation process. (Vanhaverbeke 2014, 5.) Outside-in open innovation practices are seen as more favorable by companies. Outside-in practices can entail things like involving consumers and customers in the generation, evaluation or testing of new ideas for products or services. University research collaboration also falls under this category. (Lazarotti & Manzini 2009, 619-623.) Businesses can fund research projects in universities and therefore gain access to external knowledge. Outsourcing innovation problem solving through open calls to external organizations or individuals is also a form of outside-in open innovation. Inside-out practices can be for example joint venture

activities with external partners where knowledge and financial collaboration happens. A company can also sell their ready-made ideas to others and monetize their knowledge. Participating in public standardization activities helps shape industry standards and is also seen as inside-out open innovation. (Dorrego-Viera et al. 2025, 5-6.)

CBM logics of closing, narrowing, slowing loops have been combined with open innovation to identify three strategies for open innovation to support circular business model innovation: open-closing, open-narrowing, and open-slowing. Open-closing refers to closing loops by bringing resources from external ecosystems and bridging them in different ways to customer offerings. Open-narrowing refers to collaboration aiming to reduce the environmental footprint associated with a product, often with new technologies and processes. Lastly, open-slowing refers to extending the life of a product by partnering with external stakeholders. (Bocken & Ritala 2022, 186-189.) These open approaches to circular business models allow companies to bring in capabilities from outside their own business, allowing them access to knowledge and resources which would otherwise not be available to them.

To summarize, effective collaboration relies on both well-structured frameworks and dynamic relational processes that enable organizations to align goals, share risks, and co-create value. Collaborative approaches such as open innovation and different collaborative methods offer concrete strategies for pooling complementary capabilities and overcoming common barriers in CBMI. However, the complexity of circular transitions also requires engagement beyond the firm level. Multi-level collaboration across organizational boundaries, industry ecosystems, and institutional layers plays a critical role in scaling circular practices (UNECE 2023). By embedding collaboration into the core of CBMI efforts, companies can strengthen the feasibility of circular solutions.

2.4 Synthesis of literature review

This section brings together the key findings from the literature review to provide a preliminary overview of the research before moving to the empirical part of the study. Summarizing the key approaches to collaboration studied in the previous chapter, Table 3 presents the main forms of collaboration for CBMI based on CBMs and open innovation strategies. Their main characteristics, and how they contribute to value creation and capture are defined. These approaches highlight the variety of ways in which organizations can work together to drive circular business. Examples of possible use cases are also given.

Table 3 Forms of collaboration for CBMI and their key characteristics

Form of collaboration	Main idea	How value is created	How value is captured	Example
Sharing model	Partners with similar capabilities collaborate to scale operations	Economies of scale or network	Pre-agreed revenue or cost split	Joint venture between two manufacturers
Specialization model	Partners combine different strengths to innovate	Combining complementary skills	Each partner carries their own costs/revenue	Tech firm & recycler developing new product
Allocation model	Partners share or allocate risks based on who is best suited	Reducing and sharing risk for better results	Incentives tied to performance	Supplier takes over logistics in a circular project
Outside-in innovation	Company brings in ideas/knowledge from external stakeholders	Integrating external knowledge or technology	Depends on collaboration type (i.e. R&D, co-creation)	Partnering with a university for sustainable material research
Inside-out innovation	Company shares its own ideas or knowledge externally	Monetizing internal knowledge or shaping the ecosystem	Licensing, joint ventures, industry standards	Selling unused patents or joining standardization efforts

As can be seen from Table 3, collaboration for CBMI can take many forms depending on the goals, capabilities, and context of the parties involved. Collaboration can be through structured models or open innovation; however, the main idea is in building mutually beneficial relationships that enable resource efficiency, innovation, and shared value creation. Choosing the right form of collaboration is essential to unlocking the full potential of CBMs. It is also important to note that there are multiple external factors that affect collaboration on circular business initiatives.

Supportive regulatory frameworks, technological advancements, and growing market demand for sustainable solutions are seen as key enablers for collaboration in the field. However, there are also major barriers, including misaligned incentives, a lack of standardized processes, and resource constraints, which can hinder effective collaboration. While businesses can benefit from adopting structured collaboration models, their long-term viability depends on addressing both external and internal challenges that shape collaborations for CBMI. (De Man & Luvison 2019, 6-10; Leder et al.

2023, 17-19.) Building on the key forms of collaboration for CBMI, Table 4 summarizes the different barriers to CBMI on different levels mentioned in the literature review and how different forms of collaboration can help overcome these barriers.

Table 4 Overcoming barriers to circular business model innovation through collaboration

Level of barrier	Barrier	Form of circular collaboration to overcome barrier
Institutional	Regulatory misalignments	Cross-border specialization model – partners align on local regulations and share insights for navigating systems (Ranta et al. 2018)
	Weak or conflicting environmental policy	Open innovation – engage in joint policy dialogue or industry standards development with external stakeholders (UNECE 2023)
	Insufficient economic incentives for circular practices	Sharing model – joint ventures can pool resources to reach economies of scale and reduce cost risks (Guldmann & Huulgaard 2020)
	Lack of funding and support for CBM initiatives	Allocation model – distribute risk and funding burdens according to each partner’s strength (Bigliardi & Filippelli 2021)
	Limited consumer demand	Outside-in open innovation – co-develop products with customers to increase acceptance (D’Agostin et al. 2020)
	Cultural and cognitive resistance to circular products	Specialization model – combine technical and cultural expertise to tailor solutions to local consumer preferences (Pretner et al. 2021)
	Inconsistent institutional environments across borders	Specialization + open innovation – co-create solutions that reflect multiple institutional settings (Geng et al. 2019)
Market	Unclear or niche market demand	Outside-in open innovation – engage with users early for market co-creation and validation (Lazarrotti & Manzini 2009)
	High cost of circular solutions	Sharing model – reduce cost through joint infrastructure or service platforms (de Man & Luvison 2019)
	Volatility in supply of recycled materials	Symbiotic ecosystems (via open innovation) – build networks to stabilize supply through material sharing (Grafström & Aasma 2021)

Value Chain	Complexity of existing linear supply chains	Specialization or sharing model – redesign supply chains through trusted, jointly managed partnerships (Korhonen et al. 2018)
	Inadequate reverse logistics and take-back systems	Allocation model – assign logistical responsibilities to the more capable partner (Guldmann & Huulgaard 2020)
	Lack of standards and definitions for circularity	Inside-out open innovation – contribute to setting industry standards and increasing ecosystem alignment (Dorrego-Viera et al. 2025)
	High coordination costs for partner collaboration	Formal collaborative structures (e.g., JVs, consortia) – reduce ambiguity and share coordination responsibilities (de Man & Luvison 2019)
	Unreliable supply of secondary materials	Symbiotic ecosystems / open-closing – connect with networks that reuse and exchange materials (Bocken & Ritala 2022)
Organizational	Path dependency and resistance to change	Internal collaboration + open innovation – cross-functional and external co-creation challenges old routines (Guldmann & Huulgaard 2020)
	Misalignment between circular goals and short-term profit logic	Allocation model – separate high-risk/low-return circular activities and assign them to suitable partners (Bocken & Ritala 2022)
	Risk aversion	Specialization or allocation model – distribute innovation risk across partners with different tolerances (Bigliardi & Filippelli 2021)
	Lack of internal capabilities	Specialization model – complement internal weaknesses with external partner expertise (Fehrer & Wieland 2021)
	Fragmented internal collaboration	Internal circular collaboration – foster shared values and incentives across departments (Todeschini et al. 2017)

At the institutional level, CBMI is often hindered by regulatory misalignments, limited economic incentives, and a lack of coherent policy frameworks. For example, strict or outdated regulations may restrict the reuse or remanufacture of products, while conflicting legislation across countries adds further complexity for companies operating internationally (Ranta et al. 2018, 72). Moreover, the limited availability of funding or policy-driven support can stall the development of circular models (UNECE 2023, 13). Collaborative models can help overcome these barriers. Specialization models, in particular, allow firms from different institutional contexts to align and complement one another.

For example, Finnish firms bringing circular expertise and their U.S. counterparts offering scale and capital. Open innovation models, especially when applied through industry-wide dialogue can advocate for policy change and aligning standards across borders. Additionally, collaboration with consumers (outside-in open innovation) can help address societal skepticism or cultural resistance to circular products by engaging end-users in the design and validation process, improving acceptance and demand (D'Agostin et al. 2020, 8).

Despite growing awareness of sustainability, the market for circular products remains relatively undeveloped. Unclear or weak demand, higher costs associated with circular solutions, and price sensitivity contribute to market uncertainty (Guldmann & Huulgaard 2020, 6). These factors are particularly challenging for smaller firms seeking to scale innovations. Collaboration again provides a strategic solution. Sharing models (i.e. joint ventures) can be used to reduce costs by pooling infrastructure or scaling operations across partners. Meanwhile, outside-in open innovation can help shape the market by involving customers early in product development or identifying unmet needs that circular products or services can fulfill. For securing a stable supply of recycled or secondary materials, companies can build symbiotic ecosystems through collaboration with other actors in the value chain, mitigating material volatility and supporting long-term market development (Grafström & Aasma 2021, 6).

Perhaps the highest barriers can be found within the value chain. Existing supply chains are often optimized for linear models, and transitioning to circular operations can be complex and costly. There may be a lack of reverse logistics, limited traceability of materials, and an absence of standardized circularity metrics (Korhonen et al. 2018, 44). Collaborative business models, especially sharing and specialization models can enable companies to restructure value chains collectively. For example, responsibilities for reverse logistics can be assigned to the partner with the strongest logistics capability (allocation model), while design or manufacturing can be handled by the partner best suited to those tasks. Additionally, inside-out open innovation can help shape value chain standards by contributing knowledge and aligning ecosystem actors around common practices (Dorrego-Viera et al. 2025, 6).

External factors are not the only ones hindering CBMI; internal resistance is also a key barrier. Organizational complacency, lack of circular capabilities, and an overemphasis on short-term financial returns often prevent companies from committing to holistic circular transitions (Bocken & Ritala 2022, 186). Additionally, fragmented internal coordination especially in larger companies can make it difficult to implement circular strategies that cut across departments. In these

cases, specialization models and open innovation offer effective responses. By partnering with actors who bring in complementary capabilities, companies can compensate for internal skill gaps and accelerate learning (Fehrer & Wieland 2021, 612). Internally, circular collaboration between departments can facilitate cross-functional cooperation. Allocation models, where risks and responsibilities are shared based on each partner's strengths, are particularly useful when circular innovations carry uncertain returns. These models help companies experiment with circular business models without exposing the entire organization to unnecessary risk.

3 Research design

The aim of this chapter is to present how the empirical part of this study has been carried out. The empirical part aims to provide an overview of circular collaboration between Finland and the United States and how it can be strengthened. First, a qualitative research approach is showcased and justified. Then primary expert interviews and secondary data collection are discussed as well as the data analysis methods used for both. Finally, the research is evaluated based on qualitative research trustworthiness criteria and research ethics.

3.1 Qualitative research process

Research methods are usually divided into qualitative and quantitative approaches (Eriksson & Kovalainen 2008, 16-17). A qualitative approach was chosen over a quantitative one for this study. Qualitative business research allows the research of business phenomena within their real-world contexts. It generates new insights into why businesses operate in certain ways, and how business phenomena can be understood to drive change. (Eriksson & Kovalainen, 2008, 2) This research does not aim to provide scientifically and statistically verified evidence on the role of collaboration in CBMI, but rather to gain insights of perceptions of the topic from real-life examples. Qualitative research is therefore suitable for this research, because it focuses on peoples' thoughts and observations rather than numbers. Qualitative research studies social and cultural factors, aiming to understand the deeper, often more complex aspects of an issue (Silverman 2001, 29). Given that this research focuses on a complex phenomenon: understanding different points of cross-border collaboration and circular business model innovation, gaining insights into observations and perceptions from experts on the matter is crucial (Eisenhardt 1989, 535). Since prior studies around this topic are limited, the aim is to be able to provide valuable insights for future research as well as an overview for managers looking to implement circularity into their business models. The findings are therefore intended to serve as a starting point for further exploration rather than conclusive results. By highlighting emerging practices and perceptions, this research contributes to building a foundation for more targeted studies in the future. The operationalization table of this study is presented in Table 5.

Table 5 Operationalization table

Research question	Sub-questions	Links to theory presented in the thesis	Key themes in analysis of primary and secondary data
How can cross-border collaboration help overcome barriers to circular business model innovation?	What are the key barriers to circular business model innovation?	Circular business model innovation, external and internal influencing factors	Regulation, funding, market demand, internal skills
	What different collaborative approaches can drive circular business model innovation?	Collaborative business models & open innovation	Trust, shared goals, specialization, open knowledge flows
	How can cross-border collaboration be strengthened to effectively support circular business models?	Mechanisms and enablers for collaboration	Complementary strengths, public support, trust & co-creation

The operationalization table provides a clear overview of the research in a table format. It presents the main research question of the thesis and divides it into the three different sub-questions. Each sub-question is linked theory sections presented earlier in the thesis and to themes recurring in the analysis of both the expert interviews and secondary data. The following sections will dive deeper into the research methodology of this study by explaining how the data for both the primary data and secondary data was collected and analyzed.

This research utilizes two different types of empirical data for data collection and analysis to gain deeper knowledge around the topic. First, expert interviews were conducted in order to gain first-hand experience and knowledge on collaboration between Finland and the U.S. in circular business model innovation from different experts. Second, to fill in possible gaps from the expert interviews, a set of secondary data was collected and analyzed. This additional data helped strengthen the analysis by providing additional insights into company-level activities and collaboration efforts that could not be captured through interviews alone.

3.2 Primary expert interview data

3.2.1 Data collection

Primary data was collected for this study through expert interviews. Primary data is data that is produced for the purpose of the research that it is presented in (Hirsjärvi et al. 1996). Expert interviews were chosen as the data collection method for a few reasons. Expert interviews focus on the expertise of the interviewee within a certain area, in this case CBMI and cross-border collaboration between Finland and the U.S. (Meuser & Nagel 2009). Due to there being scarce prior scientific literature on the topic, especially regarding collaboration between Finland and the U.S., expert interviews were an ideal way to obtain information on the topic. Interviews are common in qualitative research, due to their purposeful interaction for data collection, where both the interviewer and interviewee influence each other (Eskola & Suoranta 1998, 85).

The participants for the interviews were carefully selected by the researcher. The participants were chosen with a focus on the individuals' relevant experience and knowledge of the phenomenon studied (cf. Tuomi & Sarajärvi 2009, 85). Both Finnish and U.S. views were wanted in terms of circular business model innovation and views on cross-border collaboration. For finding the right interviewees a so-called snowball technique was used, where initial participants help find suitable future participants from among their networks. Experts often have vast network in the field and are aware of other potentially fitting interviewees that they were able to recommend to the researcher. (Bogner et al 2009, 2.) The chosen interviewees were expert professionals in their field, with their competence and knowledge being the most important factors (cf. Holstein & Gubrium 1995, 21). By using the snowball technique, the researcher noticed that the same names were being repeated by several interviewees and therefore can conclude that they were perhaps the best suited for this study.

In total four experts we interviewed for this study. The number of experts interviewed was left rather limited because earlier planned interviews with MNEs were not conducted. The initial plan included interviewing MNE management about their experiences with cross-border collaboration between the two countries. A handful of companies had been suggested by the interviewed experts. However, all contacted companies declined to participate, either due to uncertainty surrounding circular activities in the U.S. with the new administration or because they felt their circular business models were not yet developed enough to confidently discuss in an interview. Table 6 presents the participants of the interviews with their descriptions and interview specifics.

Table 6 Introduction of interviewees

Interviewee	Expertise	Date of interview	Duration of interview	Language of interview
Senior Consultant	Senior advisor in cleantech and bio-circular industries for Finnish companies in the U.S.	17.3.2025	31 minutes	Finnish
Head of Decarbonizing Industries	Expert in sustainable business and innovation, specializing in circular economy and international growth strategies for Finnish companies	24.3.2025	59 minutes	Finnish
Managing Director, North America	U.S.-based senior sustainability consultant with experience in circular economy partnerships and innovation	2.4.2025	62 minutes	English
Senior Advisor, Clean Tech, Bio and Circular Economy	Clean tech expert attracting U.S. companies in expanding to Finland through circular and low-carbon solutions	15.4.2025	70 minutes	English

To protect the confidentiality of the participants along with good scientific practice, names and represented companies are not disclosed in this study. However, their industry, position as well as expertise are described. The Senior Consultant is an experienced advisor based in Los Angeles, California specializing in cleantech and bio- and circular industries, supporting Finnish companies in entering and growing in the U.S. market. With extensive experience in business internationalization and sustainability transitions, they offer valuable insights into the practical challenges Finnish companies face abroad. The Head of Decarbonizing Industries based in Helsinki, Finland is an expert in sustainable business and innovation with a strategic focus on the circular economy and the global scaling of circular solutions. Their knowledge of national policy priorities as well as private-sector

development makes their perspective especially relevant to understanding Finland's role in the circular transition. The Managing Director for North America, based in Austin, Texas is a senior U.S.-based sustainability consultant with hands-on experience in circular economy innovation and partnerships. Their expertise supports the study by providing a U.S. market perspective on collaboration mechanisms, barriers, and enablers. Finally, the Senior Advisor for Clean Tech, Bio and Circular Economy based in Washington D.C. works to attract U.S. companies to expand into Finland using circular and low-carbon solutions. With deep knowledge of market positioning, clean technology, and cross-border business incentives, they contribute important insights into bilateral collaboration potential. Together, these experts offer both strategic and operational views that are well-aligned with the study's aim to examine how collaboration between Finland and the U.S. can help overcome barriers of CBMI.

All participants were reached out to through email to ask for participation in the study. An overview of the study was given as well as the themes of the interview and data privacy information. Interviews can be held in person or through phone calls or emails for example, and they can either be individual or group interviews (Eriksson & Kovalainen 2008, 78). The interviews for this study were all individual interviews conducted through video calls due to the interviewees' being in different countries and time zones than the researcher. The interviews were held on Microsoft Teams, enabling video call discussions for the most natural feel possible. The interviews were recorded with consent from the interviewees in order to best analyze the data and let the researcher focus on best guiding the interview when it was held. Notes were taken during the interview as backup in case of technical difficulties with the recording. It can be noted that no technical difficulties arose during the interviews or in the recordings. The conducted interviews lasted from 31 minutes to 70 minutes and were held in March and April 2025. The interview language for two interviews was Finnish and for two English.

The format of semi-structured interviews was chosen for this study. Semi-structured interviews follow a set of predetermined questions, however leaving room to explore some topics further and allowing flexibility in the conversation. Since the interviews were conducted with varying experts it was seen best that the conversation could flow in different ways depending on the interviewee's expertise while still following a pre-set guideline of questions to ensure that all topics were covered. The questions asked in the interviews were open-ended, allowing for a wide range of responses and for the interviewees' own viewpoints to arise. (cf. Metsämuuronen 2006, Kovalainen & Eriksson 2003.) The interview guide is listed in Appendice 1, where the utilized interview questions can be found. Some questions were left unanswered due to the interviewee's specific expertise and many

sub-questions were answered by the interviewees in their answers, therefore not needing the specific question to be asked.

The challenges of interviews were also considered in the decision-making process for the data collection method. Interviews require extensive resources, such as time and preparation, and therefore it was crucial that the right experts were interviewed for successful data collection. Interviews can also pose the challenge of misunderstandings in the conversation, which can be due to factors such as the interview language or different understandings of terminology. The interviewer also plays a determining role in how well data is collected through an interview by being able to guide the conversation. (Tuomi & Sarajärvi 2018; Hirsjärvi et al. 1996, 201–203.)

3.2.2 Data analysis

After the interviews, the interview recordings were repeatedly watched to ensure accuracy and familiarity with the content. The interviews were transcribed using the built-in Microsoft Teams function to ensure the most efficient and consistent transcriptions. To avoid any possible language barriers and to allow the interviewees to express themselves naturally, the interviews were held in each participant's native language. Thus, two of the interviews were held in Finnish and two in English. The interviewer is fluent in both languages, so this caused no issues or possible misinterpretations. To maintain consistency in the analysis, the Finnish transcripts were later translated by the author into English, creating a unified dataset for the analysis.

A thematic analysis method was used to analyze the collected data. This method was chosen to systematically interpret the expert interviews and identify any recurring themes. Thematic analysis is a widely used method in qualitative research for identifying, analyzing, and interpreting patterns of meaning. In thematic data analysis, topics and patterns are identified that come up in the interview transcription. Since the interviews produced a large amount of data on a complex topic this was seen as the most adequate method. Thematic analysis is seen as a good tool to find links between answers and uncover possible new insights arising from the data, especially from large amounts of data like interviews. (Eskola & Suoranta 1998, 151–153.).

The analysis began with a process of manual coding of the transcribed interviews. The researcher read through the transcripts several times to become deeply familiar with the content. During this process, segments of text that appeared relevant to the research topic were highlighted and labelled as initial codes. Codes are the first units of analysis identified, capturing potentially relevant information in regard to the research (Clarke & Braun 2017, 297–298). Codes were primarily data-

driven, but theoretical findings from earlier chapters led to ideas such as the three levels of barriers to CBMI, or specific collaborative approaches. After the coding, related codes were grouped together into themes, which are larger concepts with shared core ideas (Clarke & Braun 2017 , 297–298). These themes were determined by the researcher based on their relevance to the research question, ensuring that the final analysis reflected both the diversity of the interview data and the study's aim. This approach ensured that both new emergent insights and expectations from theory were identified. The final two themes were:

1. Barriers to CBMI in Finland and the U.S.
2. Strengthening cross-border collaboration for CBMI between Finland and the U.S.

These themes were refined iteratively. Originally there was a separate third theme on collaborative approaches but seeing as the data overlapped heavily with the second theme, they were combined into one to ensure a better flow of the findings. After the themes were finalized, the researcher wrote analytical summaries for each, integrating quotes from the data to illustrate findings and support interpretation. The analysis was continuously informed by the research questions, as well as the theoretical framework developed earlier in the thesis, ensuring a link between data and theoretical discussion.

3.3 Secondary document data

3.3.1 Data collection

To further deepen the knowledge on the topic and complement the data obtained from the expert interviews, secondary data was collected. Secondary data, in contrary to primary data, is data that has already existed prior to the study and therefore was not produced or influenced by the researcher (Silverman 2006). Although the collected data was not produced for the aim of this study, it was repurposed to fit this study. Secondary data was able to provide a higher level of detail and numerical data, that the interviews can only provide estimates of (Saunders et al. 2016). Moreover, given the limitations of resources, it was more practical and effective to use data already produced by field experts than to attempt generating comparable material independently. Consulting these relevant documents helped provide more accurate and comprehensive input for addressing the research question. The data was also not restrained by time and location, so it was easily accessible for the researcher. Lastly, secondary data was also used to verify and contextualize data collected from the expert interviews with existing research and documentations.

For this study, the data collected was three reports, one recorded webinar, and a press release, produced by official, reliable or established institutions. These institutions were the Technical Research Centre of Finland (VTT), The Ellen McArthur Foundation, the Embassy of Finland in the U.S and Huhtamäki. The sources used are presented in Table 7. Further detail with links can be found in Appendix 2.

Table 7 Introduction of secondary data sources

Source title	Publisher	Type	Date published
Sporting Kansas City Teams Up with Huhtamäki to Make Children’s Mercy Park Zero Waste	Huhtamäki	Press Release	17.4.2023
USA Circularity Index 2024	INDEED Innovation	Report	2024
Circular Economy Outlook Nordics 2024	Nordic Circular Hotspot	Report	2024
An Innovation Pathway to Decarbonization: Circular Economy Solutions for Policymakers and Industry in the U.S.	Ellen MacArthur Foundation & Oliver Wyman	Report	2024
Finland–US Cooperation on Clean Technologies and the Circular Economy of the Future	Embassy of Finland in the U.S.	Webinar	2020

These sources were chosen for their direct relevance to the topic of the study. The Huhtamäki press release was chosen to verify an interviewee’s comment and provide more context to it. The USA Circularity Index report was suggested by an interviewee as a relevant report to support the interview. The other three sources were selected through desktop research. Internet searches were conducted with i.e. the following keywords: “U.S.-Finland circular business collaboration” and “U.S. (or) Finland circular business model innovation”. Each result was reviewed based on its source credibility, publication date, geographical relevance, and thematic alignment with the study. More recent publications (2020–2024) were preferred to ensure topicality. These documents and webinar enriched

the study by offering macro-level views and practical case examples to interviewee answers, strengthening the triangulation of findings and deepening the overall analysis.

3.3.2 Data analysis

For the data analysis of the secondary data qualitative content analysis was used. Qualitative content analysis is often used when dealing with rich data that requires interpretation, such as the sources used in this study. It is a method for describing the meaning of qualitative material in a systematic way. Unlike purely quantitative content analysis, the qualitative approach focuses on interpreting broader meanings. (Mayring 2014.) The method involves multiple steps including defining the coding frame, segmenting the material, assigning text segments to categories, and interpreting patterns within the material (Schreier 2012, 1-4). In this study, the themes that emerged from the expert interviews: barriers to CBMI, and strengthening cross-border collaboration, both with a focus on Finland and the U.S., served as a deductive framework for reviewing the sources (c.f. Elo & Kyngäs 2008).

The selected documents were carefully read through and the most relevant parts for this study were highlighted manually, with the help of color coding to assign them to each of the three themes. For the webinar recording, the video was first transcribed and then analyzed like the other documents. The highlighted parts were color-coded based on the different themes they could be put under. The analysis focused not only on identifying supporting evidence for themes raised in the interviews but also on triangulating findings bringing out new insights from the data sources. To help the comparison and synthesis between the primary and secondary data, the highlighted materials were then simplified, and the key points from each source were summarized. These summaries were later compared and integrated with one another in the findings section of this thesis.

3.4 Evaluation of the study

There are different frameworks for assessing the quality of a study. The quality of this research is assessed based on Lincoln and Guba's (1985) framework for trustworthiness, since it is especially adapted to qualitative studies. Trustworthiness can be explained as being able to persuade the audience to believe that the findings of a study should be taken into account. To assess the trustworthiness of this study, Lincoln and Guba's (1985) framework utilizes four criteria: credibility, transferability, dependability, and confirmability.

Credibility, alternative to internal validity, ensures that the research findings accurately represent reality (Merriam & Tisdell 2015). For research to be credible, any other researcher should be able to

come relatively close to the same findings based on the materials used in the research. One has to also consider the researcher's level of expertise in the field and whether the data collected is adequate to support the claims made. (Eriksson & Kovalainen 2008, 294.) To increase the credibility of my research, I familiarized myself with the research topic by doing in-depth research on theoretical as well as practical literature over many months. This was done in addition to my multiple years of experience both in studies and work around the field of business model innovation, circularity as well as cross-border collaboration. To further ensure credibility of this research, data triangulation was used by gathering information from multiple sources and theories. Primary data was collected through expert interviews and secondary data through reports, industry publications and expert talks to validate and cross-check the findings. With data triangulation, the risk of single source bias is reduced (Lincoln & Guba, 1985). The data analysis was also guided by theoretical concepts as seen in the operationalization chart, ensuring the alignment between the research questions and the empirical findings.

Transferability refers to the similarity between a given research and any other research, so that the causal relationships found in the research should be transferable to other theoretical contexts. (Lincoln and Guba 1985, 298.) The research approach and both the data collection and analysis process are thoroughly discussed to maximize transferability. The empirical part of this study is country specific which makes the transferability of the findings harder to other contexts. However, the literature review focuses on the role of collaboration in circular business model innovation in general, and the conclusions made in the synthesis can be easily utilized in another setting. The empirical study can also be used as a blueprint for possible future studies on the topic in regard to other countries or regions. The findings can be especially useful for similar collaborations, for example between other Nordic countries and the U.S.

Dependability is described as how logical, traceable and documented the research process has been (Eriksson & Kovalainen 2008, 294). The research was transparent, with a clear research methodology having been documented. The data collection and analysis methods have also been transparent, making the research easily traceable for other researchers. An iterative approach was used, in which themes were regularly examined and improved in face of new empirical findings. This guaranteed flexibility without sacrificing the reliability of the research. Interviews are however seen as a subjective form of primary data, since their interpretation is influenced by the researcher's perspective, and the questions asked reflect the researcher's own framing and thought process. All interviews were recorded and transcribed, and while spoken language can sometimes be prone to misinterpretation, the deliberate steps were taken to ensure accurate understanding of each answer.

Given the researcher's fluency in spoken and written English and Finnish, the translation process from Finnish to English is not expected to have altered the original meanings of the interviewees.

Lastly, *conformability* is seen as the idea that the data and findings of the research are not just imagination. It is about linking findings to data in a way which is easily understandable and accessible to others. (Eriksson & Kovalainen 2008, 294.) Here again, data triangulation increases conformability because it minimizes personal bias. The empirical data for this study was gathered through primary expert interviews and publicly available secondary sources. While the secondary data can be freely accessed, the full interview transcripts will not be published and are available only through the researcher. Therefore, the findings of this study can only be partially verified by other researchers. However, the findings are supported with detailed explanations, and the interview themes are included in the appendix to enhance transparency.

3.5 Research ethics

High ethical research standards were adhered to throughout the research and design of this study. Multiple ethical codes and principles have been set for research. Their aim is "to protect participants and researchers, minimize harm, increase the sum of good, assure trust, ensure research integrity, satisfy organizational and professional demands, and cope with new and challenging problems from concern to conduct." (Aluwihare-Samaranayake 2012, 62.) Regarding the interviews conducted for this study, the following decisions were made to ensure ethical procedure. All participants were given clear information on what participating in the research would involve and then letting them decide whether they wish to participate or not. Participants also had the chance to withdraw from participation at any time if they wanted to. Interviewees were sent data privacy forms which stated how the collected data would be handled and where it would be stored. Finally, the exact identities of each participant were not disclosed; only information relevant to this study to prove their credibility as expert interviewees.

The secondary sources used in the study were public documents, reports, and recording ensuring that no breaches of confidentiality or unauthorized access to sensitive information occurred. (Shaw 2008, 404–405.). Data triangulation was used to minimize the possibility for bias, by analyzing different types of data sources and only using internationally reliable sources. Transparency in reporting is also a critical aspect of research ethics (Resnik 2011, 3). Throughout all of the study, clear citations are provided to acknowledge all sources of information used, ensuring academic honesty. The findings are presented in a clear way, avoiding any misrepresentation or exaggeration, therefore, remaining accurate to the data and context in which they were obtained. The limitations of the study are also

acknowledged openly, allowing readers to have a holistic view of the strengths as well as the constraints of the study. Artificial intelligence was not used to produce this study. However, the help of artificial intelligence tool DeepL was used to translate the abstract of the study into Finnish as well as to check the final version for any grammatic errors.

4 Findings of the empirical study: Finland-U.S. context

In this chapter, the findings of the empirical data analysis are presented. The chapter is sectioned according to the following two themes identified in the data analysis process: barriers to CBMI in Finland and the U.S. and strengthening cross-border collaboration for CBMI between Finland and the U.S. Section 4.1 outlines both the internal and external barriers of circular business model innovation in the same way as in the literature review. Section 4.2 focuses on the success factors and improvement strategies for circular cross-border collaboration, particularly in a Finnish-U.S. context.

4.1 Barriers to circular business model innovation across borders

The key barriers to CBMI in Finland and the U.S. identified in the interviews and secondary data span across the institutional and market, value chain and organizational levels. Some barriers are shared between the two countries whereas some are distinct from one another. Despite growing momentum, multiple barriers continue to hinder CBMI, especially highlighted in the U.S. context. The barriers identified have been gathered into Table 8 below.

Table 8 Barriers to CBMI identified in Finland and the U.S.

Level of barriers	Barriers identified
Market & institutional	Fragmented regulations and lack of enforcement Unstable incentive structures and fluctuating policy environment (U.S.) Absence of universal standards and metrics for circularity Lack of regulatory clarity within and across states (U.S.) Uncertain funding and political support (U.S.) Economic uncertainty and weak business case for circularity Lack of customer demand / market readiness Reluctance to act without regulatory pressure
Value chain	High cost and complexity of circular transformation Protectiveness over IP, limited openness to collaboration (U.S.) Weak trust between partners
Organizational	Legacy systems and resistance to change

	<p>Circularity not integrated into operations or KPIs</p> <p>Lack of internal clarity and formal commitments</p> <p>Circularity isolated in sustainability departments</p> <p>Lack of management support and cultural prioritization (U.S.)</p> <p>Underdeveloped market-specific capabilities (Finnish companies in U.S. market)</p>
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Regulations play an important role in either hindering or driving CBMI. For example, emission reduction targets linked to EU regulations serve as a major driver for CBMI in Finland. This is largely to their being consequences and sanctions from the EU if the regulations are not met. In contrast, the U.S. presents a more fragmented regulatory landscape. While 67% of major U.S. companies have committed to Net Zero by 2050, only 35% are actively transforming their business models towards circularity, indicating a gap between policy commitments and company strategies.

Incentive structures, specifically in the U.S. are often unstable. The fluctuating policy environment and short-term tax credits in the U.S. discourage long-term investment in circular initiatives. The recent and unpredictable political changes in the U.S. have caused funding for sustainability and circular projects to become uncertain. This is in contrast with the previous U.S. administration, where sustainability and circular projects were prioritized and pushed forward. Since the U.S. regulations and support for circular initiatives varies largely between states, this can cause confusion for many non-American companies and even local ones. For example, even the different counties within a state like California have very different recycling and waste management regulations.

The absence of universal standards and metrics for circularity are continuously mentioned as barriers. Many businesses face difficulties in evaluating the effectiveness of their circular strategies, quantifying their advancements and communicating their success credibly. Many businesses in the U.S. only think of sustainability and circularity as an afterthought rather than as a core value.

“Companies are struggling with how to define success in circularity. What metrics do you track? How do you prove it to regulators or investors? That ambiguity is a real barrier.”
(Managing Director, North America)

The possible lack of clarity, internal resistance and legacy systems can make CBMI difficult. Many sectors still remain ingrained in their old linear production logic. Only 5% of companies in the U.S. have specific circular economy target dates, and 55% lack any formal circular commitments. Established businesses also tend to resist change due to optimized legacy systems. Large corporations

have systems and processes fine-tuned for the current model, making transformation both resource-intensive and strategically risky. In the Nordics, almost a third of companies also feel constrained by existing linear business models. The lack of standardized frameworks for circularity performance assessment further challenges circular business model implementation. While many companies might publicly commit to CE goals and sustainability strategies to please their stakeholders, in practice, circularity often lacks operational integration. This means that CBM principles are not embedded into the day-to-day functions, or performance metrics of core business operations. Instead, circularity remains isolated within sustainability or marketing departments, rather than being scaled across the organization.

Particularly in industries that lack regulatory enforcement, like the textile industry, companies are often reluctant to act until legally obligated to do so. Cultural attitudes also vary between countries, and whereas in Finland, sustainable organizational culture is seen as a driver for circular business model innovation, in the U.S. circularity often lacks the same kind of management support.

“In the U.S., sustainability and circularity are often positioned as appealing and expected in public discourse, yet in practice, they may remain secondary considerations.” (Senior Advisor, Clean Tech, Bio and Circular Economy)

Unlike in Finland, where open innovation and collaboration are more normalized, U.S. companies tend to be more protective of their intellectual property. This is seen to be caused by a more competitive market. In Finland on the other hand, companies often underestimate the need for market-specific sales skills and power. Finnish companies often believe that strong products will sell themselves without investing in local relationships. However, especially in such a competitive market like the U.S., companies must be able to sell themselves and build business networks.

One of the main barriers identified in both countries is the high cost and complexity associated with adopting new circular practices. The number one barrier seen by Nordic companies to circular business is uncertain business cases. Over a third of companies find it challenging to justify the business case for circular strategies due to uncertainties. Many companies also face economic uncertainty related to circular business model. If something is not economically viable, it is hard to be ecologically viable either.

4.2 Strengthening cross-border collaboration

Cross-border collaboration is essential for advancing circular business model innovation, especially due to the interconnected nature of value chains. However, it is also seen as something challenging.

This is highlighted in the fact that 19% of Finnish companies emphasize a lack of partners as a significant barrier to circular business models. There is seen to be potential for cross-border collaboration between the U.S. and Finland, particularly in sectors such as sustainable packaging, bioeconomy, and clean tech. Finnish companies are perceived as credible and trustworthy partners by U.S. companies, who are looking for stability and transparency in their partners.

Effective collaboration often requires mutual learning and continuous engagement. This highlights how collaboration is not only a tool for market access but a key enabler of innovation itself. However, practical examples of collaboration, particularly focused on circularity between the two countries, remain limited. There is a gap between interest and implementation for these initiatives. Only 35% of U.S. companies are actively transforming their business models for circularity, indicating potential challenges for collaboration due to differing levels of commitment between the U.S. and Finland, where the number is much higher. In Finland 83% of companies indicate that circular economy is included in their business strategy to at least some degree.

There are a few promising examples of collaborations between the two countries' companies. Finnish packaging company Huhtamäki's collaboration with a Major League Soccer stadium in Kansas City involves efforts toward zero-waste and circular packaging. In 2023, Huhtamäki's North America branch launched a collaboration with Children's Mercy Park stadium, home of the US Major League Soccer team, Sporting Kansas City. The five-year deal aims to reduce the stadium's environmental footprint with the goal of zero waste by 2027. The two companies work together by providing Huhtamäki's recyclable or compostable packaging for consumers at the stadium. Sporting Kansas City also aims to introduce composting depositories at other soccer facilities operated by the club, while also emphasizing strategic messaging campaigns to educate consumers on circularity. In Finland, Business Finland's Veturi program, providing funding for internationally operating companies, is a potential opportunity for U.S. companies to engage in Finnish circular initiatives, although with limited access to funding unless registered in Finland. This could give U.S. companies a chance to become part of the circularity roadmap that Finland is developing and therefore be a useful tool for fostering future collaborations.

Successful cross-border collaboration depends heavily on local conditions. This means that circular economy solutions cannot simply be exported. There needs to be a local problem that it is solving for there to be a need in the market. For collaboration to succeed, there must be a clear local demand, along with societal or governmental will to implement circular practices. Without this, even the most advanced technologies can fail to gain traction. For example, some Finnish solutions often appear too

advanced for current U.S. market local needs due to the different levels of awareness around circularity.

Successful cross-border collaboration also often requires long-term relationship building and soft diplomacy.

“It's not just about showing up with a great product—it's about understanding local politics, community values, and embedding circularity in a way that resonates.” (Senior Advisor, Clean Tech, Bio and Circular Economy)

Collaboration for CBMI is particularly impactful when it enables shared experimentation and co-learning across borders. Joint pilot projects and innovation collaboration allow companies to adapt solutions to different regulatory and cultural contexts, strengthening local knowledge. Public sector support is also seen as important driver of collaboration for CBMI. In Finland, companies are actively supported by public funding instruments like Business Finland in their research and development efforts, enabling them to invest in long-term development of circular initiatives. This includes initiatives focusing on for example bio-based materials and the scaling of circular innovations. The alignment between public sector goals and innovation opportunities is strong. In the U.S. for example, Los Angeles is aiming for zero waste upcoming Olympics, which is predicted to provide new opportunities for circular innovations in the area and related to the event. Even public procurement practices in major U.S. cities, such as San Francisco and New York, are beginning to include circularity requirements, offering new opportunities for circular innovators. Cities have started favoring vendors with concrete circular strategies, creating incentives for early-stage innovation.

Collaboration platforms that support matchmaking between public institutions, companies, and research actors are identified as essential mechanisms for unlocking for advancing collaboration. For example, Business Finland's international visits and the Nordic Circular Summit have been instrumental in fostering international connections. Trust and transparency between partners are highlighted particularly in sharing business models and cost structures, where companies are sharing sensitive information. In international partnerships cultural adaptability is key. This means for example respecting differences in communication styles or ways of doing business. Long-term commitment is also required from collaborating parties. Building circular projects take time and take into account long-term benefits over short-term ones. Furthermore, the need for open innovation and transparency is highlighted in the findings, particularly when engaging with complex global value chains.

Beyond institutional drivers, market forces are seen as key drivers for CBMI and collaboration on circular projects. This was especially emphasized in sectors like packaging, where consumer and corporate demand for sustainability is strong. Investor expectations are also rising in terms of sustainability and circularity. Customer pressure is listed as the third most common driver of circular activities for Nordic companies with consumers showing this through their consumption choices.

“Investors are starting to ask harder questions about resource use and end-of-life impact, especially in sectors like tech and consumer goods.” (Managing Director, North America)

Resilience is highlighted as a key driver on the value chain level. The growing scarcity of resources and the need for increased resource efficiency is pushing companies towards circularity and collaborating with value chain partners to secure resources. The demand for textile fiber is for example already exceeding the available supply, emphasizing the urgency to find alternative circular solutions.

“It (circular business model innovation) is not always about green values—often it's about risk management, autonomy, and access to materials.” (Head of Decarbonizing Industries)

Looking ahead, the outlook for cross-border collaboration between Finland and the U.S for CBMI is uncertain. The outlook in general remains cautiously optimistic and context dependent. The U.S. is identified as a market with potential, but also with notable limitations. While interest in CBMs is increasing, the U.S. remains "at a very different level" compared to Finland in terms of readiness for change. Circular initiatives are often regional and fragmented, and in many cases, there is no societal will for CBMs. While the U.S. market, particularly liberal states like California, are interested in sustainability, there are still many systemic challenges to overcome. CE and CBMs remain in their early stages compared to sectors like clean energy, which are already market-driven and more mainstream.

On one hand, there is growing recognition of Finland's leadership in circularity, especially among internationally oriented U.S. firms. Finnish companies are increasingly recognized abroad for their sustainable and circular solutions. Many foreign companies are drawn by Finland's sustainable approach, Finland's commitment to carbon neutrality, and the country's stable infrastructure and educated workforce. Finland's advanced expertise in circularity is a clear strength, that is recognized abroad. Finnish solutions are often far ahead of those currently being considered in the U.S. for example. This technological maturity offers competitive advantages in emerging markets like the state of California, where global visibility events such as the upcoming Olympics could accelerate adoption of circular solutions. In the U.S., while the overall pool of companies is not as circularity

oriented as Finnish ones, we are seeing increasing interest in circularity. For example, companies like AT&T exemplify leadership by implementing comprehensive take-back programs of electronic products. The company has recycled 12.9 million electronic devices in 2023 alone. These kinds of initiatives not only strengthen brand reputation but also align with larger sustainability goals.

On the other hand, the vast size of the U.S. market creates a challenge working with a small economy like Finland. The success of Finnish companies in international collaboration for CBMI largely depends on the companies' maturity and preparedness. Companies that have already piloted and proven their solutions in Finland or within the EU are more likely to succeed in the U.S, since the U.S. is seen as hard to enter as a first market. Promising sectors for collaboration between the two countries for CBMI include packaging, textiles, bio-based materials, and forestry. Specific Finnish companies such as Huhtamäki, Valmet, and Infinited Fiber Company are examples of companies either already active or well-positioned for collaboration between Finland and the U.S. The presence of Finnish solutions and expertise in the U.S. market is seen as strategically important. However, successful entry into the U.S. market requires long-term investment and local presence.

For newer companies or circular business models still in early stages, collaborating in the U.S. market is indeed challenging due to the need for local infrastructure and support or specific teams focused solely on the U.S. market. Smaller companies therefore often lack the needed resources. Overall, while the conditions for circular collaboration between Finland and the U.S. are developing, much depends on aligning local demand with the offerings of Finnish innovations.

“If there is a local will, Finnish companies will come—but it must be clearly articulated and concrete. And that’s what we’re often missing—someone who owns the issue locally and says, 'Yes, this is what we want to do together.’” (Head of Decarbonizing Industries)

The U.S. is still lags in systemic integration of circularity. Many companies prioritize market scale over environmental values unless incentivized through regulations or tax breaks. Further, the fragmented nature of U.S. regulations hinder progress. Despite these limitations, there is still hope for future collaboration between the U.S. and Finland on CBMI. Education and visible proof of successful circular business model collaboration are vital for progress and inspiration. Cross-border circular initiatives should start with co-creation, not export. For collaboration to succeed, there must be a clear local demand and societal or governmental will to implement circular practices in both countries and globally. A unified direction would provide clarity for business and stakeholders. If the legislative future would be more predictable businesses' focus could be shifted from short-term goals to long-term ones.

To strengthen cross-border collaboration for CBMI further, three main things are highlighted. Firstly, co-creating CBMs from the start. This means that the collaboration begins with joint problem identification and solving rather than trying to fit one company's predefined solution on the other. Second, localizing innovation by fitting solutions and CBMs to the target country. For example, by matching CBMs to regional climate or sustainability goals, or public procurement targets, companies are more likely to gain support and funding for their projects. Third, is the importance of investing in presence and relationship building. Long-term commitment requires ongoing engagement and dedicated teams in order for the collaboration to succeed especially in cross-cultural and cross-border settings.

5 Conclusions

This chapter combines the empirical findings related to cross-border collaboration for CBMI in the context of Finland and the U.S. with the preliminary theoretical framework. Additional barriers are added to the preliminary table and key barriers that arose both in literature and the empirical study are highlighted. Collaborative approaches used in cross-border settings are discussed and finally how they can overcome the key barriers identified. The theoretical contributions and practical implications of this study are provided. Finally, the limitations of this study, including scope and suggestions for future CBMI collaboration research are acknowledged.

5.1 Discussion

The discussion is divided according to the three sub-questions of this research, ultimately providing a holistic answer to the main research question.

5.1.1 Barriers to circular business model innovation

CBMI is at the core of this study. Drawing on Geissdoerfer et al. (2018, 2020), CBMI is defined as the conceptualization and implementation of business models that support the principles of the CE: cycling, extending, intensifying, and dematerializing material and energy flows. The value proposition, value creation, and value capture in CBMs prioritize resource efficiency, ecological sustainability, and long-term system resilience (Bocken et al. 2014, 2016; Nußholz 2017). CBMI can occur through various pathways, including transformation of existing models, diversification within existing firms, establishment of new start-ups, and acquisitions (Geissdoerfer et al. 2020).

CBMI is shaped by multiple internal and external factors as agreed upon both in the theory and empirical research. The literature review identified four key levels of influence: institutional, market, value chain, and organizational, each presenting different barriers to CBMI (Guldmann & Huulgaard 2020). These levels were also strongly reflected in the empirical study of Finland–U.S. cross-border collaboration. Table 9 builds on the barriers to CBMI presented in Table 4, based on the literature review by adding any barriers that arose from the empirical data in Table 8 to it. The data collected in the empirical study supported the barriers already brought up in the literature review. However, a few barriers were added to each level based on the findings of the empirical study. These added barriers can be seen in bold in table. There was no contradiction to any of the barriers identified in the literature review.

Table 9 Reviewed list of barriers to CBMI

Level of barriers	Barriers identified
Market and Institutional level	<p>Regulatory misalignments</p> <p>Weak or conflicting environmental policy</p> <p>Insufficient economic incentives for circular practices</p> <p>Lack of funding and support for CBM initiatives</p> <p>Limited consumer demand, more specifically limited consumer and market pull for circular offerings</p> <p>Cultural and cognitive resistance to circular products</p> <p>Inconsistent institutional environments across borders</p> <p>Unclear or niche market demand</p> <p>High cost of circular solutions</p> <p>Volatility in supply of recycled materials</p> <p>Fragmented regulatory landscape (U.S.)</p> <p>Short-term policy incentives</p> <p>Lack of circularity performance metrics / standards</p>
Value chain level	<p>Complexity of existing linear supply chains</p> <p>Inadequate reverse logistics and take-back systems</p> <p>Lack of standards and definitions for circularity</p> <p>High coordination costs for partner collaboration</p> <p>Unreliable supply of secondary materials</p> <p>Lack of operational integration of CE policies</p> <p>Reluctance to share data or IP in competitive markets (U.S.)</p> <p>Limited culture of open innovation (esp. U.S.)</p> <p>Weak trust between partners</p>
Organizational level	<p>Path dependency and resistance to change</p> <p>Misalignment between circular goals and short-term profit logic</p> <p>Risk aversion</p> <p>Lack of internal capabilities</p> <p>Fragmented internal collaboration</p> <p>Sustainability isolated from core business functions</p> <p>Optimized legacy systems inhibit transition</p>

	Underdeveloped market-specific capabilities (for example sales/relationship-building)
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At the institutional level, regulatory complexity and policy uncertainty emerged as dominant barriers in both literature (Ranta et al. 2018; Rweyendela & Kombe 2021; Hana et al. 2022) and empirical data. Interview data confirms the difference between Finland's supportive circular policy framework and the U.S.'s more fragmented regulatory landscape. Market readiness and consumer demand also rose as key factors in both theory (D'Agostin et al. 2020; Sajjad et al. 2024) and empirical research. However, whereas in the literature market demand is mentioned more as a fixed external condition (Pretner et al. 2021), the empirical data showcase that market demand can also be co-created through branding, education, and local partnerships. This reinforces the importance of collaborative marketing strategies in contexts and markets where circularity is still a niche or unknown offering. Thus, future frameworks might more explicitly recognize market-shaping capabilities as part of CBMI strategy, especially in cross-border contexts where consumer awareness and cultural expectations differ significantly.

The literature identified the complexity of existing linear supply chains and lack of reverse logistics as structural barriers (Korhonen et al. 2018; Guldman & Huulgaard 2020). Empirical insights support these claims but also add a relational layer to these barriers. The difficulty of finding trusted partners for circular supply chains in unknown markets was repeatedly raised as an issue. This emphasizes the importance of relational capital as part of value chain barriers: trust, reputation, and openness. These can either unblock or block collaboration. Competitive pressures in the U.S. context, for instance, were shown to limit information sharing and openness, further complicating collaborative projects. This shows that CBMI often needs coordination amongst the whole value chain but is often hard to facilitate due to their fragmented state.

At the organizational level, resistance to change, risk aversion, and misaligned internal incentives were seen as common barriers in literature (Bocken & Ritala 2022; Guldman & Huulgaard 2020). The empirical data supports these claims and showcases that these barriers are often mutually reinforcing and aggravated in international context. When the lack of internal capabilities is mentioned as a barrier for CBMI, literature mainly refers to the lack of technical capabilities (De Jesus & Mendonça 2018; Urbinati et al. 2021). The empirical data adds to this with an emphasis on market-specific capabilities, revealing a need to expand the definition of internal capabilities in this context. This was showcased with Finnish companies lacking the needed sales expertise for the U.S. market.

5.1.2 Methods of cross-border collaboration

The synthesis of the literature review identified several structured and open collaboration models that support CBMI, such as specialization, sharing, and allocation models, as well as outside-in and inside-out open innovation approaches (see e.g. de Man & Luvison 2019; Bocken & Ritala 2022). While these models provide useful conceptual tools for understanding how value is co-created and captured, the empirical findings of this study reveal important practical dimensions to deepen this theoretical understanding. A key insight from the empirical data is that collaboration for CBMI is not only a method for resource and risk sharing, but a key enabler of market access, innovation, and long-term business viability. Especially in the cross-border context between Finland and the U.S., collaboration serves two functions: helping overcome systemic barriers to circularity while also opening pathways to adapt circular solutions to new regulatory, cultural, and market conditions.

The empirical findings highlight co-creation and joint experimentation as critical collaborative methods for advancing CBMI. While literature discusses open innovation broadly (Vanhaverbeke 2014; Bocken & Ritala 2022), this study highlights joint pilot projects and shared learnings as effective formats of cross-border collaboration. These forms of collaboration allow companies to locally adapt technologies and business models in a low-risk environment while building mutual trust. This expands on the typical understanding of open innovation by highlighting co-creation as a trust-building mechanism, especially important in the context of differing and unfamiliar regulatory and institutional settings.

Another extension to existing theory is the strategic importance of public–private collaboration platforms. While these are often underemphasized in business model innovation frameworks, the empirical data showcases initiatives like Business Finland’s international programs and summits such as the Nordic Circular Summit as key enablers of matchmaking and agenda-setting for CBMI. These platforms support companies in identifying shared goals and forming initial partnerships, making them key infrastructure for collaborative innovation.

The role of softer collaboration capabilities, such as cultural adaptability, long-term commitment, and transparent communication, was also identified as central to successful collaboration, especially in cross-border partnerships. While previous literature touches on trust and alignment (Guldmann & Huulgaard 2020), the empirical data suggests that collaboration models need to be culturally embedded and locally grounded to be successful. For instance, Finnish firms entering the U.S. market

must consider not only regulatory alignment but also regional consumer attitudes, procurement systems, and societal priorities in their collaborative approaches. Furthermore, the purpose of collaboration itself emerged as more multifaceted than the literature review implies. In addition to shared innovation or resource pooling, companies increasingly see collaboration as a way to build legitimacy, access new funding opportunities, and align with broader sustainability goals. In the case of Huhtamäki and Sporting Kansas City for example, collaboration enabled the framing of a circular initiative in line with local zero-waste ambitions. This proves how alignment with local narratives and public-sector goals can enhance the traction of CBMs. Finally, the findings highlight that successful collaboration must be strategically localized yet globally informed. CBMI, particularly in cross-border settings, is not a one-size-fits-all process. Rather, it requires dynamic and iterative collaboration models that evolve in line with the partners' learning and changing environments.

5.1.3 Strengthening cross-border collaboration for circular business model innovation

The cross-border nature studied in the empirical research introduces additional complexity to the topic of collaboration for CBMI but also unique opportunities. The research on Finland–U.S. collaboration highlights how international collaboration can enhance innovation through the exchange of knowledge, complementary capabilities, and strategic alignment. The empirical data highlights, how cross-border collaboration can be strengthened in practice to drive successful CBMI.

First, one key finding is that successful collaboration must begin with co-creation, not the export of ready-made solutions. This adds depth to theory that often present CBMI as a linear transfer of capabilities or technologies (de Man & Luvison 2019; Fehrer & Wieland 2021). In contrast, the empirical data show that joint problem framing and shared pilot initiatives are more effective starting points for collaboration. This co-creative approach allows companies to align their innovations with the needs and constraints of the target market and enables mutual learning, especially important in circularity where regulatory, cultural, and infrastructural contexts differ significantly.

Second, effective cross-border collaboration is strengthened when it is embedded in local and long-term presence. The findings confirm that CBMs cannot simply be scaled internationally without adaptation. Companies must invest in localized innovation, tailoring solutions to local public procurement goals, sustainability agendas, and consumer expectations. Third, institutional alignment is a crucial yet often underestimated driver of collaboration. While the literature mentions regulatory barriers broadly (Gunningham & Holley 2016; Suchek et al. 2021), the empirical data shows that predictable and supportive policy environments are essential for enabling collaboration to thrive. In

Finland, strong institutional support and policies foster innovation, while the fragmented and state-dependent U.S. system poses challenges, especially for foreign companies. However, developments like the U.S. Inflation Reduction Act and local CE targets in cities such as Los Angeles and San Francisco present new windows of opportunity. Cross-border collaboration can be strengthened by aligning with these local and federal initiatives, particularly through partnerships that offer public value. This is why collaboration platforms that guide companies in these complex regulatory environments are important and should be strengthened. They create neutral ground for companies to identify common priorities, build long-term relationships, and explore funding and innovation opportunities. Strengthening these platforms, especially with the involvement of both public and private actors, could accelerate collaboration uptake and reduce entry barriers for smaller firms.

Fifth, cultural adaptability and soft diplomacy emerged as essential but underrepresented aspects of cross-border collaboration. Differences in communication styles, business practices, and expectations can easily derail projects unless they are openly addressed. Finally, the study finds that the success of cross-border collaboration depends on shifting from short-term project focus to long-term strategic partnerships. Building CBMs that function across borders takes time, iterative learning, and shared risk. Trust and transparency particularly in sharing business models, cost structures, or sensitive data are foundational. Collaboration must be designed with flexibility, ongoing communication, and realistic time horizons. Especially in global value chains, where change is slow and systemic, companies need to view collaboration as a journey rather than a quick transaction.

5.1.4 Overcoming the barriers to circular business model innovation through cross-border collaboration

Having explored the key barriers to CBMI, the methods through which collaboration can be approached, and the ways in which cross-border collaboration can be strengthened, this section now returns to the main research question: *How can cross-border collaboration help overcome barriers to circular business model innovation?* The findings clearly show that collaboration plays a crucial role in addressing the multifaceted barriers of CBMI, from institutional and market-level to value chain and organizational challenges. However, collaboration in itself is not a straightforward solution. To be successful, it must be structured strategically and adapted to context. Table 10 summarizes the key insights by linking the most critical barriers identified across both the literature and empirical data to specific forms of collaboration and practical mechanisms for strengthening U.S.–Finland collaboration. The insights stemming from the literature review are bolded for clarity.

Table 10 Cross-border collaboration driving CBMI

Level	Key barrier	Form of circular collaboration	U.S.–Finland specific insights	Strengthening cross-border collaboration
Institutional	Regulatory misalignments	Specialization model, Open innovation	Finnish firms bring regulatory clarity and sustainability expertise; U.S. context often lacks clear CE legislation.	Bilateral policy dialogues and public–private roundtables to align CE priorities and terminology.
	Lack of funding or economic incentives	Sharing model, Allocation model	U.S. offers larger investment pools; Finnish firms contribute with high CE maturity and project credibility.	Co-develop joint funding applications to U.S. and EU sustainability programs.
Market	Unclear or niche demand for circular products	Outside-in open innovation	U.S. market demand for CE is emerging but inconsistent; Finnish firms often face cultural disconnect.	Conduct joint market research and consumer engagement strategies to localize circular offerings.
Value Chain	Lack of reverse logistics infrastructure	Allocation model, Specialization model	U.S. infrastructure for recycling and take-back systems is fragmented; Finnish firms struggle to scale their models.	Partner with logistics firms and municipal recycling agencies to pilot new return systems.
	Limited trust and coordination	Open innovation	Finnish firms are trusted for transparency; U.S. partners often require clear business cases.	Long-term pilots, governance frameworks, and shared metrics to build trust and manage complexity.
Organizational	Internal resistance and misaligned incentives	Internal collaboration + Specialization	Finnish firms tend to be CE-driven, while U.S. counterparts may prioritize short-term returns.	Establish shared KPIs that reflect both sustainability and commercial outcomes.

As the table demonstrates, cross-border collaboration can directly address key barriers to CBMI when designed to match the challenge. Regulatory misalignments emerged as a key institutional barrier. Literature identifies regulatory inconsistency as a major challenge for companies operating across borders (Ranta et al. 2018; UNECE 2023). In Finland, policy frameworks like the national circular economy roadmap and EU directives provide structure and direction, whereas in the U.S., regulation remains fragmented and often state specific. Finnish companies, due to their compliance with stricter EU standards, often possess expertise in navigating complex regulations, making them attractive as collaborative partners. However, to turn this into impact, collaboration should go beyond project-level engagement. Bilateral policy dialogues and public–private roundtables, as also suggested in open innovation literature (UNECE 2023), can help align terminology, expectations, and priorities. These efforts would reduce ambiguity and foster regulatory alignment, which is essential for scaling CBMs internationally.

Insufficient economic incentives and unstable funding were also noted as significant institutional barriers, particularly in the U.S. context. As supported by Guldmann and Huulgaard (2020), financial viability is central to CBMI. Collaboration through sharing or allocation models, such as joint ventures or risk-sharing agreements, can reduce economic burdens for individual companies. In a cross-border setting, co-developing joint funding applications could pool expertise and increase access to financing. Literature emphasizes that institutional support structures such as public grants, innovation platforms, and government-backed initiatives are critical to fostering collaboration (Bigliardi & Filippelli 2021), which Finnish companies already leverage well through instruments like Business Finland’s Veturi program.

Market readiness and unclear demand were identified as common market-level barriers in both literature (Pretner et al. 2021) and empirical findings. Despite growing interest in the U.S., demand for circular products is uneven. Finnish companies face difficulties in transferring advanced CE solutions due to differing levels of consumer awareness. Literature recommends outside-in open innovation to bridge this gap (D’Agostin et al. 2020), bringing customers into the innovation process early. This can be strengthened through joint market research and consumer engagement strategies to localize offerings and reduce cultural disconnects. Empirical data supports this by showing that without local demand, even the most advanced solutions struggle to gain traction. Tailored collaboration addressing local needs, regulatory trends and consumer expectations is therefore critical.

Barriers within the value chain, such as fragmented logistics infrastructure and weak trust among partners, were heavily emphasized in both your theoretical synthesis and data. Korhonen and colleagues (2018) argue that linear supply chains resist circular restructuring due to their complexity. In the U.S., the lack of harmonized recycling and take-back systems challenges scalability. Collaboration via allocation or specialization models, where reverse logistics would be assigned to the partner most capable, is a key theoretical solution (Guldmann & Huulgaard 2020). Strengthening this in practice requires partnering with for example logistics firms, or municipalities to develop pilot programs, and scale new return systems. Lack of trust and coordination also limits value chain collaboration. Literature emphasizes the importance of shared goals, trust-building mechanisms, and formal governance structures (de Man & Luvison 2019). According to empirical data, Finnish firms are seen as trustworthy due to their transparency, while U.S. firms demanded strong business cases. Addressing this mismatch requires joint pilots and governance frameworks, supported by shared metrics and accountability tools, to manage complexity and reduce relational risks.

At the organizational level, resistance to change, legacy systems, and misaligned incentives persist as key barriers. These align with findings from Bocken and Ritala (2022) and Guldmann and Huulgaard (2020), who emphasize that CBMI requires both cultural and structural shifts. While Finnish companies often lead in CE strategy, their U.S. counterparts may focus more on short-term return of investment. Collaboration via specialization models, where firms bring complementary strengths, is seen as a theoretical solution. Yet, the empirical findings show that such partnerships only succeed when there is internal alignment. To address this, collaboration should be supported through shared key performance metrics that reflect both financial and sustainability outcomes. Cross-organizational collaborations need internal managers who advocate for CBMI across departments. As noted in Todeschini et al. (2017), internal fragmentation is a known barrier, but the empirical data adds that this is not just structural but cultural. Circularity often remains outside of core strategy unless intentionally integrated into it.

However, it must be noted that collaboration is not a guarantee of success. The empirical data emphasizes that many cross-border initiatives remain at the level of interest or intent, with relatively few operationalized projects between Finland and the U.S. Challenges such as differing regulatory timelines, resource asymmetries, and varying levels of CE readiness remain. Therefore, building effective cross-border collaboration requires long-term commitment, continuous relationship-building, and mechanisms that foster transparency and shared learning. Cross-border collaboration can therefore significantly accelerate CBMI, but only when it is built on shared understanding, mutual

value creation, and context-sensitive approaches. Rather than a one-size-fits-all solution, collaboration must be seen as an evolving capability.

5.2 Theoretical contributions

This study contributes to existing literature on CBMI by addressing gaps identified in prior research. While the importance of CBMs has been acknowledged in prior literature (see e.g. Geissdoerfer et al. 2018; Centobelli et al. 2020), the role of collaboration in enabling CBM implementation has required further study (Hina et al. 2022; Köhler et al. 2022). This study addresses this research gap by examining collaboration, particularly in a cross-border context as a dynamic driver of CBMI.

This study expands on the work of Bocken and Ritala (2022) and Guldmann and Huulgaard (2020), who identify barriers to CBMI across different levels. By incorporating empirical insights, this study provides a more nuanced view of these barriers, emphasizing how they translate differently across country contexts. For example, while regulatory misalignment and fragmented policy environments have been widely discussed in theory (Ranta et al. 2018; UNECE 2023), this study showcases how Finnish companies often take proactive roles in navigating these frameworks, positioning themselves as influencers of policy rather than passive recipients. This highlights a more active role for companies in shaping institutional conditions for CBMI.

The empirical findings elaborate on organizational-level barriers by adding a cultural dimension to what has previously been framed primarily as structural or capability-based challenges (Todeschini et al. 2017). While prior studies mention internal fragmentation as a barrier to CBMI, the data in this study suggests that circularity often remains separate within sustainability or innovation departments. This insight extends the concept of internal resistance beyond inertia or misaligned goals to include issues of organizational culture and leadership engagement. The study also contributes to the literature on collaboration in CBMI by exploring specific forms of collaboration, such as sharing, specialization, and allocation models, as mechanisms for overcoming different types of barriers. While the literature has acknowledged the importance of open innovation (Lazarotti & Manzini 2009; Bocken et al. 2014), this thesis provides an empirically backed mapping of how different collaborative approaches align with specific levels of barriers. For example, specialization models appear particularly effective in addressing regulatory complexity through mutual adaptation, while allocation models support logistical challenges by assigning reverse logistics responsibilities to the more capable partner. These findings extend the theoretical framework presented in the literature synthesis and suggest practical ways to match collaboration forms with CBMI challenges.

Finally, this research advances the underexplored area of cross-border collaboration in CBMI. While previous studies have highlighted the global nature of circular value chains (Geng et al. 2019; Badza et al. 2024), few have empirically examined how collaboration plays out between specific country pairs. By focusing on the Finland–U.S. context, this study contributes a rare case-based perspective on international collaboration is shaped. In doing so, it offers new conceptual insights into how CBMI can be locally adapted and globally scaled, which is an area that remains largely underdeveloped in the current literature. In summary, this thesis not only supports prior findings on the barriers of CBMI but also deepens and extends them by introducing new perspectives on cross-border collaboration, cultural integration, and the operationalization of collaborative models.

5.3 Practical implications

Companies, legislators as well as trade promotion services can gain valuable insights from this study. This study is especially valuable for those companies wanting to drive CBMI through collaboration, particularly in cross-border contexts like between the Finland and the U.S.

First, managers are encouraged to adopt structured collaborative models such as joint ventures, co-investment schemes, and specialization partnerships that allow companies to share resources, distribute risk, and combine complementary capabilities. Especially in cross-border contexts like Finland and the U.S., strategic alignment between partners is essential for successful CBMI. As echoed in both theoretical and empirical findings, managers should:

1. Establish shared goals and mutual benefit frameworks early in the collaboration. Partners should explicitly define value creation and value capture mechanisms, especially when business cultures and CE maturity levels differ.
2. Invest in relationship-building and trust building, which were consistently identified as key enablers for successful collaboration. This includes maintaining transparent communication, long-term engagement, and cultural sensitivity.
3. Localize circular solutions to target markets. In the U.S.–Finland context, this means adapting offerings to regional policy goals, procurement practices, or sustainability branding strategies, rather than attempting to directly export own past models.
4. Integrate circularity into the strategic core of the organization by encouraging cross-functional cooperation, aligning key performance metrics with long-term environmental value, and prioritizing sustainability in leadership mandates.

5. Build internal capacity for CBMI collaboration, including training on open innovation, stakeholder engagement, especially for teams working internationally.
6. Pilot joint projects and use iterative learning to build strategies for CBMs in unfamiliar contexts.

This study has key takeaways for public sector actors as well, who also play a vital role in advancing CBMI. This especially includes trade promotion agencies and policymakers who can help scale CBMs in cross-border settings. To strengthen collaboration for CBMI, public sector actors should:

1. Support matchmaking platforms and innovation hubs that bring together Finnish and U.S. actors around CE themes. Examples like the Nordic Circular Summit and Business Finland's international visits were seen as vital in seeding collaboration.
2. Align public funding mechanisms with circular priorities and allow for international participation. While Finnish programs such as Business Finland's Veturi program, are highly effective domestically, their impact could be expanded through bilateral co-funding models or eligibility for foreign partners.
3. Convene bilateral policy dialogues between countries to harmonize definitions, standards, and performance metrics for circularity. This helps reduce institutional misalignments and regulatory ambiguity, which are major barriers to CBMI.
4. Use public procurement as a lever to stimulate demand for circular solutions. As shown by U.S. city-level examples, for example in San Francisco and New York, favoring vendors with circular offerings sends strong signals to the market and de-risks private innovation.
5. Incentivize experimentation through adaptive regulation, such as temporary exemptions, sandbox environments, or risk-sharing schemes. These approaches enable firms to test new CBMs without facing prohibitive legal or financial risks.
6. Foster education and awareness campaigns targeted at both consumers and business actors, to strengthen the cultural foundation for circular practices and increase market pull. This is particularly critical in markets where CE awareness remains low.

Supporting collaboration across businesses, governments, and civil society, these actions can help accelerate the transition toward scalable and impactful CBMs. Both between Finland and the U.S. and in other cross-border contexts.

5.4 Limitations and suggestions for future research

This study is of course not without its limitations. First, the empirical data is based on a relatively small sample of expert interviews and secondary data sources due to the limited availability of information on this topic. Although the interviewees provided valuable insights, the limited number of participants restricts the generalizability of the findings. The planned interviews with MNEs were not realized due to access challenges and companies' hesitation to speak on underdeveloped circular activities, which narrowed the scope of firsthand business perspectives. Additionally, the study focuses on a very specific bilateral collaboration between Finland and the U.S., which may limit the generalizability of the findings to other country contexts with different institutional, market, or cultural environments. It is also important to note that the topic of collaboration in CBMI is emerging and changing, and that the themes studied, especially in the empirical research are subject to development and i.e. the influencing factors identified may change overtime.

These limitations however bring incentives for future research. CBMI collaboration is a very novel and growing field of study and offers many possibilities for research. Future research could address these limitations by conducting comparative studies across multiple national or regional settings to better understand how cross-border collaboration dynamics vary. There is also a need for longitudinal studies that track CBMI collaboration over time to understand how partnerships evolve, scale, or dissolve. Furthermore, deeper quantitative analysis of the financial and environmental performance outcomes of CBMI collaborations would provide stronger evidence to support business case arguments. Lastly, future studies could also explore the role of other stakeholders such as consumers or policymakers in shaping and sustaining circular business collaborations.

6 Summary

This research studied the role of collaboration in overcoming barriers to CBMI, with a specific focus on cross-border collaboration between Finland and the U.S. As global sustainability challenges grow, businesses are increasingly expected to transition from linear models to circular ones to minimize waste and resource use while maximizing value creation. However, implementing CBMs remains challenging due to institutional, market, value chain, and organizational factors. Collaboration is seen as a key enabler of CBMI. This study was set to find out how exactly collaboration, through different methods, can overcome the barriers of CBMI, especially in a cross-border setting.

The aim of the research was to answer the research question: *“How can cross-border collaboration help overcome barriers to circular business model innovation?”*. To build a holistic answer to the research question, three sub-questions were also posed: 1) *“What are the key barriers to circular business model innovation?”* 2) *“In what ways can collaborative methods address barriers to circular business model innovation?”* and 3) *“How can cross-border collaboration be strengthened to effectively support circular business models?”*.

The literature review studied CBMI, its barriers and different collaborative methods through existing literature. The foundations of CBMI were studied: CE, business models and business model innovation, and CBMs to lay of foundation for the research. Key barriers to CBMI, identified from previous research were categorized into three levels of barriers: institutional and market level, value chain level as well as organizational level. Inspecting the barriers to CBMI through each level, allowed for a detailed overview of the key barriers identified. This was followed by introducing different methods of collaboration for CBMI: sharing, specialization, and allocation models as well as outside-in and inside-out innovation. From these, a synthesis was composed, suggesting how these different collaborative methods can overcome the identified barriers of CBMI on different levels.

The empirical research was focused on Finland-U.S. cross-border collaboration for CBMI specifically. Empirical data was collected through expert interviews both from Finland and the U.S. with an addition of secondary data sources to provide more detailed data. The findings highlight the cross-border specific barriers to CBMI and how collaboration to overcome them can be strengthened and utilized. The research reveals that strategic alignment, trust, and supportive institutional frameworks are critical to successful cross-border collaboration, enabling companies to manage risks, scale innovations, and access new capabilities. The findings of the empirical study support the synthesis of the literature review and build upon it to provide new information.

The research contributes to the emerging theoretical discussion on CBMI by examining it through a cross-border collaborative lens, a perspective that has so far received limited attention. Practically, it offers actionable implications for managers and public sector actors, including the importance of structured collaboration, flexible governance, and internal capability-building. While limited in scope due to its qualitative and bilateral focus, the study serves as a foundation for future research around international collaboration for CBMI.

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Appendices

Appendix 1 Interview questions

Introductory question

1. Could you briefly describe your background and current role, especially as it relates to circular economy, and international collaboration between Finland and the U.S.?

Influencing factors of circular business model innovation

2. What are the key drivers motivating companies to adopt circular business models in your experience?

3. What barriers do you most commonly see hindering the implementation or scaling of circular business models?

4. How does regulation — whether supportive or restrictive — impact circular innovation in your context?

5. To what extent do you think collaboration helps companies overcome challenges related to circular innovation?

Cross-border collaboration between Finland and the U.S.

6. In your view, what enables successful collaboration between Finnish and U.S. actors on circular economy initiatives?

7. What are some of the common challenges in cross-border circular collaboration between these two countries?

8. Have you encountered any specific collaboration models that have worked particularly well across borders?

Outlook: strengthening Finland–U.S. circular collaboration

9. Where do you see the most promising opportunities for Finnish companies to scale their circular solutions in the U.S. market?

10. What kind of support — from public agencies, policies, or networks — is most helpful in enabling international circular collaboration?

11. What steps or changes would you recommend strengthening circular business collaboration between Finland and the U.S. going forward?

Appendix 2 Secondary data sources

Huhtamäki press release 17.4.2023. <<https://www.huhtamaki.com/en/highlights/recent/sporting-kansas-city-teams-up-with-huhtamaki-to-make-childrens-mercy-park-zero-waste/>>, retrieved 16.4.2025

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