Tampereen yliopisto

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# COOPETITION AND ALIGNMENT IN CIRCULAR ECONOMY ECOSYSTEMS

## Beverage Package Recycling System and Circular Economy Service Platform

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# ABSTRACT

Linnea Harala: Coopetition and Alignment in Circular Economy Ecosystems – Beverage Package Recycling System and Circular Economy Service Platform
Master of Science Thesis
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The increasing pressures towards more environmentally friendly operations, drive companies to work together to forward shared objectives. To achieve system-level outcomes in advancing circular economy, multiple actors from different industries must join forces. Consequently, these companies and organizations form circular economy ecosystems which usually also involve competitors from multiple industries. Collaboration between competitors is often filled with tension and other issues inherent to simultaneous competition and collaboration (discussed as coopetition). Alignment among the ecosystem participants as well as some form of facilitation is needed in these coopetitive circular economy ecosystems to enable efficient multi-actor collaboration. To address the limited understanding of these issues in multi-actor collaboration to promote circular economy, the objective of this study was to investigate the dynamics of circular economy ecosystems entailing competitors and analyze the facilitation and alignment needed to achieve system-level outcomes in the field of circular economy.

To meet the research objectives, a multiple-case study of two different circular economy ecosystems from Finland was conducted. To validate the case selection, a preliminary case identification from Finland of cases in which horizontal actors pursue circular economy objectives together, was carried out. The selected cases were the beverage package recycling system and the circular economy service platform, representing ecosystems that vary in, for example, time-frame, success-rate and participant composition. The primary data sources for both cases were interviews with the studied ecosystems' key actors. Data triangulation was ensured with multi-sourced secondary data. Data-driven thematic analysis was supplemented with ecosystem actor mapping. Lastly, a cross-case analysis between the studied cases was performed to identify the similarities and differences between the cases.

The key findings show that strong alignment in technological, economic, and cognitive dimensions regarding the alignment of goals and practices is needed for multi-actor collaboration to achieve system-level outcomes. Especially, the joint understanding of the shared objectives and mutual benefits among the ecosystem participants, enhance the alignment within the ecosystem. Entailing horizontal actors in the ecosystem may increase the overall alignment due to the shared challenges, interests, and objectives of competitors. However, coopetition facilitation by an objective central actor or project leader is required to enable smooth collaboration between competitors. According to the findings, coopetition facilitation should include a strong focus on operations by an objective coordinator, taking into consideration issues related to trade secrets and regulations. In addition, the equal involvement of core partners should be ensured as well as the balance between the interests of different actors. Mental facilitation between partners is often needed in coopetitive relationships, whereas the utilization of research can ease joint decision making and development between competitors.

This study contributes to ecosystem, coopetition, and alignment literatures in circular economy context by providing insights on the coopetitive dynamics as well as alignment and misalignment in two dissimilar circular economy ecosystems. In practice, the findings of the study support organizations in initiating, implementing, and managing multi-actor collaboration in ecosystems aiming for system-level outcomes. In future research, more studies of various circular economy ecosystems and their dynamics are needed to expand the understanding of the related phenomena. Studying the cases in the preliminary case identification could provide an interesting outlook of the field in Finland.

Keywords: coopetition, alignment, circular economy, ecosystems, multi-actor, collaboration, environmental sustainability

# TIIVISTELMÄ

Linnea Harala: Kilpailijayhteistyö ja yhteisymmärrys kiertotalousekosysteemeissä – Pullonpalautusjärjestelmä ja kiertotalouden palvelualusta
Diplomityö
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Kasvavat paineet ympäristöystävällisempään liiketoimintaan ajavat yrityksiä työskentelemään yhdessä kohti jaettuja tavoitteita. Useiden toimijoiden eri toimialoilta täytyy yhdistää voimansa, jotta voidaan saavuttaa systeemitason tuloksia kiertotalouden edistämisessä. Näin ollen, yritykset ja organisaatiot muodostavat kiertotalousekosysteemejä, joihin yleensä kuuluu myös kilpailijoita useilta eri toimialoilta. Kilpailijoiden välisessä yhteistyössä esiintyy usein kitkaa ja muita kilpailijayhteistyölle ominaisia haasteita. Ekosysteemin toimijoiden välinen yhteisymmärrys sekä yhteistyön fasilitointi ovat tarpeen kilpailijoita sisältävissä kiertotalousekosysteemeissä, jotta tehokas monitoimijainen yhteistyö on mahdollista. Tämän tutkimuksen tavoitteena oli tarkastella kilpailijoita sisältävien kiertotalousekosysteemien dynamiikkaa sekä analysoida kiertotalouden systeemitason tulosten mahdollistavia kilpailijayhteistyön fasilitointikeinoja sekä tehokkaaseen yhteistyöhön vaadittavaa yhteisymmärrystä.

Monitapaustutkimus kahdesta erilaisesta kiertotalousekosysteemistä Suomessa suoritettiin tutkimustavoitteiden saavuttamiseksi. Tutkittavien tapausten valitsemisen tueksi tehtiin alustavien tapausten kartoitus ajankohtaisista tapauksista Suomessa, joissa eri toimialoilla kilpailijat tavoittelevat yhdessä kiertotaloustavoitteita. Tutkimukseen valittiin suomalainen pullonpalautusjärjestelmä sekä kiertotalouden digitaalinen palvelualusta, jotka eroavat muun muassa ajoittumisessaan, tavoitteiden saavuttamisessa sekä ekosysteemin rakentumisessa. Tutkimusdata kerättiin ensisijaisesti ekosysteemien avaintoimijoiden haastatteluista sekä täydennettiin toissijaisella datalla eri lähteistä. Data analysoitiin datalähtöisesti ja teemapohjaisesti, ja ekosysteemin toimijat analysoitiin ekosysteemikarttaohjelmistoa hyödyntämällä. Lopuksi, tutkittuja tapauksia verrattiin toisiinsa samankaltaisuuksien ja eroavaisuuksien tunnistamiseksi.

Tutkimuksen tulokset osoittavat, että vahvaa yhteisymmärrystä tavoitteiden ja toimien suhteen teknologisessa, taloudellisessa ja kognitiivisessa ulottuvuudessa tarvitaan systeemitason tulosten saavuttamiseksi monitoimijaisessa yhteistyössä. Erityisesti ymmärrys jaetuista tavoitteista sekä yhteisistä hyödyistä edistää ekosysteemin yhteisymmärrystä. Horisontaalisten toimijoiden sisällyttäminen ekosysteemiin voi lisätä yhteisymmärrystä ekosysteemissä, sillä kilpailijoilla on tyypillisesti samanlaiset haasteet, intressit sekä tavoitteet. Toimivaan kilpailijoiden väliseen yhteistyöhön kuitenkin vaaditaan kilpailijayhteistyön fasilitointia neutraalilta keskustoimijalta tai projektin vetäjältä. Tulosten mukaan kilpailijayhteistyön fasilitoinnissa puolueettoman koordinaattorin tulisi keskittyä vahvasti operatiiviseen toimintaan liikesalaisuudet ja kilpailulainsäädäntö huomioiden. Avaintoimijoiden tasapuolinen osallistaminen ekosysteemissä on tärkeää kuin myös kaikkien toimijoiden intressien välillä tasapainoilu. Kilpailijayhteistyössä vaaditaan usein myös henkistä fasilitointia. Tutkimustiedon hyödyntäminen voi helpottaa päätöksentekoa sekä kehitysprojekteja kilpailijoiden välillä.

Tämä tutkimus antaa panoksensa ekosysteemien, kilpailijayhteistyön sekä yhteisymmärryksen tutkimusaiheisiin kiertotalouskontekstissa avaamalla kilpailijayhteistyön dynamiikkaa sekä yhteisymmärryksen tasoja kahdessa erilaisessa kiertotalousekosysteemissä. Käytännössä tutkimuksen tulokset tukevat monitoimijaisen yhteistyön käynnistämistä, implementointia sekä hallinnointia systeemitason tuloksiin tähtäävissä kiertotalousekosysteemeissä. Jatkotutkimusehdotuksina lisää tutkimusta erilaisista kiertotalousekosysteemeistä ja niiden dynamiikasta tarvitaan aiheeseen liittyvien ilmiöiden ymmärtämiseksi. Avartavan katsauksen kilpailijayhteistyöstä kiertotaloudessa Suomessa voi saada esimerkiksi tarkastelemalla tässä tutkimuksessa alustavasti tunnistettuja tapauksia.

Avainsanat: kilpailijayhteistyö, yhteisymmärrys, kiertotalous, ekosysteemit, monitoimijaisuus, yhteistyö, ympäristöllinen kestävyys

# PREFACE

I'm glad that I will be able to remember the peculiar year of 2020 as the year of writing my Master's Thesis above all. In a time where all was cancelled and uncertain, for me one thing was certain – just write your thesis.

I'm thankful for my thesis supervisors: Leena for inspiring and guiding me through the process and Marko for new insights and advice. I also want to thank you Professor Paavo Ritala for inspiration and motivation for the thesis project. Our research team CITER CIRQ deserves my gratitude for good discussions, insights and peer support during research seminars and other meetings. Thank you to my dear Johannes for building me a great home office and keeping my spirits up during the, at times, strenuous thesis process. Lastly, I would like to thank my most *hype* study-squad for accompanying and supporting one another through these university years and making the hard work fun.

*Academic life is like peaking even higher mountains one after the other* (Harala, 2021). In the first autumn of my university studies in Hervanta, I remember thinking that a Bachelor's Thesis sounds scary, whereas writing a Master's Thesis felt purely terrifying and simply a mission impossible. But here I am now, four and a half years later, standing on top of that terrifying mountain already planning to peak even higher mountains.

Somerniemi, 10 February 2021

Linnea Harala

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# LIST OF SYMBOLS AND ABBREVIATIONS

| | |
|---|---|
| CE | Circular Economy |
| CEO | Chief Executive Officer |
| CEP | Circular Economy Service Platform |
| CICAT2025 | Research program *Circular Economy Catalysts: From Innovation to Business Ecosystems* |
| CITER | Center for Innovation and Technology Research |
| CSSP | Cross-Sector Social Partnership |
| EU | European Union |
| HoReCa | Hotels, Restaurants and Catering |
| LUT | Lappeenranta University of Technology |
| Luke | Natural Resources Institute Finland |
| NCC | A Nordic construction company |
| NGO | Non-governmental organization |
| NPC | New Plastics Center located in Lahti |
| PBL | Brewing Laboratory |
| Palpa | Suomen Palautuspakkaus Oy |
| R&D | Research and Development |
| RVM | Reverse Vending Machine |
| SYKE | Finnish Environment Institute |
| TUNI | Tampere Universities |
| UK | United Kingdom |

# 1. INTRODUCTION

## 1.1 Background of the study

As the whole world, including academia, industry and policymakers, become more concerned about environmental issues (Geissdoerfer *et al.*, 2017), business actors focus increasingly on sustainable solutions and circular economy innovations. To survive and thrive in the fast-paced change towards a more environmentally friendly way of life and business, companies have to take sustainability into careful consideration. To achieve significant advances in circular economy initiatives, multiple actors have to join forces and work together towards a common objective. These collaborating actors form circular economy ecosystems in which actors have their own objectives in addition to sharing a common goal (Aarikka-Stenroos, Ritala and Thomas, 2021). For these collaborative actions to succeed minimum viable alignment within the ecosystem is needed. Circular economy ecosystems often entail also horizontal industry players and as prior research indicates, collaboration between horizontal actors is often filled with tension and other inherent issues related to simultaneous cooperation and competition (widely discussed as coopetition) (Fernandez, Le Roy and Gnyawali, 2014). In addition to alignment among ecosystem participants, some form of facilitation for multi-actor collaboration involving competitors is necessary (Kestemont and Chalant, 2013).

When striving to accelerate the transition towards circular economy there are wide discussions on the importance of collaboration between various actors and a strong push towards collaborative actions. However, the knowledge on interorganizational collaboration within the field of circular economy is limited especially concerning cases where horizontal actors are involved in the collaboration (Manzhynski and Figge, 2020). Operational and thriving circular economy ecosystems can't be taken for granted. Therefore, creating understanding on the aspects and prerequisites enabling successful circular economy ecosystems is essential.

An ecosystem approach for studying the factors shaping circular economy ecosystems is chosen for this study, as more research is needed to understand the characteristics and implications of circular economy ecosystems (Aarikka-Stenroos, Ritala and Thomas, 2021), especially regarding circular economy ecosystems in which competitors cooperate towards a shared sustainability goal (Christ, Burritt and Varsei, 2017; Manzhynski

and Figge, 2020). An increasing number of ecosystems are focusing on solving issues related to environmental sustainability and these ecosystems with objectives linked to environmental sustainability and circular economy are referred to as circular economy ecosystems (Aarikka-Stenroos, Ritala and Thomas, 2021). Adner (2017) defines business ecosystems as *the alignment structure of a multilateral combination of partners interacting in order to materialize the focal value proposition*, which also highlights the focus on alignment when aiming for system-level outcomes. Circular economy is widely understood as aiming towards a more sustainable use of natural resources (McDowall *et al.*, 2017). Circular economy ecosystems in this study are considered according to Aarikka-Stenroos et al. (2021) as *"communities of hierarchically independent, yet interdependent heterogeneous actors who collectively generate a sustainable outcome".* Both of these definitions, business ecosystem and circular economy ecosystem definitions, highlight the interaction and interdependence between ecosystem participants and the collective outcome, which are also core aspects of this study.

The studied ecosystems of this thesis entail coopetitive relationships and the study aims to look into the dynamics of coopetition in circular economy ecosystems. In management literature the term coopetition refers to the collaboration of companies that compete at the same time (Bengtsson and Kock, 2000) in other words, coopetition refers to relationships between actors which are built on simultaneous cooperation and competition (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019). Management literature demonstrates a variety of advantages gained through the collaboration between competing actors, such as improving market positions (Gnyawali and Park, 2009, 2011), production and R&D efficiency (Bengtsson and Kock, 2000; Gnyawali and Park, 2009), innovation outcomes (Ritala and Hurmelinna-Laukkanen, 2009, 2013) and business model innovation (Ritala, Golnam and Wegmann, 2014). These identified benefits and advantages of coopetition are assessed on the individual firm level, but for advancing circularity and environmental sustainability in ecosystems a broader view on coopetition is needed.

When engaging in coopetition to forward circular economy and sustainability the result realizes on the macrolevel while the result of coopetition is affected by the behavior of individual companies on the microlevel (Manzhynski and Figge, 2020), which underlines the differences of coopetition towards sustainability when comparing to the majority of previously studied coopetition. Existing research on coopetition focuses on assessing the outcomes of coopetition from the focal firms perspective (Bouncken and Kraus, 2013), which isn't appropriate when studying coopetition in the circular economy ecosystems, where multiple actors are involved and the ecosystem aims to benefit as a whole.

As private outcomes in coopetitive relationships may differ (Manzhynski and Figge, 2020), one firm benefiting in the ecosystem doesn't necessarily benefit the whole ecosystem or lead to a positive contribution of circular economy on the societal level, which underlines the importance of creating deeper understanding on ecosystems in which horizontal actors collaborate.

Alignment and misalignment have attracted interest in ecosystem research in previous years (see e.g. Autio and Thomas, 2014, 2018; Wareham, Fox and Giner, 2014; Adner, 2017; Thomas and Autio, 2020). In addition, alignment has been studied for example in business relationships (Gulati, Lawrence and Puranam, 2005; Stephen and Coote, 2007; Corsaro and Snehota, 2011), value creation and destruction (Järvi, Kähkönen and Torvinen, 2018; Järvi *et al.*, 2020) and institutional logics (Ingstrup, Aarikka-Stenroos and Adlin, 2020). In this study, alignment is considered as the compatible motives and incentives of the ecosystem participants and their consistent understanding of the configuration of activities in the ecosystem (Adner, 2017). This study looks into the alignment and misalignment of goals and practices (Corsaro and Snehota, 2011; Ingstrup, Aarikka-Stenroos and Adlin, 2020) as well as technological, economic and cognitive alignment and misalignment in the ecosystems (see e.g. Wareham, Fox and Giner, 2014; Autio and Thomas, 2018; Thomas and Autio, 2020). Circular economy ecosystems' participants need to have alignment in these different dimensions of alignment when aiming for collective goals advancing environmental sustainability and circular economy in the ecosystems or in entire industries.

Alignment in an ecosystem is vital for the ecosystem to meet its objectives. Alignment in an ecosystem is linked to the classic "strategic fit" literature (Chorn, 1991; Zajac and Kraatz, 2000). For success it is necessary that a firm's strategy fits to its operating environment. Similarly, it is important that an ecosystem's collective strategy fits to the environment the ecosystem operates in. Multiple actors operating within the ecosystem have to form a minimum viable alignment to reach collective goals. Circular economy ecosystems can also include horizontal actors which create tension and possible other issues inherent to coopetition (see e.g. Fernandez, Le Roy and Gnyawali, 2014). Coopetition appears dominant in multiple examples of circular economy ecosystems and to understand the operating environment these ecosystems are in; this thesis analyzes the ecosystems through how the competitive and co-operative objectives are met linking this to alignment theory. Meeting the competitive and collaborative objectives requires align-

ment especially in economic and cognitive dimensions. This thesis zooms into the internal alignment and misalignment in circular economy ecosystems and the dimensions of alignment in the selected cases.

This study aims to fill research gaps identified in multiple research streams and fields. This thesis contributes to the research fields of circular economy and environmental sustainability, ecosystems, coopetition as well as the research concept of alignment. Research still lacks insights on how companies are connected to each other as, for instance, business model and strategy literature concentrate solely on the perspectives of individual companies while issues and specialties of multi-actor collaboration and coopetition for circular economy remain widely unaddressed. When looking into research on circular economy and environmental sustainability, the research entails plenty of insights on, for example, business models (see e.g. Ranta, Aarikka-Stenroos and Mäkinen, 2018), whereas understanding on ecosystems (Aarikka-Stenroos, Ritala and Thomas, 2021) and coopetition (Manzhynski and Figge, 2020) in the field of circular economy and environmental sustainability is very limited.

This study contributes to filling the research gaps of multi-actor collaboration for advancing the circular economy. The transition from linear to circular economy requires collaboration between multiple actors, including direct competitors. Coopetition literature has been linked comprehensively to e.g. innovation literature (see e.g. Ritala and Hurmelinna-Laukkanen, 2009), but research connecting coopetition with circular economy and environmental sustainability through an ecosystem approach is inadequate. Coopetition, particularly for the circular economy and environmental sustainability, is a research topic of high relevance currently but it hasn't been studied thoroughly. Although, there is a handful of research articles looking into coopetition for environmental sustainability (see e.g. Manzhynski and Figge, 2020), research on coopetition to advance specifically circular economy is practically non-existent.

Previous studies (see e.g. Volschenk, Ungerer and Smit, 2016; Christ, Burritt and Varsei, 2017) have called for more sustainability-related coopetition research to develop a better understanding on the dynamics of coopetition for enhancing environmental sustainability. In addition, ecosystem literature lacks connections to coopetition research (Hannah and Eisenhardt, 2018). This study answers the call by investigating the critical aspects of coopetition in ecosystems as well as looking into the roles and relationships of ecosystem participants in the studied ecosystems. Alignment among the ecosystem participants, horizontal, vertical and supporting actors, are needed for fruitful collaboration in the ecosystem. The research concept of alignment is applicable to many phenomena,

but empirical research looking into the alignment in ecosystems entailing coopetitive relationships is sparse. Therefore, this study aims to create understanding on alignment and misalignment and their various dimensions in multi-actor coopetitive ecosystems.

## 1.2 Research objective, questions and scope

To address the discovered issues and lack of empirical research and understanding on the topics this study aims to shed light on circular economy ecosystems in which competing companies and others join forces to benefit the industry as a whole while simultaneously appropriating individual value from the collaboration. The research objective is approached through three research questions.

Firstly, the study aims to look into the constituents of circular economy ecosystems and shed light on the actors, their roles and the connections between ecosystem participants in different circular economy ecosystems. To understand the structure and the characteristics of the studied circular economy ecosystems, the first research question is formulated as follows:

*RQ1: How are circular economy ecosystems including competitors composed?*

After mapping the studied ecosystems and analyzing the structures, actors and their roles and relationships in the studied circular economy ecosystems, the second research question aims to discover the interactions in the ecosystems especially looking into the coopetitive relationships and their facilitation in the circular economy ecosystems. The study examines where and in which relationships within the ecosystem coopetition can be identified and what are the identified coopetitive relationships like regarding, for instance, the tensions and paradoxes inherent to coopetition. The second research question also aims to clarify the measures needed to facilitate the coopetition in the studied circular economy ecosystems. To dive deeper into coopetition in circular economy ecosystems, the second research question is formulated as follows:

*RQ2: What kind of coopetition can be identified in circular economy ecosystems and how is it facilitated?*

As the hypothesis of the study is that alignment is needed for successful collaboration in the circular economy ecosystems, this study aims to clarify the different dimensions of alignment and misalignment identified in the studied circular economy ecosystems to create understanding on what kind of alignments are needed for circular economy ecosystems to achieve system-level outcomes instead of focusing on individual outcomes.

Answering the third research question requires examining the alignment and misalignment of goals and practices in technological, economic and cognitive dimensions. To identify the alignment in circular economy ecosystems and evaluate the impact of different alignments, the third research question is:

*RQ3: What kind of alignments are needed for circular economy ecosystems to achieve system-level outcomes?*

Through answering these three research questions the study contributes by creating understanding on the pre-requisites of advancing circular economy objectives through multi-actor collaboration.

In order to answer to the research questions of the study, a multiple case study method was chosen. To allow rich cross case analysis two dissimilar cases were chosen with the aim to look into the collaborative initiatives of circular economy in Finland including horizontal actors. The cases were chosen after a preliminary case identification of suitable cases from Finland based on access, novelty and different success rates. The analyzed data from the cases contribute to the understanding of how to organize the collaboration in ecosystems aiming to enhance circular economy.

This study contributes to a joint research program CICAT2025, *Circular Economy Catalysts: From Innovation to Business Ecosystems*, which aims to support Finland's strategic objective to become a global leader in circular economy by accelerating the transition from circular economy innovation ecosystems to business ecosystems. The research program creates understanding on the transition from linear to circular with an ecosystem approach. As a part of CICAT2025, this study investigates coopetition and alignment in circular economy ecosystems.

## 1.3 Structure of the thesis

The first chapter of this thesis introduces the background of the study and the objectives of studying circular economy ecosystems entailing coopetition and looking into the alignment within the ecosystems. Later, the first chapter presents the research questions, research scope and the structure of the thesis. The structure of this thesis is illustrated in figure 1.

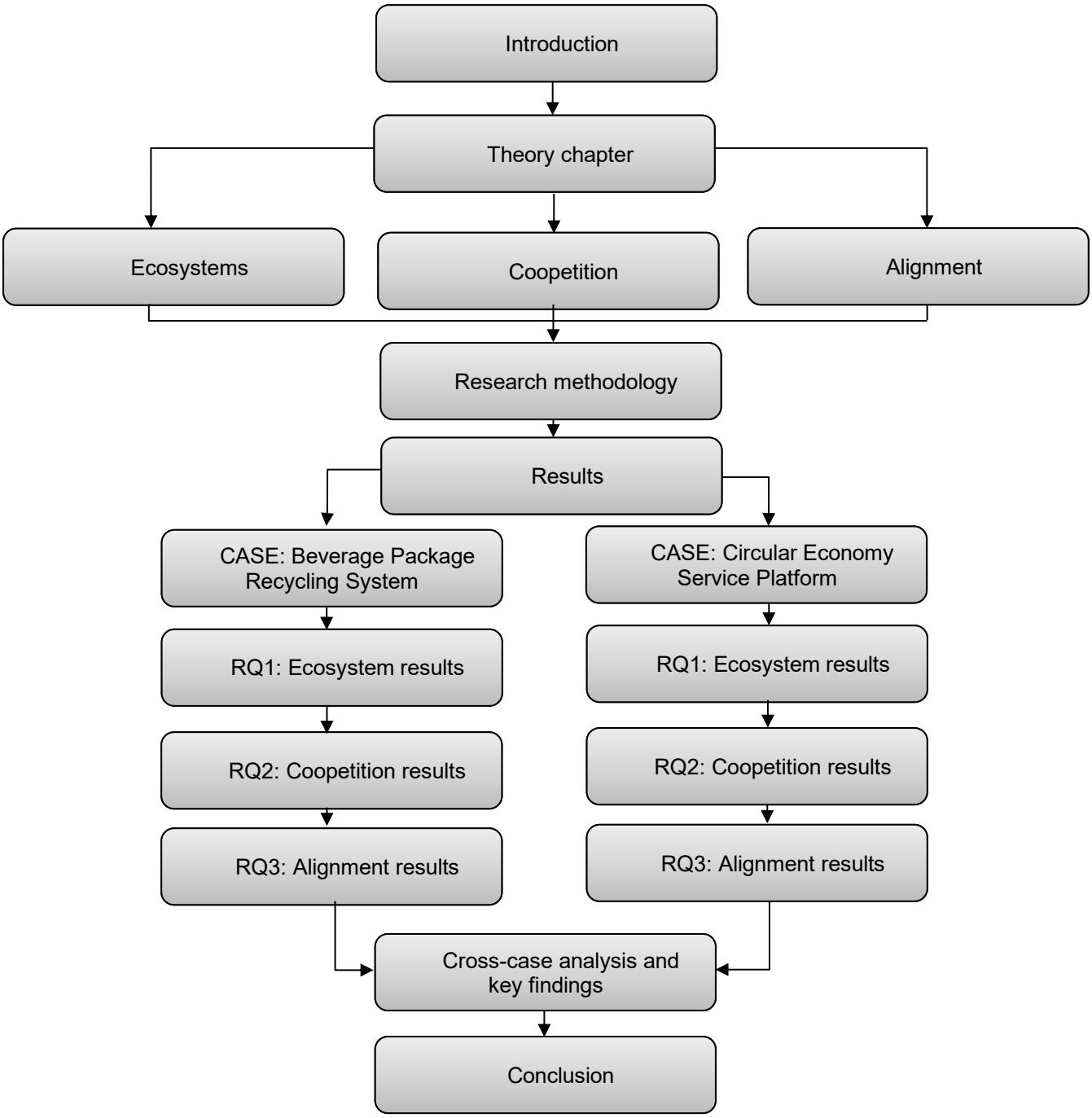


***Figure 1**. Structure of the thesis.*

The first chapter is followed by the theory chapter. The theory chapter discusses the theoretical background of the study providing insights from previous research in ecosystem, coopetition and alignment literature. Firstly, the theory chapter covers the ecosystem approach for multiple actors collaborating in circular economy ecosystems. Next, coopetition is discussed as a particular type of collaboration and the tensions and paradoxes inherent to coopetition. Management of coopetition and coopetition facilitation are

covered. The coopetition section of the theory chapter also looks into the current situation of sustainability-related coopetition research. Lastly, the theory chapter presents the diverse alignments enabling collaboration and coopetition for circular economy. To conclude the theory chapter synthesizes the literature review.

The theory chapter is followed by the description of the research methodology of the study. Chapter 3 presents and justifies the methodological choices of the study. A case study was chosen as a research strategy to understand complex phenomena in their real-life contexts. Two dissimilar cases were chosen on the basis of an initial case identification to provide rich cross-case analysis. Data was gathered primarily from interviews with key actors in the studied ecosystems and data triangulation was ensured with secondary data. Data analysis follows a data-driven thematic analysis approach and an ecosystem mapping software, Kumu, was used to map the studied ecosystems.

Chapter 4 presents the results of the empirical part of this thesis. The results of beverage package recycling system case are covered for each research question discussing firstly the ecosystem, secondly the coopetition aspects and lastly looking into the alignment in the case. The results from the case CEP follow a similar structure.

The results are followed with chapter 5 presenting a cross-case analysis and key findings of the study in which the empirical findings from both cases are compared and concluded. Before the references and appendices, the last chapter concludes the study by discussing the theoretical and practical contributions and implications, assessing the quality and limitations of the study and proposing suggestions for future research.

# 2. MULTI-ACTOR COLLABORATION IN CIRCULAR ECONOMY ECOSYSTEMS

This chapter proceeds by defining the core concepts of the study; ecosystems, coopetition and alignment while also digging deeper into the related key issues. Firstly, the ecosystem approach for circular economy is discussed through looking into the collaboration between multiple actors in circular economy ecosystems. Then coopetition is presented as a particular type of collaboration and the tensions inherent to coopetition are discussed. This is followed by the looking into existing coopetition research within the field of environmental sustainability. Lastly, the theory chapter provides an overview on different dimensions of alignment enabling collaboration in circular economy ecosystems. To conclude, a synthesis of the literature review is presented in the last section.

## 2.1 Multiple actors collaborating in circular economy ecosystems

Ecosystem as a concept is used increasingly in the academic and business world in various contexts after it was first introduced in practitioner literature by Moore (1993). In addition to using "*ecosystem*" as a theoretical concept, the term is also used as a metaphor (Autio and Thomas, 2014; Aarikka-Stenroos and Ritala, 2017). According to Moore's (1993) initial definition, in a business ecosystem companies coevolve capabilities around new innovations through cooperation and competition. In management research, ecosystems most often refer to a network of interconnected organizations which operate around or are linked to a focal firm or a platform (Moore, 1993; Autio and Thomas, 2014). According to Autio and Thomas (2014) ecosystems are organized around a shared focal point or asset and innovation ecosystem is defined as *"a network of interconnected organisations, connected to a focal firm or a platform, that incorporates both production and use side participants and creates and appropriates new value through innovation".* The inclusion of use side participants in the ecosystem definition differentiates the ecosystem concept from other constructs centered around networks in management literature (Autio and Thomas, 2014).

Adner (2017) defines ecosystem as *"the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize"*. Whereas, Aarikka-Stenroos & Ritala (2017) conceptualize ecosystem as *"a co-evolutionary business system of actors, technologies and institutions"*. Hannah & Eisenhardt

(2018) differ slightly by defining ecosystem *as "a group of firms that produce products or services that together comprise a coherent solution"*. In this view ecosystems form around a final product with complementary components (Hannah & Eisenhardt 2018). Recent literature by Thomas & Autio (2020) forms the ecosystem definition focusing more on the actors instead of the value proposition by defining ecosystem as *"a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate an ecosystem output"*.

This study adopts an ecosystem approach to look into the factors shaping circular economy ecosystems working together towards a shared goal. According to seminal business ecosystem literature, business ecosystems cross a variety of industries and in these ecosystems companies work both cooperatively and competitively to support new products and to satisfy customer needs (Moore, 1993). As the studied ecosystems include horizontal actors and involve multiple industries, an ecosystem approach is regarded as the best fit. More recent ecosystem literature describes ecosystems in management as organic and coevolving phenomena (Thomas and Autio, 2020) and highlight that ecosystem literature aims to discover how the connections between the actors in the ecosystem and their activities impact the value proposition of the ecosystem's offering (Adner, 2017). An ecosystem approach enables the analysis of complex systems in which actors, technologies and institutions are connected to each other through co-evolution or some level of interdependence (Aarikka-Stenroos, Ritala and Thomas, 2021).

Ecosystems compose of heterogenous participants in varying roles and ecosystems facilitate extensive outputs which single participants aren't able to deliver alone (Thomas and Autio, 2020). Ecosystems can consist of participants from varying sectors and industries (Moore, 1993; Thomas, Autio and Sharapov, 2015) composing *"a multilateral set of partners"* (Adner, 2017). Ecosystems entail a high interdependence among ecosystem participants and the governance of ecosystems relies mostly on non-contractual mechanisms. The interdependencies between ecosystem actors can be for example technological, economic or cognitive (Thomas and Autio, 2020). Cognitive interdependence is essential, because of different expertise and interests in the ecosystem may create tension between ecosystem actors (Wareham, Fox and Giner, 2014). Cognitive interdependence can also appear as ecosystem collective identity (Thomas and Autio, 2020) which is linked to cognitive alignment dimension discussed later on.

Ecosystems can be critical for shaping firm success and ecosystems appear as specific economic settings including particular strategic implications (Hannah and Eisenhardt, 2018). Ecosystems enable the delivery of system-level outcomes as ecosystems are

able to produce outcomes which are more encompassing than single participants could deliver individually (Thomas and Autio, 2020). As previous literature points out ecosystems can form around activities that are undertaken to create a certain value proposition or around actors, which most often implies to the actors' ties to the ecosystem's focal actor (Adner 2017). Ecosystems formed around a collective goal of enhancing circularity often work towards forming a joint value proposition benefiting circular economy. In these type of cases (and the cases in this study) the ecosystem-as-structure presented by Adner (2017) is a better fit for analysis than ecosystem-as-affiliation. In this structuralist approach the basic elements of ecosystems are activities, actors, positions and links (Adner, 2017). Especially strategy literature (e.g. Adner 2017) tends to emphasize the collective generation of outputs, whereas for instance in innovation literature the knowledge and learning dimensions are underlined (Thomas and Autio, 2020).

As Aarikka-Stenroos et al. (2021) presents, there are an increasing number of examples of ecosystems forming around circular economy objectives, also referred to as **circular economy ecosystems**. Circular economy can be considered as a means to design an economic pattern which aims at increasing efficiency of production and consumption through appropriate use, reuse and exchange of resources with the objective of doing more with less (Ghisellini, Cialani and Ulgiati, 2016). The term *'circular economy'* denotes *"an industrial economy that is restorative by intention and design"* (Macarthur, 2013), which reflects the systemic nature of circular economy when viewed as a phenomenon (Aarikka-Stenroos, Ritala and Thomas, 2021). The concept of circular economy can be considered through the dimensions (economic, environmental, social) of sustainable development and a successful circular economy can contribute to all these dimensions (Korhonen, Honkasalo and Seppälä, 2018). Korhonen et al. (2018) describes circular economy as an economy constructed from societal production-consumption systems, which maximizes the service produced from linear material and energy throughput flows. According to Aarikka-Stenroos et al. (2021) ecosystems thriving to advance circular economy are *"communities of hierarchically independent, yet interdependent heterogenous actors who collectively generate a sustainable ecosystem outcome".* In addition to the sustainability objectives, the sustainable ecosystems outcomes are of great importance and Aarikka-Stenroos et al. (2021) define the outcome of a sustainable ecosystem as *"a system-level outcome typified by circular processes of recycling, reuse and reduction".*

For an ecosystem to succeed as a whole, firms are required to balance competition and cooperation. When collaborating too much, they might not be able to capture enough

value to survive and on the other hand when concentrating too heavily on competing the ecosystem may fail to form. (Ozcan and Santos, 2015; Hannah and Eisenhardt, 2018) Collaborating companies pursue mutual interests and common benefits together, while competing companies pursue their own interests at the expense of others (Hannah and Eisenhardt, 2018). Horizontal actors in ecosystems have to balance cooperation to achieve value creation and competition to capture a part of that value for themselves (Ritala and Hurmelinna-Laukkanen, 2009; Hannah and Eisenhardt, 2018).

According to Lado et al. (1997) competition and cooperation being distinct, but simultaneously closely intertwined, partners who engage in both are likely to outperform comparable partners who emphasize solely competition or cooperation. Collaboration and competition can unfold in different ways simultaneously at multiple levels of the ecosystem, which increases the complexity of balancing competition and cooperation by companies within ecosystems over time (Chiambaretto and Dumez, 2016; Hannah and Eisenhardt, 2018). There are various views on what is the optimal balance of competition and collaboration (Hannah and Eisenhardt, 2018), which calls for a deeper look into the dynamics of simultaneous competition and cooperation to understand this unique yet challenging type of collaboration.

## 2.2 Coopetition as a particular type of collaboration

Coopetition refers to relationships built on simultaneous cooperation and competition (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019). In their seminal book “Co-opetition” (1996) Nalebuff & Brandenburger introduce coopetition through game theory and value-net perspective. Through coopetition competitors create a bigger pie by cooperating and increase benefits for all players and by competing the pie is divided among players (Brandenburger and Nalebuff, 2011). In coopetition players focus on market growth when creating a bigger pie, whereas when players divide the pie, the focus is on market share (Bengtsson and Raza-Ullah, 2016).

Bouncken et al. (2015) define coopetition as *“a strategic and dynamic process in which economic actors jointly create value through cooperative interaction, while they simultaneously compete to capture part of that value”* concentrating on the processes of value creation and value capture within the coopetitive relationships, while some definitions focus more on the relationships between actors and their value chain positions. For example, Bengtsson & Kock (2014) describe coopetition as “*a paradoxical relationship between two or more actors, regardless of whether they are in horizontal or vertical relationships, simultaneously involved in cooperative and competitive interactions*”. Whereas

according to Ritala et al. (2014) this simultaneously collaborative and competitive relationship takes place between two or more firms within the same value chain position, between horizontal actors. Often in management literature, coopetition is described simply as simultaneous cooperation and competition between firms.

Typically coopetition research has shown that in a coopetitive relationship organizations collaborate in activities far away from the customer, such as R&D or procurement, whereas competition occurs in activities involving customers, such as sales (Bengtsson and Kock, 2000). On the other hand, more recent research has made interesting findings. For example, among nascent craft breweries collaborative activities occur also very close to the customer. Competing breweries collaborated not only in inbound logistics but also in marketing and sales. This collaboration included for example word-to-mouth promotion of competitors. (Flanagan, Lepisto and Ofstein, 2018) This approach illustrates the continuous development of coopetitive relationships in different industries.

There are various reasons for an organization to cooperate with its competitors. These drivers have to be compelling enough for organizations to initiate this controversial relationship of coopetition (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019). Synergy achieved in coopetitive relationships can act as a catalyzer for different types of cooperation (Resende et al., 2018). Typical and tempting reasons for entering a coopetitive relationship are for example gaining access to essential knowledge and resources as well as improving efficiency by sharing resources and knowledge (Bengtsson and Kock, 2000, 2014). Essentially companies engage in coopetition aiming for better results together than individually (Resende *et al.*, 2018). The drivers of coopetition can be divided to external, relation-specific and internal drivers (Bengtsson and Raza-Ullah, 2016). These drivers can either increase or decrease the attractiveness of entering coopetitive relationships in certain industries.

External drivers include industrial characteristics and the technological demands of the industry in addition to possible influential stakeholders (Bengtsson and Raza-Ullah, 2016). The growth level and the industry structure as well as instability and uncertainty can drive organizations to initiate coopetition in the industry (Ritala, 2012; Czakon and Czernek, 2016). In addition, technological convergence drives companies to pursue coopetition, because of the risks and opportunities it provides for coopetitive relationships. Technological convergence makes it possible for coopetitive partners to set industry standards. (Gnyawali and Park, 2011; Czakon and Czernek, 2016) Through coopetition, especially in high-tech industries, companies seek to meet the challenges posed by

increasing R&D and capital expenditures and risks, short product life cycles and technological uncertainty. (Gnyawali and Park, 2009, 2011; Bengtsson and Raza-Ullah, 2016). Through coopetition companies can achieve economies of scale, reduce uncertainty and risk and speed up product development (Gnyawali and Park, 2009).

Relationship-specific drivers for coopetition refer to partner characteristics and the characteristics of the relationship between partners which affect the formation of the coopetitive relationship. Firms opt for coopetitive partners with useful resources and capabilities for the coopetitive relationship. Partners' distinct and complementary resource profiles can benefit the formation and success of the coopetitive relationship. (Gnyawali and Park, 2011; Bengtsson and Raza-Ullah, 2016) Also, similar goals and different technologies between potential coopetitive partners boost the formation of coopetitive relationships (Bengtsson and Raza-Ullah, 2016). Because competitors in the same industry face common challenges the coopetitive partners' resources and capabilities are often fully relevant to each other, especially for market leaders. These superior and essential resources and capabilities of market leaders are vital for accelerating the R&D processes and setting industry standards. (Gnyawali and Park, 2011)

Internal drivers for coopetition are associated with companies' internal environments, such as their own motives, resources and capabilities (Bengtsson and Raza-Ullah, 2016). Through coopetition firms seek to increase their bargaining power and competitiveness by combining resources and knowledge with coopetitive partners. A proactive driver for coopetition is the focal firm's willingness to advance its own competitive position and obtain further bargaining power in the coopetitive relationship. A reactive reason for coopetition is reducing the focal firm's strategic vulnerability in the market. Also, companies with prospecting strategies, such as first mover or close follower, are more likely to search for coopetitive opportunities. (Gnyawali and Park, 2009) Previous experience of coopetition also motivates firms to enter into new coopetitive relationships (Gnyawali and Park, 2011).

Coopetition can serve dissimilar purposes for different sized companies. Small and Medium-Sized Enterprises often use coopetitive opportunities for gaining knowledge, overall capabilities and bargaining power to compete against more established players (Gnyawali and Park, 2009). Companies with less competence regarding financial resources are likely to be more engaged in cooperation in coopetitive arrangements. Through coopetition small businesses can overcome financial constraints and other common limitations. (Resende *et al.*, 2018) Large leading firms enter into coopetitive relationships to meet industry and technological challenges and opportunities, such as

technological convergence or change, and to gain access to competitor's resources and capabilities. Through coopetition leading firms aspire to defend their position and seize opportunities, such as setting technological standards for the industry. (Gnyawali and Park, 2011)

Coopetition can emerge in different levels. On a dyad level the coopetitive relationship is between two actors, for example in the R&D processes of the leading firms aiming towards economies of scale and reduction of duplicate effort. The coopetition between leading firms may also lead to group-to-group competition. (Gnyawali and Park, 2011) Coopetition can emerge also on a network level (see e.g. Czakon and Czernek, 2016; Della Corte and Aria, 2016). In network coopetition actors are invited to join a network or they seek to join a network or work on establishing a network. Therefore, the influence of a single firm on the coopetition-partner selection is very limited and joining a network differs significantly from the coopetition-partner selection of dyadic coopetitive relationships. In addition, the trust building mechanisms are different for dyadic and network coopetition formation. In network coopetition third-party legitimization and reputation are essential. (Czakon and Czernek, 2016) Coopetition can also emerge in ecosystems in which the balancing between collaboration and competition is challenging (Hannah and Eisenhardt, 2018).

In addition to coopetition on different levels, coopetition can also emerge in different situations and take different forms (Chiambaretto and Dumez, 2016) Coopetitive relationships may emerge not only between various actors (see e.g. Gnyawali and Park, 2011; Rusko, 2011) but also between actors at different organizational levels (see e.g. Chiambaretto and Dumez, 2016). Coopetition has been analyzed in various contexts including business networks, value nets, supply chains and ecosystems (Bouncken and Kraus, 2013; Fernandez, Le Roy and Gnyawali, 2014; Hannah and Eisenhardt, 2018; Planko *et al.*, 2019). Hannah & Eisenhardt (2018) stress the complexity of balancing cooperation and competition by companies within ecosystems and argue that active learning over time by partners deepens trust and cooperation while early failures can lead into competition (Hannah and Eisenhardt, 2018). Networks can strategically create and shape the ecosystem in which they operate to fit the needs of cocreation. This collective system building requires close collaboration between competing firms, as firms have to share information and pool resources. These actions entail risks, including knowledge leakage, dependencies or loss of first-mover advantage. (Planko *et al.*, 2019)

In maintaining a business network or similarly a business ecosystem, trust and governance stand out as important factors (Resende *et al.*, 2018). For coopetition, management

leadership (Chin, Chan and Lam, 2008) and development of trust (Bengtsson and Kock, 2000; Chin, Chan and Lam, 2008; Bouncken and Kraus, 2013; Fernandez, Le Roy and Gnyawali, 2014) appear to be the most important factors enabling success. Management's attitude towards coopetition largely determines the success of coopetitive relationships. Managerial commitment to collaboration with competitors, instead of aiming for immediate benefits and short-term gains, is vital for successful coopetition. (Chin, Chan and Lam, 2008) Development of trust between competitors reduces problems and tensions in the coopetitive relationship (Chin, Chan and Lam, 2008; Ritala and Hurmelinna-Laukkanen, 2009; Fernandez, Le Roy and Gnyawali, 2014) and existing trust also helps in maintaining a successful coopetition strategy (Chin, Chan and Lam, 2008).

Common vision and goals are necessary to succeed in coopetitive relationships and the shared goals and vision are based on mutual objectives and complementary needs of the participants (Bengtsson and Kock, 2000; Planko *et al.*, 2019). The alignment of goals within the coopetitive network or ecosystem enables pursuing collective strategies for value creation (Planko *et al.*, 2019). Equal power distribution and fair collaboration between big and small firms have been identified as important enablers of coopetition regarding risks and contribution to the relationship (Bengtsson and Kock, 2000; Planko *et al.*, 2019). Effective communication management, such as systems for data interchange, coordination and conflict management, are seen essential in coopetitive endeavors (Chin, Chan and Lam, 2008). In addition, clear boundaries for information sharing and innovation activities are needed. A neutral entity in charge of coordination is seen as necessary for system-building networks. (Planko *et al.*, 2019)

The essence of coopetition is that a rising tide lifts all boats. The realization of collective goals and the preservation of the rising tide seem to be the key for a successful coopetitive relationship. (Mathias *et al.*, 2018) Czakon & Czernek (2016) present that coopetition uses simultaneously collaboration and competition to achieve better collective and individual results or gain a competitive advantage. Coopetition serves multiple purposes also beyond financial measures. In environmental coopetition companies collaborate with their competitors to create environmental value or reduce harmful environmental impact (Volschenk, Ungerer and Smit, 2016).

**Tension management and coopetition facilitation in multi-actor collaboration**

Coopetition creates a paradoxical situation for the competitors in the coopetitive relationship, as collaboration is necessary for the partners to enhance the mutual achievements

while simultaneously ensuring the fulfilment of their own organizations' interest to secure competitiveness (Kestemont and Chalant, 2013). Partners benefit most from sharing knowledge, but on the other hand, protecting their own core knowledge and core competencies are crucial for maintaining competitive advantage (Gnyawali and Park, 2009; Ritala and Hurmelinna-Laukkanen, 2013; Estrada, Faems and de Faria, 2016). Coopetitive relationships are paradoxical by nature because of the opposing logics of competition and collaboration existing in the same relationship and due to this paradoxical nature of coopetition relationships tensions between participants are bound to arise (Tidström, Ritala and Lainema, 2018). Kestemont and Chalant (2013) identified multiple sources of paradox, such as multiple interest versus a common strategic vision, borrowed processes versus newly-created processes, fragmentation versus sharing, ignorance versus trust as well as several identities versus a shared identity.

Coopetitive tensions arise on both inter-organizational and intra-organizational level (Fernandez, Le Roy and Gnyawali, 2014). Focusing on the inter-organizational coopetitive tensions is reasoned while applying the ecosystem approach to coopetition dynamics. Inter-organizational coopetitive tensions arise, for instance, from the dilemma between common value creation and private value appropriation (see e.g. Ritala and Hurmelinna-Laukkanen, 2009), risks of transferring confidential information and the risk of technological imitation (see e.g. Gnyawali and Park, 2009) and differences in strategies and goals of coopetitors towards the partnership (Fernandez, Le Roy and Gnyawali, 2014). On the other hand, if the level of tensions is well controlled and the paradoxes are anticipated, managed and overcome by facilitation, the paradoxical injunctions in co-creation can stimulate creativity and lead to successful innovation outcomes (Kestemont and Chalant, 2013).

Tensions arise also in coopetitive endeavors aiming for sustainability objectives. In sustainability related tension at the interorganizational level, high levels of competition tend to harm the social outcomes of the coopetition partnership (Hahn and Pinkse, 2014; Stadtler, 2018). The paradoxical nature of coopetition is present also at the interface of social and economic goals at the inter-organizational level (Stadtler, 2018). Even if there is a potential to improve sustainability it can't be assumed that opportunistic behavior disappears from the coopetitive relationships (Hahn and Pinkse, 2014; Manzhynski and Figge, 2020).

Managing tension and paradox inherent to coopetition is key to achieving results in co-creation activities (Kestemont and Chalant, 2013; Chiambaretto and Dumez, 2016). Tension management benefits from both interactional and procedural practices. Interactional

practices refer to face-to-face interactions and procedural practices include organizational routines. (Tidström, Ritala and Lainema, 2018) Tension is more intense in dyadic coopetition than in coopetition in multilateral alliances which implies that competitive behavior at the dyad level is more likely to weaken the partnership than competitive behavior in multilateral alliances (Chiambaretto and Dumez, 2016). According to Fernandez et al. (2014) a mixed organization based on both separation and integration of cooperation and competition is beneficial when grasping and managing the tension arising from coopetition. Common goals, collective benefits, intra-industry complementarities and strong ties in cooperative networks are also found to promote collective horizontal coopetition (Choi, Garcia and Friedrich, 2010).

Fernandez et al. (2014) highlight the key role of the ordering parties in managing inter-organizational coopetitive tensions, whereas the project team and project managers have a key role in managing intra-organizational and inter-individual coopetitive tensions (Fernandez, Le Roy and Gnyawali, 2014). In addition to these insights, Kestemont and Chalant (2013) have identified the need for facilitation by a third party to manage the paradoxes inherent to inter-organizational coopetitive relations. As noted in previous research (see e.g. Paananen, Irrmann and Smeds, 2013), optimal structures for consortiums (or ecosystems regarding this study) don't emerge automatically, hence a project partner who is able to generate an optimal structure and provide support to the competitive partners within the dynamic cooperation is needed (Kestemont and Chalant, 2013).

A neutral entity in charge of coordination in interorganizational collaboration is seen important (Planko *et al.*, 2019). The paradoxical tensions arising from coopetition can be managed through a third party, who acts as a coordinator or facilitator between the partners. The third-party position may be filled from within the project, such as the project leader, or externally by utilizing someone external to the coopetition relationship. (Kestemont and Chalant, 2013) As coopetition is practiced on different levels and in different forms also the facilitation of these coopetitive relationships has to adapt to the various coopetitive situations (Chiambaretto and Dumez, 2016). Third party facilitation can take diverse forms, such as project leader, external person, tools or methods (Kestemont and Chalant, 2013; Paananen, Irrmann and Smeds, 2013).

A third party can bring new perspectives and help to identify and communicate on paradoxes reassuringly and safely because of the third party's neutral position in the relationship. A third party can be used as a buffer in some situations allowing the coopetitors to express negative feelings and liberate tensions and thus avoid internalizing the paradoxes arising from coopetition. (Kestemont and Chalant, 2013) Consequently, a third-

party facilitator can facilitate open communication. Open communication between coopetitors promotes trust, which can increase the desired knowledge sharing between the organizations (Ritala and Hurmelinna-Laukkanen, 2013; Tidström, Ritala and Lainema, 2018) Facilitating inter-organizational coopetition requires horizontal management skills and “soft” skills, such as communication and conflict management (Kestemont and Chalant, 2013).

**Coopetition as a setting for environmental sustainability**

Coopetition in circular economy initiatives can deliver positive outcomes on both the macrolevel for the society and on the microlevel for individual companies (Manzhynski and Figge, 2020). Simultaneous competition and cooperation provide benefits related to synergy of the coopeting companies, which leads generally to better performance in many business sections, such as R&D, innovation, market position, business model development, (Gnyawali and Park, 2009, 2011; Ritala and Hurmelinna-Laukkanen, 2013; Ritala, Golnam and Wegmann, 2014) and according to previous research these seem to be true also in sustainability outcomes (Christ, Burritt and Varsei, 2017). Sustainability comprises of environmental and social goals as well as economic goals and both microlevel and macrolevel concerns which underline the importance of balancing between the coopetition outcomes (Manzhynski and Figge, 2020).

Outcomes from coopetition may differ for coopetition partners and positive outcomes on the microlevel might not lead to positive outcomes on the macrolevel (Manzhynski and Figge, 2020) which are important notions when looking into multilateral coopetition aiming towards advancing sustainability and circularity goals. In coopetition for sustainability the success needs to be assessed on the macrolevel, which makes evaluating the benefits of coopetition only from the perspective of the focal firm imprecise. In addition to analyzing only the individual benefits of coopetition, the vast majority of earlier research on coopetition outcomes focuses on economic profitability (e.g. Bengtsson and Kock, 2000; Gnyawali and Park, 2009, 2011; Ritala, Golnam and Wegmann, 2014) but when it comes to advancing sustainability and circular economy through coopetition, concerns about environmental and/or societal issues must be taken into consideration when analyzing coopetition outcomes. When discussing the outcomes of coopetition for sustainability, the microlevel or macrolevel on which the outcomes accrue must be taken into consideration. Gains of the focal firm aren’t synonymous with successful coopetition. (Manzhynski and Figge, 2020)

Some earlier studies on collaboration between competitors (see e.g. Peloza and Falkenberg, 2009; Hahn and Pinkse, 2014) have, on the contrary, questioned the usefulness of the competitive setting in collaboration towards sustainability. Hahn and Pinkse (2014) argue that competition between companies can inhibit the realisation of environmental objectives because of the opportunistic behavior of partners as well as tension and conflicts inherent to coopetition. On the other hand, according to management literature, coopetition can be beneficial regardless of the inherent challenges of the paradoxical relationship (see e.g. Bengtsson and Kock, 2000; Gnyawali and Park, 2011) and there is no comprehensive reasoning why coopetition wouldn't be beneficial for reaching sustainability objectives. Opportunistic behavior doesn't disappear from coopetitive relations even if the aim is to advance sustainability (Hahn and Pinkse, 2014) but opportunistic behaviour can be better anticipated and understood when the outcomes of coopetition for each actor in the ecosystem are clarified (Manzhynski and Figge, 2020). Coopetition for sustainability brings benefits, but it also entails risks (Planko *et al.*, 2019). The viability of coopetition for sustainability depends on the perspectives of the stakeholders involved in coopetition (Manzhynski and Figge, 2020).

What comes to innovation, companies thriving for innovative technologies supporting sustainable development and its successful implementation need to collaborate with other actors in the ecosystem including competitors. Through collaboration within the ecosystem companies can pool knowledge and resources as well as develop standards and interoperable products. These actions as well as joining forces enable the ecosystem to compete against other technologies. (Planko *et al.*, 2019) Cross-sector collaboration in networks of companies, suppliers, competitors, customers and universities is crucial to achieve radical innovations that contribute to sustainable development (Melander, 2017). To achieve systemic change collaboration in interorganizational networks and ecosystems is required (Planko *et al.*, 2019). Macrolevel eco-efficiency can be enhanced with circular resource usage. Competing companies can collaborate in resource usage or develop infrastructures increasing the circularity and resource efficiency of materials, side streams and goods. (Manzhynski and Figge, 2020)

Environmental coopetition refers to companies collaborating with competitors aiming to reduce harmful environmental impact or create environmental value (Volschenk, Ungerer and Smit, 2016). Sustainability related coopetition strives to achieve economic and environmental performance for individual companies taking part in coopetition through win-win solutions (Limoubpratum, Shee and Ahsan, 2015; Christ, Burritt and Varsei, 2017). The literature linking coopetition to sustainability is scarce but coopetition

for sustainability holds potentially considerable benefits, for instance, when applying coopetition strategies towards sustainability on the corporate level (Christ, Burritt and Varsei, 2017). Earlier literature has shown the benefits related to sustainability in multiple contexts, such as recycling (Volschenk, Ungerer and Smit, 2016), logistics (Limoubpratum, Shee and Ahsan, 2015) and procurement (Meehan and Bryde, 2015). Table 1. gathers the previous research combining coopetition and environmental sustainability.

***Table 1.*** *Previous research on coopetition in environmental sustainability context.*

| ***Authors, Year*** | ***Research type and research context or industry*** | ***Sustainability focus*** | ***Main insights*** |
|---|---|---|---|
| Manzhynski and Figge, 2020 | Case study of two coopeting firms, studying economic and environmental dimensions. | Contributions to **sustainability on the societal level.** | The paper links organizational and societal outcomes of coopetition; coopetition for sustainability can be assessed from firm, resource and societal perspectives. |
| Planko *et al.*, 2019 | Empirical case of the Dutch smart grid industry; emerging industry with sustainability goals. | Competitors collaborate in **developing innovative technologies** that support sustainable development. | Examination of coopetition strategy for sustainable development at the network level and identification of coopetition enablers in the context of sustainability technology development. |
| Bowen, Bansal and Slawinski, 2018 | Inductive examination of the collective actions taken by a consortium of 12 oil sands companies to address three environmental issues of different scale. | **Collective action problem solving** in environmental issues of different scale through industry self-regulation. | Organizing rules in industry self-regulation for collaborative collective action are more effective for smaller scale issues (tailing ponds and water) than larger scale issues (greenhouse gas emissions). |
| Stadtler, 2018 | Comparative case study analysis of two multi-company CSSPs (from Egypt and Jordan) in education. | **Sustainability related tensions** in collaborative arrangements between multiple companies and actors from the public and/or civil society sectors. | The study exposes the paradoxical nature of coopetition at the interface of social and economic goals. |
| Christ, Burritt and Varsei, 2017 | A single case study on coopetitive agreement in Australian wine industry logistics. | **Sustainability in wine industry logistics**: reducing fossil fuel and refridgeration usage by jointly outsourcing bottling and packaging. | According to literature review and the example on wine industry coopetition, there is no fixed relationship between improving carbon performance and increasing competitiveness. |

| | | | |
|---|---|---|---|
| Rivera *et al.*, 2017 | Panel data analysis on participation efforts in a collective voluntary environmental program in Costa Rica. | Collective voluntary environmental program aiming to improve environmental performance and **shared green reputation**. | Higher levels of within-community cooperation for shared green reputation are more likely in seashore localities with lower income inequality and/or a higher number of businesses. |
| Melander, 2017 | Literature review on external collaborations in green product innovation. | Collaboration in **green product innovation**. | By developing green products, companies can reduce environmental costs and create new opportunities in new markets in collaboration with partners. |
| Volschenk, Ungerer and Smit, 2016 | Case study on environmental coopetition in the South African wine industry. | **Recycling** and socio-environmental value. | Coopetition can create socio-environmental value in some instances. While socio-environmental value is a public benefit and can't be appropriated by coopetitors, it can act as a catalyst to value creation for the coopeting firms. |
| Limoubpratum, Shee and Ahsan, 2015 | A survey among Thailand newspaper industry on logistics. | Coopetition strategy for **sustainable logistics distribution.** | Managers strongly believe in coopetition to achieve sustainable logistics distribution which results in significant economic, social and environmental improvement. |
| Meehan and Bryde, 2015 | Field-level examination through a case study and an online survey of the UK social housing sector. | **Sustainable procurement** activities in public sector context. | Sustainable procurement is heterogeneous in practice. Social housing organizations take holistic considerations of sustainable procurement to support the importance of connecting planet, people and profit in the sector. |
| Hahn and Pinkse, 2014 | Conceptual examination on how the competitive nature in firm interactions within cross-sector partnerships affects effectiveness. | Cross-sector partnerships effectiveness for the **governance of global environmental issues**. | The effectiveness of cross-sector partnerships for governing global environmental issues depends considerably on whether competitive forces at the firm level are aligned with the collective benefits of partnerships. |
| Peloza and Falkenberg, 2009 | A conceptual framework for the collaboration among firms and NGOs. | **Collaboration structures for addressing environmental issues.** | Collaboration with either multiple firms and/or multiple NGOs can deliver better performance in corporate social responsibility issues than collaboration between a single firm and NGO. |

As is evident from the table above, coopetition has been studied from multiple environmental sustainability perspectives. The line of literature was initiated by Peloza and Falkenberg (2009) looking into the dynamics between firms or between NGOs to deliver better performance in corporate social responsibility issues compared to individual actors. After that coopetition has been studied in different settings, industries countries and contexts, such as, sustainable procurement in the public sector (Meehan and Bryde,

2015), sustainable logistics in Thailand (Limoubpratum, Shee and Ahsan, 2015), recycling in the wine industry (Volschenk, Ungerer and Smit, 2016) and sustainability related tensions (Stadtler, 2018).

Although there are a few studies linking coopetition and environmental sustainability aspects, there are still a lot of research gaps considering the research area. For example, the dynamics of circular economy ecosystems entailing horizontal actors still remains widely unaddressed.

## 2.3 Diverse alignment to enable collaboration and coopetition for circular economy

Alignment and misalignment have attracted interest in the fields of strategy and business-to-business marketing research for some time (Ingstrup, Aarikka-Stenroos and Adlin, 2020), whereas alignment and co-alignment structures have turned up more recently in ecosystem research (see e.g. Adner 2017, Autio et al. 2018, Thomas & Autio 2020). In ecosystems, members of the ecosystem have defined positions and activity flows (Adner 2017) which makes the investigation of alignment structures reasoned. Adner (2017) describes alignment as *"the extent to which there is mutual agreement among the members regarding these positions and flows"*. The difference between participation and alignment are illustrated in cases where various actors aim towards different end states and end goals. Alignment includes the compatible motives and incentives of the ecosystem's actors and highlights the need for consistent understanding of the configuration of activities among ecosystem actors. (Adner 2017)

According to Adner (2017) the search for alignment is in the heart of ecosystem strategy and Adner (2017) also uses alignment structure when defining an ecosystem: *"the alignment structure of the multilateral set of partners".* Whereas, Thomas & Autio (2020) describe that co-alignment structure coordinates the interactions among ecosystem participants through enabling the ecosystem's actors specializing in roles not defined by formal contracts. According to Autio et al. (2018) mutual alignment is the core object of endogenous strategic action. The co-alignment structure of an ecosystem can reflect the interdependencies and the power relations within the ecosystem (Thomas and Autio, 2020), whereas, the interdependencies between the actors in the ecosystem provide an important precondition for mutual alignment (Autio and Thomas, 2018).

Alignment can be seen as an important driver for value creation between actors who are in a relationship (Ingstrup, Aarikka-Stenroos and Adlin, 2020). The alignment of differing perceptions of obligation fulfilment can also be regarded as a key enabler of trust building

along with, for example, the balance between value creation and community values within ecosystem environments (Autio and Thomas, 2014). Alignment and misalignment can be present simultaneously, as partial alignment and misalignment are in-between modes of alignment. Alignment and misalignment are also dynamic by nature and may change as the collaboration evolves over time. (Ingstrup, Aarikka-Stenroos and Adlin, 2020) Misalignment can lead to decision errors which should be corrected by re-alignment. But misalignment can also lead to positive outcomes, while complete alignment among parties might have a negative effect through reducing the stimulus to change. (Corsaro and Snehota, 2011)

Multiple alignment types and structures can be distinguished according to previous literature. Corsaro and Snehota (2011) identified research streams looking into the alignment of goals, alignment of practices and cognitive alignment, whereas Thomas and Autio (2020) categorize alignment according to participant interdependencies in ecosystems, which include economic, technological and cognitive interdependencies. Alignment structures are included in the non-contractual governance of ecosystems and these structures enable the ecosystem participants to specialize in certain roles not necessarily defined by formal contracts (Thomas and Autio, 2020). An ecosystem co-alignment structure, as denoted by Thomas and Autio (2020), reflects the interdependencies as well as the power relations between the constituents of an ecosystem (Thomas and Autio, 2020). The most applicable division of alignment in an ecosystem for this study is a combination of the alignment types and structures identified by Corsaro and Snehota (2011) and Thomas and Autio (2020).

The need for **technological alignment** stems from the interdependence between heterogeneous actors within the ecosystem in which the actors are co-specialized around a shared platform or a common modular architecture (Autio and Thomas, 2018; Thomas and Autio, 2020). Innovation ecosystems including strong technological interdependence often use technological platforms and architectures as their co-alignment structures (Wareham, Fox and Giner, 2014; Thomas and Autio, 2020). Technology ecosystems are product platforms defined by core components made by the owner of the platform and complementing components made by other autonomous companies (Wareham, Fox and Giner, 2014). In addition to these technology ecosystems, technological alignment is also important to multiple other ecosystems, such as circular economy ecosystems, as technological alignment refers to the coordination mechanisms through which the transactions in the ecosystems are done and managed technically. Typically, a platform or other

technologies facilitate the technological alignment (Wareham, Fox and Giner, 2014; Thomas and Autio, 2020).

**Economic alignment** refers to the contractual and incentive structures for value creation in an ecosystem. As interdependencies between actors can be seen as a precondition for alignment (Autio and Thomas, 2018), the economic interdependence in an ecosystem stems from the value that each actor receives from participating in the ecosystem, which is dependent on the simultaneous availability of compatible offerings by others (Thomas and Autio, 2020). If the potential ecosystem stakeholders perceive enhanced potential value in the economic exchanges that the ecosystem offers, they will align with the ecosystem. The perceptions of economic instrumentality and value of potential ecosystem stakeholders can be enhanced by several externality strategies, such as alliance formation. (Autio and Thomas, 2018) Economic interdependencies can emerge when the ecosystem enables economies of scale and scope for its participants (Autio and Thomas, 2018; Thomas and Autio, 2020). Economic interdependencies can arise from technological interdependencies, where complementarities occur across different components, in addition to knowledge sharing and spill-overs, which promote the growth and maturation of the ecosystem's shared knowledge base increasing its value for the ecosystem participants (Thomas and Autio, 2020).

The alignment between cognitive representations is categorized as **cognitive alignment** (Corsaro and Snehota, 2011). Cognitive alignment is the shared understanding between actors of what the value creation and value proposition in the ecosystem is about. Cognitive alignment refers to the issue of whether the views and perceptions of actors match (Corsaro and Snehota, 2011; Ingstrup, Aarikka-Stenroos and Adlin, 2020). Cognitive alignment between actors is needed for trust building, communication and knowledge transfer facilitation as well as enabling the prediction of others' behavior (Corsaro and Snehota, 2011). In order to ease collaboration between ecosystem participants, some cognitive alignment is needed (Ingstrup, Aarikka-Stenroos and Adlin, 2020). Cognitive alignment advances the effectiveness of communication in the ecosystem (Corsaro and Snehota, 2011). Because of cognitive structures, such as mental schemes, routines and social roles, the behavior of others is often taken for granted and not reflected upon. The ecosystem participants have to establish cognitive legitimacy for newly emerging technological ecosystems because the established cognitive structures or norms of the potential stakeholders may be contradictory to the cognitive structures in the technological ecosystem. (Autio and Thomas, 2018) The cognitive interdependence in an ecosystem promotes the cohesion of heterogeneous participants in an ecosystem (Thomas and

Autio, 2020). Cognitive interdependence is important in ecosystems as the self-interests and expertise among participants is different, which increases the cognitive distance among the actors (Wareham, Fox and Giner, 2014).

**Alignment of goals** refers to the consistency and agreement of goals among ecosystem participants (Ingstrup, Aarikka-Stenroos and Adlin, 2020). When the actors' goals are highly consistent and compatible, the connection between relationship activities and the effectiveness of inter-organizational change is higher compared to situations with lower consistency and compatibility of goals. When the compatibility of goals among the actors is low, conflicts damaging further development of the collaboration are more likely to occur. (Corsaro and Snehota, 2011) Relational behaviors create the conditions which are necessary for achieving alignment of goals (Stephen and Coote, 2007). The determinants for alignment of goals in relational behaviors are flexibility, solidarity, information exchange and trustworthiness (Stephen and Coote, 2007; Corsaro and Snehota, 2011). The increased perceptions of goal alignment within an ecosystem leads to improved financial performance (Stephen and Coote, 2007). Goal alignment is seen as one of the enablers of coopetitive relationships (Gnyawali and Park, 2009; Bouncken and Kraus, 2013; Planko *et al.*, 2019).

The degree to which the processes and competences fit the actors in the ecosystem is referred to as the **alignment of practices** (Ingstrup, Aarikka-Stenroos and Adlin, 2020). Bridging, extending, transforming and amplifying are examples of types of alignment practices which can mobilize ecosystem participants towards alignment (Corsaro and Snehota, 2011). Alignment of practices links to the coordination of the collaboration or the alignment of actions. Coordination problems arise when there are difficulties in aligning actions and these issues can persist even when the interests are aligned because, according to Gulati et al. (2005), the coordination problems arise due to the cognitive limitations of individuals regarding the interdependencies among actors (Gulati, Lawrence and Puranam, 2005). On the other hand, positive outcomes can be generated through the alignment of practices even in situations where misalignment remains (Corsaro and Snehota, 2011).

**Misalignment** is discussed in parallel to alignment and its dimensions. In this study misalignment can appear in the same dimensions as alignment, being the opposite of alignment to some extent. This study adopts the views of Ingstrup et. al (2020) in which partial alignment and misalignment are found to be in-between modes of alignment and alignment and misalignment can be seen as the two ends of a continuum. Also, tensions between ecosystem participants can be categorized as misalignment.

This study proposes a new structuring model for alignment and misalignment dimensions. In this study these above discussed alignment structures and types are formulated to a table presenting alignment dimensions. The table is applicable to categorize the alignments identified in the studied ecosystems. This is a new categorization of alignment dimensions which combines different alignment structures and types from previous literature (see e.g. Ingstrup, Aarikka-Stenroos and Adlin, 2020; Thomas and Autio, 2020) in a new way. Table 2. illustrates the positioning of the alignment dimensions. Technological, economic and cognitive alignments and misalignments are divided into the alignment of goals and alignment of practices. The alignments and misalignments are divided in the table with a dashed line and illustrated with + or - signs.

***Table 2.*** *The proposed categorization of alignment and misalignment dimensions, presenting examples from previous alignment literature.*

| | **Technological alignment** | **Economic alignment** | **Cognitive alignment** |
|---|---|---|---|
| **Alignment of goals** | + Firms develop technological processes jointly (Ingstrup et al. 2020). | + Ecosystem enables economies of scale (Thomas and Autio, 2020).<br><br>+ Alliance formation (Autio and Thomas, 2018). | + Researchers join forces to provide world class education (Ingstrup et al. 2020). |
| | - Firms have different interests in technology development (Ingstrup et al. 2020). | | - Industry, government and academia have different perceptions on the pace of commercialization (Ingstrup et al. 2020). |
| **Alignment of practices** | + Industry, government and academia develop technologies jointly to further regional circular economy (Ingstrup et al. 2020).<br><br>+ The use of shared technological platforms and architectures (Wareham et al. 2014). | | |
| | | - Firms aim for fast commercialization whereas researchers seek for advanced knowledge (Ingstrup et al. 2020).<br><br>- Customers' opportunistic behavior cause misalignment in the hotel industry (Järvi et al. 2020). | - Researchers developing joint courses came from different research disciplines and traditions (Ingstrup et al. 2020).<br><br>- In hotel industry, incoherent marketing communication creates misalignment between actors (Järvi et al. 2020). |

The table above illustrates the alignment dimensions gathered from previous literature and their positioning to one another. In the proposed categorization the technological, economic and cognitive alignments are divided into alignment of goals and alignment of practices as well as to alignment and misalignment within these dimensions. In table 2. examples of identified alignments and misalignments from literature discussing alignment have been gathered and categorized to different dimensions according to the proposed model.

## 2.4 Synthesis of the literature review

The theory section of this thesis presents and links together three different research streams. The ecosystem theory helps to identify how different actors are connected to one another and what are the structures and constituents of collaboration. Through coopetition literature the horizontal relationships of the studied ecosystems are identified as well as the facilitative measures for successful collaboration between competitors. Lastly, the reviewed alignment literature aims to discover how the actors in the ecosystem are aligned concerning their objectives and practices in different dimensions.

This literature review resulted in a depictive framework combining these research streams. The research streams and their concepts present phenomena on very different levels and therefore the framework is presented as an illustration including the main phenomena and concepts of the study. In figure 2. the ecosystem structure and the relations between actors are illustrated on the background and coopetitive relationships are marked with red circles. The facilitation of these coopetitive relationships are illustrated with yellow lightning bolts from the central actor. The alignment dimensions of the ecosystem are visualized on top of the ecosystem depiction to illustrate that alignment concerns the ecosystem as a whole.

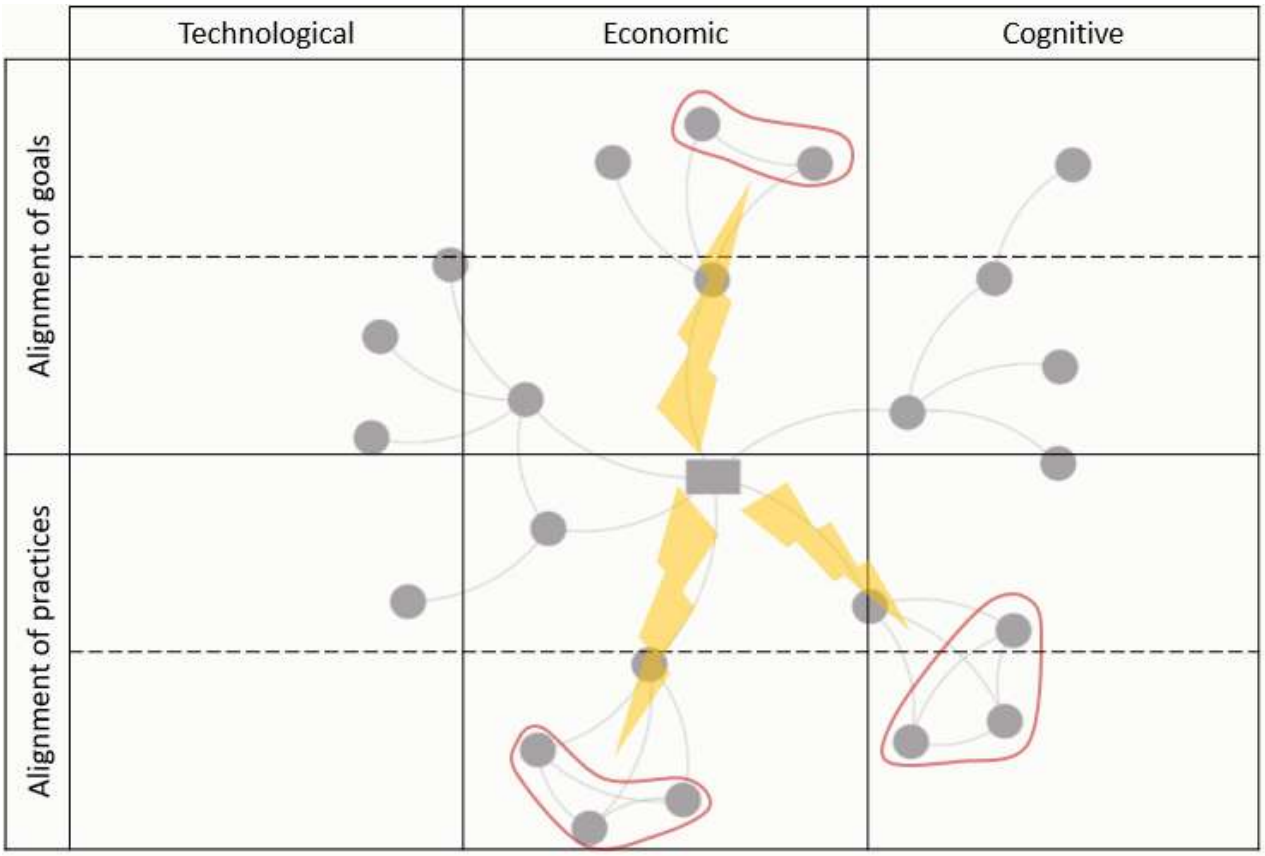


***Figure 2.*** *Depictive framework of alignment in ecosystems entailing coopetitive relationships.*

Ecosystem is the most fitting concept for the studied context as, according to the literature review, ecosystems differentiate from other constructs centered around networks by including also the use side participants to the ecosystem definition (Autio and Thomas, 2014). As the first research question looks into the composition of circular economy ecosystems entailing competitors, the ecosystem approach of this study concentrates on the actors as well as their roles and relationships in the ecosystem. Heterogenous ecosystem participants with varying roles facilitate extensive outputs which single actors could not deliver alone (Thomas and Autio, 2020). Participant heterogeneity of ecosystems is presented already in seminal ecosystem literature (Moore, 1993). The participants of an ecosystem can represent a wide variety of sectors and industries (Moore, 1993; Thomas, Autio and Sharapov, 2015) and compose *"a multilateral set of partners"* (Adner, 2017). There are interdependencies among the ecosystem participants and according to Thomas and Autio (2020) these interdependencies can present technological, economic or cognitive interdependencies.

Based on the literature review circular economy objectives drive the formation of an increasing number of ecosystems (Aarikka-Stenroos, Ritala and Thomas, 2021). These

circular economy ecosystems are defined as *"communities of hierarchically independent, yet interdependent heterogenous actors who collectively generate a sustainable ecosystem outcome*" by Aarikka-Stenroos et al. (2021). This study takes an interest in circular economy ecosystems entailing competitors and for an ecosystem to succeed as a whole the companies have to balance competition and cooperation within the ecosystem (Hannah and Eisenhardt, 2018).

As the ecosystem literature review underlined the complexity of balancing collaboration and competition in an ecosystem (Hannah and Eisenhardt, 2018) a deeper look into coopetition as a particular type of collaboration was needed. In coopetitive relationships organizations collaborate and compete simultaneously (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019) and coopetition can emerge on different levels and situations and take different forms (Chiambaretto and Dumez, 2016). In addition to identifying coopetition in the studied ecosystems the first research question looks into the facilitation of coopetition. Tensions are inherent to coopetitive relationships as the collaboration creates a paradoxical situation for competitors. Managing tension and paradox are key to achieve results in co-creation activities. (Kestemont and Chalant, 2013; Fernandez, Le Roy and Gnyawali, 2014) A need for coopetition facilitation by a neutral third party has been identified in previous literature (Kestemont and Chalant, 2013; Fernandez, Le Roy and Gnyawali, 2014; Planko *et al.*, 2019). Coopetition can be a necessary strategy for sustainability objectives. Coopetition has been studied from multiple environmental sustainability perspectives but coopetition literature lacks insights on coopetition for advancing circular economy in ecosystems formed around a shared circular objective.

The third research question aims to create understand on the alignments needed for circular economy ecosystems to achieve system-level outcomes. Alignment has attracted interest in ecosystem research recently and the identification of alignment structures in ecosystems is reasoned because of the defined positions and activity flows of ecosystem participants and alignment is defined as *"the extent to which there is mutual agreement among the members regarding these positions and flows"* (Adner, 2017). Alignment is a significant driver for value creation between ecosystem participants (Ingstrup, Aarikka-Stenroos and Adlin, 2020) including the compatible motives and incentives within the ecosystem as well as highlighting the need for consistent understanding of the necessary activities among ecosystem participants (Adner, 2017).

The co-existence of alignment and misalignment is possible because partial alignment and misalignment are in-between modes of alignment. As the collaboration evolves over time also the alignment and misalignment may change. (Ingstrup, Aarikka-Stenroos and

Adlin, 2020) Previous literature presents multiple types and structures of alignment. Alignment categorization according to participant interdependencies include economic, technological and cognitive structures of alignment (Thomas and Autio, 2020). In addition to these structures, the alignment of goals and the alignment of practices have been identified in alignment literature (Corsaro and Snehota, 2011; Ingstrup, Aarikka-Stenroos and Adlin, 2020). In this study the alignments and misalignments are categorized in technological, economic and cognitive dimensions which are further divided into the alignment of goals and alignment of practices.

# 3. RESEARCH METHODOLOGY

This chapter discusses the research methodology needed to deepen the understanding on the dynamics of circular economy ecosystems entailing horizontal actors. Firstly, this chapter presents the research design. This is followed by case selection argumentation including preliminary case identification. After describing the selected cases, data gathering and data analysis on the cases are justified. Finally, the reliability and validity of the research approaches are introduced and evaluated.

## 3.1 Research design and research strategy

The research done for this thesis aims to generate understanding on alignment in circular economy ecosystems in which horizontal actors work together towards common objectives. Prior research doesn't address the alignment of horizontal actors in ecosystems with a goal to advance circularity. Therefore, this study aims to address the research gap of alignment and coopetition in circular economy ecosystems. The aim is to contribute to the theory development of alignment as well as coopetition in the field of circular economy through gathering and analyzing qualitative insights. As the hypothesis of the study indicates, there needs to be enough alignment between actors for the collaboration to reach a circular economy goal. The data gathered to answer the research questions is qualitative. A qualitative research design facilitates understanding of real-life situations, reveals new information and enables forming a big picture of research targets (Hirsjärvi *et al.*, 2009).

To understand the alignment and coopetitive dynamics in ecosystems formed around circular economy initiatives, the research design must enable to study these holistic phenomena in their contexts, which calls for case study research. Case study strategy enables empirical investigation of specific contemporary phenomena within their real-life contexts (Robson, 2002 p. 178). A case study supports empirical research in which the boundaries between contemporary phenomena and their real-life contexts are not clearly evident and can't be easily separated (Halinen and Törnroos, 2005). The research done for this thesis focuses on gaining empirical data to understand and explain alignment in circular economy ecosystems and the coopetitive relations in the selected ecosystems. The alignment and coopetitive relations in ecosystems need to be studied in their operating environment, which makes a case study the most appropriate research strategy for this thesis.

As the research area of combining alignment, coopetition and circular economy ecosystems is novel and research on this specific phenomenon is nonexistent, the methods of a case study help to understand these new insights and elements that are yet largely undiscussed and unfamiliar. A case study is an appropriate choice to answer questions such as what, why or how with a large understanding of the phenomena (Voss, Tsikriktsis and Frohlich, 2002). On the other hand, the downside of case study research strategy is that the results of case studies are rarely generalizable (Gable, 1994) and case research challenges researchers as it is time consuming and requires interviewing skills (Voss, Tsikriktsis and Frohlich, 2002).

Case study was selected as the research strategy and the study was conducted as a multiple case study with two different cases. Choosing multiple-case study research design over a single-case design may reduce the unexpected vulnerabilities in the selected cases and a multiple case study strategy enables benefits for the analysis because of the possibility to conduct cross-case analysis (Yin, 2003 p. 53). In this thesis two cases were chosen, as fewer cases enable greater depth of observation. Two cases instead of one case mitigates the risk of misjudging of a single event and exaggerating available data, because of comparing events and data across the cases (Voss, Tsikriktsis and Frohlich, 2002).

## 3.2 Case selection

In this thesis the sampling method used is purposive sampling. The cases were selected based on their suitability for illustrating the studied phenomena. Purposive sampling formulates a non-probability sample for which the probability of the cases selected from the target population is unknown (Saunders, Lewis and Thornhill, 2016). With purposive sampling the case selection is done with the aim to choose the cases that best answer the research questions and meet the study's objectives (Saunders, Lewis and Thornhill, 2016). The aim was to select cases that illustrate the alignment and the inherent issues of coopetition in circular economy ecosystems. The analysis of the thesis is qualitative and therefore the objective of the study is to create understanding instead of focusing on statistically relevant results.

When sampling cases for a study it is important to set boundaries to what can be studied and connect the cases directly to the research questions (Voss, Tsikriktsis and Frohlich, 2002). Case selection in this study was done by gathering information on potential cases and reflecting them on the research criteria. The main research criteria for the case selection was to find cases in which multiple actors work together in the field of circular

economy across Finnish industries. The objective was to find cases where multiple actors, including competitors, collaborate to advance sustainability and circular economy. As this study aims to create understanding on the special features, possibilities and issues of collaboration towards sustainability, the selected cases should represent various aspects regarding for example the success, industry and drivers for collaboration.

Taking these research criteria into consideration, preliminary cases were identified and analyzed. To identify suitable cases, several sources and expert networks were utilized. The preliminary case identification included going through external information on national circular economy clusters and ecosystems, attending expert lectures and meetings as well as conducting expert interviews. As the research for the thesis is done as a part of the national CICAT2025 project, strong connections to project stakeholders enabled conducting initial interviews with industry experts during the case selection phase. The expert interviews and external sources used, provided good insights and understanding of the various possibilities for research on collaboration towards circularity. Multiple potential cases were identified in the preliminary case identification on horizontal collaboration towards sustainability. Table 3 presents the data types and amounts of data used for the preliminary case identification as well as the interviewed organizations.

***Table 3.*** *Overview of data sources for the preliminary case identification.*

| DATA TYPE | DATA AND AMOUNT OF DATA |
|---|---|
| Expert interviews | ***Interviews*** with industry experts (5)<br><br>Interviewees' organizations: CLIC Innovation, Motiva, Chemical Industry Federation of Finland, The Federation of Brewing and Soft Drinks Industry, NCC |
| Discussions and lectures | ***Discussions*** with representatives from the Ministry of the Environment (2)<br><br>***Lecture*** by NCC representative (1) |
| Secondary data | ***internet sources***, including e.g. web pages (12)<br><br>***news articles*** from Finnish newspapers and news sources (5)<br><br>***presentations*** from CLIC Innovation, Palpa and representatives from CEP and Palpa (5)<br><br>***information booklets, brochures and report*** from Palpa, Panimoliitto, CLIC Innovation and CITER (5) |

### 3.2.1 Identified cases

Through the preliminary case identification thirteen potential cases were selected for further evaluation. The preliminary case identification provided cases which can be divided into three categories: agreements, platforms and networks or systems. All the cases are located in Finland and include some form of horizontal collaboration with the aim of fulfilling circular economy objectives. Table 4 presents the identified cases, their descriptions, including the horizontal collaborators and their circular economy objectives as well as the sources used in identifying these preliminary cases.

***Table 4.*** *Identified cases, their descriptions and sources used for case identification.*

| Case | Case description | Sources |
|---|---|---|
| **Agreement** | | |
| No more free plastic bags for consumers | Horizontal collaborators: Consumer store retailers.<br>CE objective: Reducing plastic by not giving out free plastic bags to consumers. | Motiva expert interview, internet sources, news articles |
| Material efficiency engagement | Horizontal collaborators: Different industries, e.g. food industry.<br>CE objective: Engaging companies to decrease environmental impact and increase profitability. | Motiva expert interview, internet sources |
| Energy efficiency agreement | Horizontal collaborators: Different industries, e.g. manufacturing, service sector, property business and municipal sector.<br>CE objective: Engaging actors to enhance energy efficiency. | Motiva expert interview, internet sources |
| **Platform** | | |
| Circular Economy Service Platform | Horizontal collaborators: Forestry industry companies, two recycling companies and research organizations.<br>CE objective: Enabling the creation of new business from industrial waste and side streams with a digital platform. | CLIC Innovation expert interview, internet sources, presentations, information booklets and brochures |
| Materiaalitori | Horizontal collaborators: Construction industry.<br>CE objective: The “marketplace for materials” facilitates the exchange of side streams and waste between companies and organizations and aims for resource efficiency and creating industrial symbiosis. | Motiva and NCC expert interview, internet sources |

| | | |
|---|---|---|
| Maapörssi | Horizontal collaborators: Construction industry.<br>CE objective: Recycling surplus soil and demolition materials for the needs of companies or individuals. | Industry expert lecture and NCC expert interview, internet sources |
| Materiaalikirjasto | Horizontal collaborators: Regional construction companies.<br>CE objective: Promote the use of new regional recycled materials in Päijät-Häme region. | Internet sources |
| Loop Rocks | Horizontal collaborators: Construction industry<br>CE objective: Promoting the resource efficiency for stones and other building masses. | Industry expert lecture and NCC expert interview, internet sources |
| **Network or system** | | |
| New Plastics Center | Horizontal collaborators: Companies doing R&D for plastics.<br>CE objective: Solving the challenges of plastics through new innovations and materials, product development and networking. | Ministry of the Environment extensive discussion on plastic and expert discussion on NPC, internet sources |
| Kinkkutemppu | Horizontal collaborators: Grocery retailers.<br>CE objective: The “Ham trick” is a joint act for gathering consumer cooking fat for fuel usage. | Chemical Industry Federation of Finland expert interview, internet sources, news article |
| Beverage package recycling system | Horizontal collaborators: The brewery industry, the retail industry and other horizontal stakeholders.<br>CE objective: Beverage package recycling in Finland | Industry expert interviews, internet sources, presentations, news articles, information booklets |
| PBL Brewing laboratory | Horizontal collaborators: Brewery industry.<br>CE objective: Enhancing the sustainability and facilitating collaboration through a food chain, from barley to beer. | The Federation of the Brewing and Soft Drinks Industry expert interview, internet sources |
| PLASTin | Horizontal collaborators: Companies utilizing plastic and research organizations.<br>CE objective: Improving the recycling rate of plastics in collaboration with companies and research organizations. | CLIC Innovation expert interview, internet sources |

The above presented preliminary cases were evaluated based on their potential value for the research agenda regarding the aspects of horizontal collaboration in ecosystems advancing circular economy and also the data availability of the cases. The evaluation of these identified cases was done based on the data gained from the expert interviews and discussions, various internet sources and secondary data. The internet sources used can be found in appendix A. in which the secondary sources of the study are listed. The preliminary case analysis made evident the fact that some of the cases were significantly less accessible regarding data gathering than other cases which also had an effect on the case selection. After this preliminary analysis the cases were reflected on the theoretical findings made in the theoretical part of the thesis to evaluate which cases could provide novel results and fill the identified research gaps. Two cases were selected for thorough investigation and analysis for this study. The case selection and sampling criteria are justified in the following subsection.

### 3.2.2 Selected cases

The selected cases were the Finnish Beverage Package Recycling System and Circular Economy Service Platform (CEP). Two cases were selected to enable cross-case analysis compared to a single-case study and, on the other hand, deeper analysis on the cases compared to a multiple-case study including three or more cases. The Finnish beverage package recycling system improves material efficiency by recycling the beverage packages with a very comprehensive national recycling system in which multiple actors from the brewery industry and the retail industry collaborate to achieve economic and sustainability benefits. The Circular Economy Service Platform is a project aiming to create new business from industrial side streams by developing a platform which could serve as a market integrator in the support mechanisms for new innovations. Multiple actors from different industries collaborated in the Circular Economy Service Platform development including three major Finnish forestry companies as well as research organizations and companies from different industries. Both cases presented wide-ranging ecosystems entailing multiple different industries and multiple coopetitive relationships.

These cases differ, for example, in their operating environment and industries involved, timeframe and observed success which enables rich cross-case analysis for answering the research questions. The case selection is a reflection of the objectives of the study by looking into two different ecosystems aiming to forward sustainability through horizontal collaboration. As the research aims to investigate the actors, roles, relationships and structures within the circular economy ecosystems, a deeper look into the coopetitive dynamics and alignment is needed. Therefore, choosing these cases is justified because

they provide extensive insights on the research topics. The selected cases cover the areas of interest for this study by providing insights on how ecosystems formed around circular economy initiatives are composed, where and what kind of coopetition can be identified, how is the identified coopetition facilitated and how actors align in the ecosystem.

The Finnish beverage package recycling system represents a successful, long time frame case with high proved impact, whereas the Circular Economy Service Platform is a very recent or on some measure still ongoing case with less proven impact. The Finnish beverage package recycling system has formed an established and comprehensive ecosystem over time, whereas the ecosystem formation for the Circular Economy Service Platform is very recent. Also, the incentives for organizations to take part in these ecosystems vary between cases as well as the structures of the ecosystems. For example, these differences between the selected cases allow a fruitful cross-case analysis. When selecting these cases, the hypothesis was that the due to these inherent differences between cases, some linkages between success and the chosen course of action can be found, but simultaneously paying attention to the external factors that improve or hamper the alignment between ecosystem actors. Both cases offer a rich combination of interviewees from different key organizations as well as an extensive set of secondary data, which enables analyzing the cases from multiple perspectives and consequently provides interesting and credible results.

The Finnish Beverage Package Recycling System was selected because of its proven long-term success in Finland. This particular recycling system has often come up in research discussions as an interesting example of collaboration between competitors with the aim of advancing circular economy. In management literature there is no studies looking explicitly into the coopetition aspects of the beverage package recycling system. The phenomenon of coopetition in bottle return was recognized in seminal coopetition research by Bengtsson & Kock (2000) in which one of the cases looked into cooperative bottle return in the Swedish brewery industry. The beverage package recycling system advances circular economy substantially as the return rate of the beverage packages is close to 100 percent in the Nordic countries. This great positive influence on material efficiency makes this particular recycling system an attractive object of study.

Circular Economy Service Platform (CEP) was selected because the project was ongoing at the time of case selection and the joint project aimed to solve a common challenge in the forestry industry. Therefore, this timely case provides interesting insights of an

ecosystem formed by multiple actors, including the three major forest industry corporations in Finland. The objective of the project is to create a digital platform which can be used to collect side streams from multiple forestry industry companies and create new business opportunities for companies utilizing the side streams in their processes. The aim is to customize the platform and its services to suit different industries and operating environments so that CEP could be used in different circular economy areas. Circular Economy Service Platform raised particular interest in the case selection because major players from the Finnish forestry industry have collaborated in the development of the platform to solve the shared challenge of processing the industry side streams responsibly while simultaneously competing within their core businesses.

## 3.3 Data gathering

In case research the underlying principle of data gathering is the use and combination of different methods to study the selected phenomena (Voss, Tsikriktsis and Frohlich, 2002). The methods used in this study include interviews, expert discussions, presentations, secondary data and internet sources. The use of multiple data sources on the same phenomenon increases the reliability of the data (Voss, Tsikriktsis and Frohlich, 2002). Majority of the data for the study was collected through interviews and this primary data was supplemented with secondary data sources, such as the companies' and organizations' external material, including brochures, internet sources and recorded presentations as well as news articles. Especially in ecosystem research, interviewing is a recommended approach (Phillips and Ritala, 2019) A possible weakness of utilizing interviews as the primary data source is that as the interviews are verbal reports which might be affected with challenges such as bias, inaccurate articulation or defective memory (Yin, 2003 p.92). To address these issues, data gathered from interviews was supplemented and backed up with secondary data. Even though data triangulation was used, it is important to acknowledge that the secondary data could also be biased similarly to the primary data.

The primary data was gathered through interviews mostly between November 2019-January 2020 and an additional two interviews were conducted in June 2020 to achieve a balanced coverage of both cases. A non-probability sampling approach was chosen for the data gathering through interviews to ensure that the most relevant persons in the studied ecosystems would be reached. The interviews were conducted as semi-structured interviews. Semi-structured interviews are likely to be the most advantageous approach when collecting data on complex or open ended questions and in research situations where the order and logic of questioning needs to be varied (Saunders, Lewis and

Thornhill, 2016). These circumstances are inherent in this study as the aim is to understand the relations of various actors in an ecosystem working towards a shared goal. Interviews enable gaining deeper understanding on the research phenomena as interviews allow asking follow-up questions and building on previously asked questions.

The interviewees were CEO or managerial level in their organizations in addition to representing their organization in the studied ecosystems. The interview audios were recorded with the interviewees permission and notes were taken during the interview, as recommended for researchers (Saunders, Lewis and Thornhill, 2016). The interview durations varied from approximately from 30 minutes to 90 minutes mainly due to the interviewees' personal differences in self-expression. The interview records were transcribed by external transcribers. Irrelevant small talk and warm-up discussions not related to research were excluded from the exact interview durations mentioned in table 5 and table 6 as well as from the transcriptions. Majority of the interviews were conducted at the interviewees' organization's headquarters, while some of the interviews were conducted as remote interviews through digital systems (Skype and TEAMS). No significant difference between the quality of the data in face-to-face versus remote interviews was perceived. Some of the remote interviews were a little shorter in duration due to less small talk and disruptions between the questions and answers.

When conducting interviews it has to be kept in mind that the manner in which the interaction is done and questions are asked will impact the collected data (Saunders, Lewis and Thornhill, 2016). Therefore, when conducting interviews for this study the objective was to maintain a similar relaxed and positive yet professional manner in all interviews to mitigate the influence of the interviewer's behavior on the collected data. In addition, interviewer bias can cause data quality issues in semi-structured interviews (Saunders, Lewis and Thornhill, 2016), which underlines the importance of concentrating on objectivity when interviewing and interpreting responses.

The preliminary questions were given in advance for the interviewees to allow the interviewees to get acquainted with the interview topic. The structure of the interviews was similar in all interviews, but the questions had to be modified to suit the interviewees role in the ecosystem. Due to the inherent challenges of ecosystem research the exactly same interview can't be used in different interviews as interviewees have varying roles in the ecosystem. Furthermore, the interviews for both cases were dissimilar due to the underlying differences across the cases regarding, for example, the value proposition

and objectives, which required case specific questions. Appendix B represents the structure and question examples of the interviews for both cases in addition to the questions for the initial expert interview.

In ecosystem research it is advised to use multiple sources to understand relationships (Phillips and Ritala, 2019) as was done in this study when interviewing multiple actors in the ecosystems to understand the perspectives of different ecosystem participants. Through interviewing it was possible to establish personal contacts (Saunders, Lewis and Thornhill, 2016) which gained access to relevant contacts in the studied ecosystems as interviewees were asked to recommend their contacts in the ecosystem for further interviews. In ecosystem research identifying potential interviewees through expert discussions and then snowballing interviews is an example of well-suited research approach (Phillips and Ritala, 2019), which was used in this study. Table 5 present an overview of the data sources utilized for both cases.

***Table 5.*** *Overview of the data sources for both cases.*

| Data type | CASE: Circular Economy Service Platform | CASE: Beverage Package Recycling System |
|---|---|---|
| Interviews with key actors in the ecosystem | 2019-2020: 7 interviews | 2019-2020: 6 interviews |
| Presentation materials; company data | Presentations (3) | Presentations (2) |
| Media data, marketing materials, e.g. brochures | Brochures and booklets (1), webpages (5) | Brochures and booklets (3), webpages (6), news articles (4) |
| Other | Report (1), research article (1) | |

## Interviews

Interviews conducted for case Circular Economy Service Platform are presented in table 6. The interviews took on average half an hour to one hour. The duration of the interview

was affected for example on the extent and comprehensivity of the interviewee's answers as well as the personal communication style of the interviewee.

***Table 6**. Interview data on case CEP.*

| INTERVIEWEE | DATE | ORGANIZATION, LEVEL OF INTERVIEWEE | THE ROLE OF THE ORGANIZATION IN THE ECOSYSTEM | DURATION |
|---|---|---|---|---|
| **I1** | 12.11.2019 | CLIC Innovation, Head of CE | Coordination of the project | 50min |
| **I2** | 26.11.2019 | The Chemical Industry Federation of Finland, Chief Advisor | Industry association | 73min |
| **I3** | 26.11.2019 | UPM, Director | Forestry company and project leader | 98min |
| **I4** | 3.12.2019 | Evianet Solutions, CEO | Technology provider | 33min |
| **I5** | 13.12.2019 | Metsä Group, Manager | Forestry company | 37min |
| **I6** | 8.1.2020 | Stora Enso, Manager | Forestry company | 20min |
| **I7** | 8.1.2020 | LUT, Associate Professor | Knowledge provider | 49min |

To achieve deep understanding on the relationships and the alignment in the ecosystem formed for Circular Economy Service Platform development, representatives from multiple key organizations in the ecosystem were interviewed. The objective was to acquire data from different viewpoints in the ecosystem. The interviewees chosen from the ecosystem's organizations were the persons who were in charge of the Circular Economy

Service Platform project in their own organizations. The interview structure and question examples for the case CEP interviewees can be found in appendix B.

Table 7 presents the interviews conducted for the beverage package recycling system case. The durations of the interviews were similar to the interviews done for the case Circular Economy Service Platform. Two final interviews for the case were conducted in June 2020 due to issues with reaching the interviewees because of the global situation. As the time frame of the beverage package recycling system is substantial, a few months between the interviews doesn't affect the quality of the data gathered through interviews.

***Table 7.*** *Interview data on case beverage package recycling system.*

| INTER-VIEWEE | DATE | ORGANIZATION, LEVEL OF INTER-VIEWEE | THE ROLE OF THE ORGANIZATION IN THE ECO-SYSTEM | DURATION |
|---|---|---|---|---|
| **I8 & I9** | 12.11.2019 | Motiva, Senior Expert & Senior Expert | Expert organization | 62min |
| **I2** | 26.11.2019 | The Chemical Industry Federation of Finland, Chief Advisor | Industry association | 73min |
| **I10** | 28.11.2019 | Suomen Palautuspakkaus, CEO | Recycling system administration | 57min |
| **I11** | 21.1.2020 | The Federation of the Brewing and Soft Drinks Industry, CEO | Industry association | 29min |
| **I12** | 5.6.2020 | Sinebrychoff, Manager | Brewery and soft drinks company | 49min |
| **I13** | 30.6.2020 | Kesko, Director | Retail company | 68min |

The objective for selecting the interviewees was to gain understanding about the ecosystem from various actors in the recycling system. Interviewees included representa-

tives from an expert organization, industry associations, central organization and companies producing and selling beverages. The interviewees were chosen based on their presumptive knowledge and experience of the beverage package recycling system. Long experience and involvement in the system's operations gives valuable insights on the ecosystem. Access to the ecosystem was achieved by snowballing. Interviewees gave their recommendations and contacts for further interviews. The structure and question examples for the interviews on case beverage package recycling system are presented in appendix B.

## 3.4 Data analysis

The main data source for this study was interviews with ecosystem actors. The interviews were recorded and transcribed. Notes were also taken on the most important insights gained during the interviews as recommended (Saunders, Lewis and Thornhill, 2016). The primary data from interviews was supplemented with a wide variety of secondary data including, for example, company material, web-sources, reports, news articles and presentations (see appendix A). The utilization of a wide variety of data enables data triangulation.

Data-driven thematic analysis was applied to the gathered primary data from the interviews. Thematic analysis is a flexible and systematic approach for analyzing qualitative data. Thematic analysis allows moving between the inductive and deductive approaches, which promotes its suitability as an analysis method for qualitative research in which choosing purely inductive or deductive approach may be problematic for reaching the desired scope of analysis. (Saunders, Lewis and Thornhill, 2016) In addition to thematic analysis, ecosystem mapping technique was applied to map the studied ecosystems and the relations and connections within the ecosystems. Primary data from interviews was supplemented with secondary data to clarify the ecosystem participants and their roles and relationships as well as for supporting some insights gained from the interviews.

The data gathered from interviews was prepared for analysis by external transcribing of the interview recordings. The data analysis was initiated with familiarizing with the data as recommended by Saunders et al. (2016). The transcriptions of the interviews were marked with color-coding to highlight essential data. A comprehensive excel sheet was created to conclude the findings from each interview. This excel sheet presented the interviewees in rows and the topics and themes of the research as columns. The interview data was revisited during the analysis process to refine the analysis themes. The analyzed themes and topics included, for example, coopetition aspects and specialties,

the facilitation of coopetition, identified tension and misalignment and the different dimensions of alignment including technological, economic and cognitive alignment. Insights related to these themes were identified from the interviews and gathered to the excel sheet.

The first research question was answered with ecosystem maps and descriptions of the various ecosystem participant groups. The ecosystems of the Beverage Package Recycling System and the Circular Economy Service Platform were visualized utilizing ecosystem mapping. The ecosystems were mapped using a mapping software Kumu which is useful for modeling ecosystem structures including actors and their connections (see Kumu, 2020). The ecosystem visualizations were created based on the insights from interviews and the insights from primary data was backed up with supporting secondary sources to ensure all ecosystem participants and linkages between them were taken into consideration.

The second and third research questions regarding coopetition and its facilitation as well as alignment were mostly answered based on the interview data. Some insights for coopetition and alignment were also gathered from secondary data, but the interviews were the main data source as these phenomena are complex and need to be studied in their contexts. The interviewees were directly asked to describe different coopetition-related aspects and possible issues and tensions arising from coopetition. The facilitative measures of coopetition and the alignment dimensions were identified from the interviewees' speech and descriptions of different situations.

## 3.5 Validity and reliability of methodology

To ensure the quality of the research methods the potential errors in the validity and reliability of the methodology has to be considered. Validity is the ability to explain and measure the researched phenomena in objective settings as intended. In other words, validity refers to the appropriateness of the measures used, accuracy of the analysis and generalizability of the findings. (Hirsjärvi *et al.*, 2009; Saunders, Lewis and Thornhill, 2016) Reliability refers to replication and consistency. For reliable research, a researcher should be able to replicate an earlier research design and achieve similar findings (Saunders, Lewis and Thornhill, 2016). The validity and reliability are based mainly on the researcher's own evaluation and accessibility of the data (Saunders, Lewis and Thornhill, 2016). In this study the focus was on concentrating on the quality of the interviews and the collected secondary data.

Typical threats to validity include, for example, past or recent events changing the participants' perceptions and ambiguity about causal directions, whereas reliability can be threatened due to participant error and bias or researcher error or bias (Saunders, Lewis and Thornhill, 2016). In this study, threats to validity were minimized by data triangulation and validation of the interviewees. Interviewees were chosen representing different organizations and different roles in the studied ecosystems and primary data was backed up with secondary data to improve the validity of the study. To minimize the linguistic misunderstandings, the interviews were conducted in Finnish as it was the native language of the interviewees. The interviews were transcribed by an external transcription company, which ensured that the transcriptions were done carefully.

The data analysis in this study was done through thematic analysis which is based on the researcher's subjective interpretations even though the choices for data classification were made in a data-driven way. Some issues were identified regarding the validity and reliability of the case selection. Both of the cases are from Finland, which raises the question that would the results be different if the cases were located in another country or even another continent. When looking into the misalignment and tensions in the ecosystems, it is important to consider whether the interviewees shared their experiences openly or if some issues were hidden purposely or unintentionally.

# 4. RESULTS

In this section the results of the study are presented. The beverage package recycling system case is introduced and analyzed first and the case Circular Economy Service Platform follows similar structure as the firstly presented case.

The case analysis for both cases proceeds as follows. To begin with the cases are introduced and the background of the cases is discussed. The subsections answer the research questions of the study. Firstly, the ecosystems of the cases and the drivers for ecosystem formation as well as the ecosystem actors and their roles and relationships are presented with ecosystem maps and thorough analysis of the studied cases. Secondly, the coopetitive relationships and the facilitative measures of coopetition are discussed. Finally, the alignment dimensions of the cases are identified, categorized and analyzed.

## 4.1 Case: Beverage Package Recycling System

The Finnish beverage package recycling system is one of the best recycling systems for beverage packages in the world. The recycling system is deposit-based: the fees are returned to the consumers from the system when consumers return the beverage packages. (Sitra, 2017) The return rates in 2019 were for cans 95%, for PET-bottles 90% and for glass bottles 87% (Palpa, 2020). The Finnish beverage package recycling system is based on effective cooperation between Suomen Palautuspakkaus Oy, beverage industry, retail stores, horeca operators and a wide-ranging partner network (Palpa, 2019).

The Finnish beverage package recycling system is managed by Suomen Palautuspakkaus Oy, (Palpa) (I10). Palpa is a non-profit, administrative company managing the collection, recycling and/or reuse of the packages which belong to their systems. Palpa is a non-profit company and it is owned by Finnish breweries and franchising groups. (Palpa, 2020) The beverage industry and retail trade both own half of Palpa (I10) and the owners of Palpa include Alko Oy, Inex Partners Oy, Kesko Oyj, Oy Hartwall Ab, Olvi Oyj and Oy Sinebrychoff Ab (Palpa, 2020). Palpas board has the same amount the representatives from both sides; retail and breweries (I10).

Suomen Palautuspakkaus Oy, Palpa, is established in 1996 to manage the recycling system for aluminum cans (I10; Palpa, 2020) but the history of beverage package recycling in Finland dates back to 1950s when the first version of the Finnish bottle return

system was created. In this early phase, the system recycled glass bottles that were washed and refilled. (Palpa, 2020). In the era before Palpa, the three large breweries ran the recycling of the glass bottles together. The cooperation in the beverage industry was based on the shared interests due to use of the same bottles. (I12)

The high return rates demonstrate that Finns are among the best beverage package returners in the world. The factors for high return rates in Finland comprise of deposit, habit and convenience. (Nurminen, 2017) As the CEO of Palpa describes:

*"The habit relates to the culture [of returning beverage packages]. In addition, it has been made easy with an extensive network of consumer collection points. There is well-functioning technology and they are located in transport hubs, retail stores or shopping malls, where people go anyway. The deposit is one factor, but only one. It may not even be the determining factor.*" (I10)

Consumers' motivation for returning beverage packages is boosted by the correct deposit values and wide coverage of deposit packages as well as the convenience (location of consumer collection points, well-functioning RVMs) of the return system. (Nurminen, 2017) As a retail industry representative concluded:

"*The main factor for achieving such a successful recycling system is that quite a good combination of deposit and easiness has been found."* (I13)

A vast majority of beverage producers and importers have joined the beverage package recycling system managed by Palpa because being part of the system exempts the producers from the beverage packaging tax (Nurminen, 2017; Palpa, 2019) As the CEO of Palpa explains:

*"The underlying factor [for cooperation in the system] is tax guidance. If the company's products belong to a deposit return system, they are exempted from packaging tax, which is 0,51e per liter*." (I10)

The Finnish beverage package recycling system is based on the deposit which circulates together with the beverage packages. First, the beverage manufacturer or importer pays Palpa the deposit for the product delivered for sales (**1**). Then the beverage package is delivered to a retail store and the retailer pays a deposit in the price of the product to the manufacturer or importer (**2**). Consumers pay the beverage package deposit when purchasing the product. When returning the empty package to a return point, consumers receive the deposit back. (**3**) (Palpa, 2019; Palpa, 2020) Also restaurants, hotels and

catering (HoReCa) firms return empty beverage packages (Nurminen, 2017; Palpa 2019) From the return point, empty packages are delivered to the processing plant from which the package materials are delivered to the material recyclers. The return points and the processing plants report the returned packages to Palpa and the logistic operators report the transported units (**4**). The deposit circle closes when Palpa pays the deposit to the return points in accordance with the number of reported returned packages (**5**). (Suomen Palautuspakkaus Oy, 2019; Palpa, 2019; Palpa, 2020)

The bolded numbers describe the operations in figure 3. The circulation of the deposit and the flow of products are illustrated in the figure below.

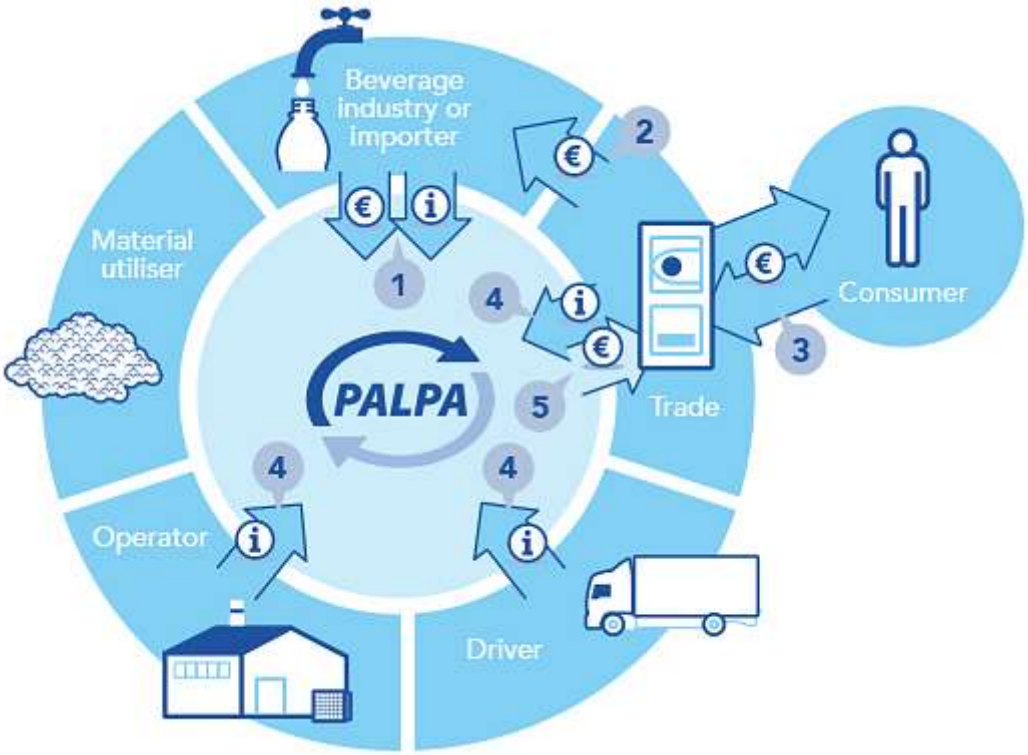


***Figure 3.*** *Deposit and product circulation in the beverage package recycling system (Palpa, 2020)*

There are also other fees and compensations in the recycling systems administrated by Palpa. Palpa pays handling fees to the return points which accept packages from consumers. Palpa pays also transport compensations to the drivers in charge of transportation. Palpa covers the expenses of the beverage package processing in the processing plants while the reprocessor pays the price of material to Palpa. (Palpa, 2020) The expenses of the recycling system are covered with recycling fees paid by beverage manufacturers and importers (Nurminen, 2017). The value chain of the operations within the

system is relatively simple: the brewery industry produces the products and the retail industry sells them (I10).

### 4.1.1 RQ1: The ecosystem of the beverage package recycling system

The first research question aims to discover the ecosystem in which the Finnish beverage package recycling system operates. This section creates understanding on the drivers for ecosystem formation, the constituents of the ecosystem as well as the actors and their roles and relationships in the ecosystem.

The main drivers for the ecosystem formation around the beverage package recycling system in Finland are tax guidance and cost savings enabled by the cooperation (I10; I12). In Finland if a company joins a recycling system, it is exempted from packaging tax. Palpa's system is organized and managed in a way that it is cheaper to belong to the recycling system than pay the packaging tax. (I10). In addition, in Finland all actors selling products which belong to Palpa's system, are obliged to accept the return of the packages (I10). There has been cooperation between the major breweries in Finland before the taxation benefits and it has been based on the shared understanding on the cost savings for all partners. The breweries understood that in a country with long distances it is beneficial for all to use the same packages and recycle them together. For the brewery companies, a neutral actor taking care of issues related to, for example, competition law was an important driver for establishing Palpa. (I12) Nowadays, a recycling system is important for major companies in retail and brewery industry because it promotes the companies' environmentally sustainable image (I12; I13).

Beverage package recycling is cooperation: the team effort of beverage manufacturers and importers, logistic and recycling operators as well consumers enable the efficient circulation of beverage packages in Finland (Palpa, 2019). Many parties take part in the recycling of beverage packages; from the design and manufacture of beverage packages and beverages, the sales of beverages, transporting and recycling empty packages to reusing the package materials (Palpa, 2020). The ecosystem formed around the Finnish beverage package recycling system is mapped with kumu mapping tool. The ecosystem map is illustrated in figure 4 and analyzed in more detail in the following sections.

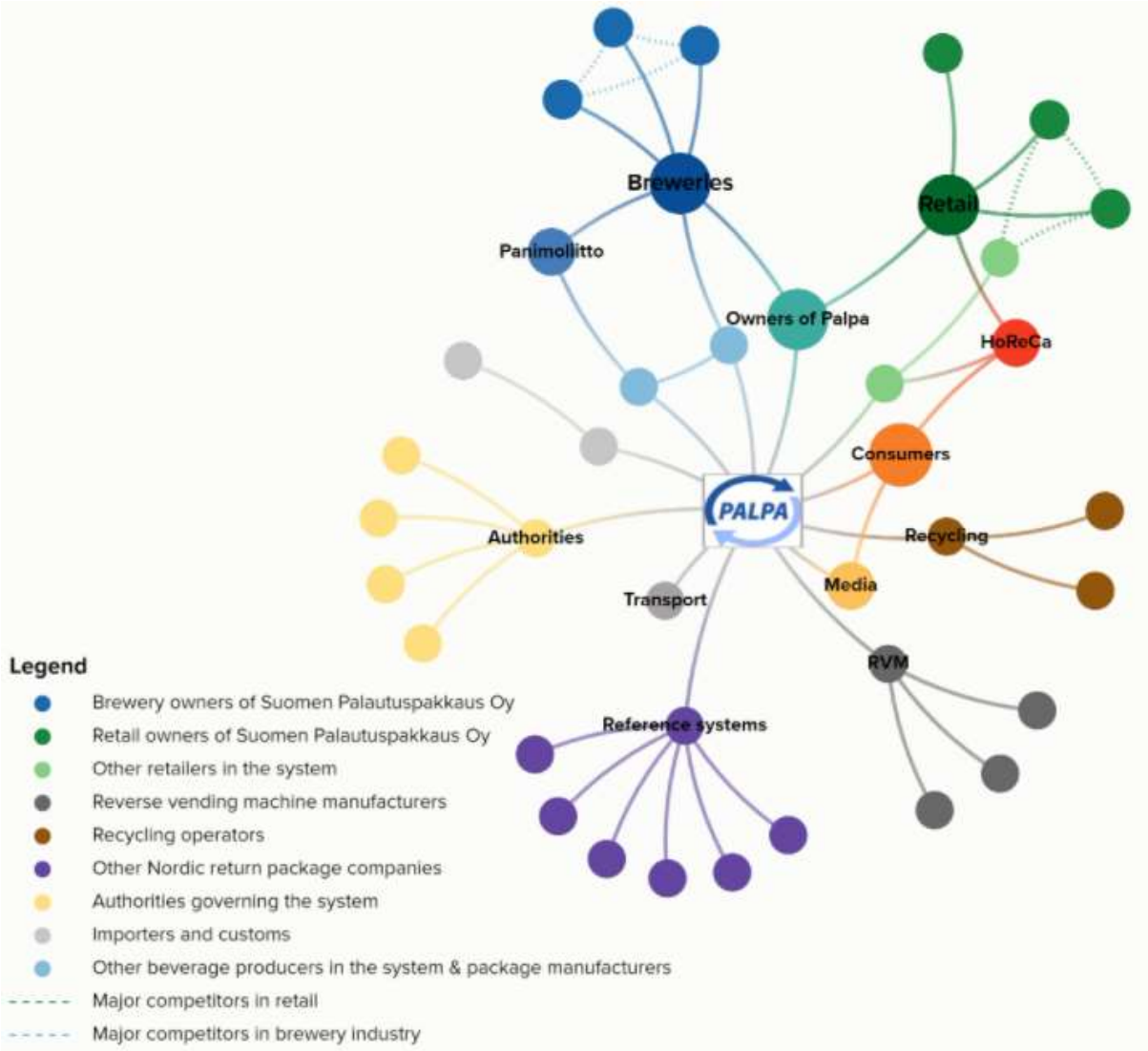


***Figure 4.*** *The networked actors in the ecosystem of the Finnish beverage package recycling system*

**Suomen palautuspakkaus Oy (Palpa)**

In the ecosystem formed around the Finnish beverage package recycling system, Suomen Palautuspakkaus Oy (Palpa) is the central actor connected to all the actors in the ecosystem. Palpa was established in 1996 for administering the recycling system for aluminium cans. Today, Palpa administrates also the return systems for PET plastic bottles and recyclable glass bottles. Palpa's operations have grown significantly over the years but the main purpose remains the same: to make the recycling of beverage packages as easy as possible for Finnish companies and consumers. (Suomen Palautuspakkaus, 2019; Palpa, 2015)

Palpa administrates, manages and develops three different return systems for different package types (Nurminen, 2017; Palpa, 2020): aluminium cans, PET plastic bottles and recyclable glass bottles (Palpa, 2019; Palpa, 2020). In this study, when referring to the Finnish beverage package recycling system, it includes all beverage package recycling systems administrated by Palpa. Palpa's administrative duties include the collection, recycling and/or reuse of the beverage packages belonging to the system. Palpa also manages the administration of the deposits in the systems, the development of the systems and the communications concerning the operation of the system. (Palpa, 2020) The annual turnover of Palpa is approximately 80 million euros and around 340 million euros worth of deposit fees run through the systems and Palpa each year (Palpa, 2019; Palpa, 2020). Palpa is a non-profit company (Palpa, 2019; Palpa, 2020). The proceeds from fees collected from the members of the system and the sales of recycled materials are used to cover the expenses of the recycling systems (Palpa, 2020).

Palpa's strategy is to outsource the services required in recycling operations and as a result, Palpa doesn't own any operative sections, such as reverse vending machines (RVMs), recycling plants or transport equipment, of the recycling systems (Palpa, 2020). As the operative sectors are outsourced, Palpa is in charge of managing the operations and data (Palpa, 2015) The 13 employees of Palpa concentrate on the management and development of the operations of recycling systems (Palpa, 2020) and as the CEO of Palpa puts it:

*"Everything that can be outsourced is outsourced."* (I10)

Ekopulloyhdistys ry is a part of Palpa's system and it is in charge of the refillable beverage packages (I10). The benefits of organizing the recycling as network operation, is the flexibility of the system. Many different operators have to cooperate seamlessly for the recycling of the beverage packages. (I10; Suomen Palautuspakkaus Oy, 2019) The CEO of Palpa describes the organization's ambitions:

*"We want to work as neutrally as possible and concentrate on managing the system instead of revenue models or the like. This has to be based on non-profit recycling activities and nothing else."* (I10)

A significant portion of the development of the recycling systems done by Palpa is negotiating and agreeing on various matters (Palpa, 2020). Palpa has an important role in managing and balancing the collaboration between the ecosystem participants (I10; I12; I13). As a brewery industry representative described:

*"To my mind Palpa's role is to be in charge of the operational side of the return system and to keep the balance between the incentives of retail and brewery industries, in order to maintain the system as efficient as possible as well as consumer-friendly."* (I12)

The representative from the retail industry also underlined the importance of Palpa's role as a coordinator in the ecosystem as follows:

*"It is actually really important, that we have a coordinator like Palpa in this system. - - If it weren't for the system managed by Palpa and all retailers would have their own systems, - - it would be quite a hassle for all actors."* (I13)

The ownership of Palpa is divided equally between retail and breweries (I10). In addition to the brewery and retail industries, Palpa has several partners that operate in the different phases of the recycling process (Palpa, 2020). These partners and other stakeholders will be discussed in more detail in the following subsections.

**Owners of Suomen Palautuspakkaus Oy**

The owners of Palpa from the retail industry are Alko Oy, Inex Partners Oy and Kesko Oyj. From the brewery industry Palpa's ownership is divided between Oy Hartwall Ab, Olvi Oyj and Oy Sinebrychoff Ab. (Palpa, 2020). Palpa's board of directors consists of the same number of representatives from both sides, retail and brewery, (I10) and the board decides all the fees and compensations in the recycling system. The fees and compensations are the same for companies selling, collecting or transporting similar packages. (Palpa, 2020) The joint decision making between retail and brewery industry makes the implementation easier (Nurminen, 2017). As the CEO of Palpa describes the dynamics in the board of Palpa:

*"Even though there is discussion from side to side of what is the best solution in various situations and differing interests at times, always after the boards agrees on matters, the nationwide implementation is quite easy, because of the comprehensive representation of the industries in the board."* (I10)

It is the interest of the owners from both industries, retail and breweries, that the recycling system is as efficient as possible. The transparency of Palpa's recycling fees is also important and, in practice, to keep the fees as low or moderate as possible is a common objective for the owners of Palpa because the aim is to maintain the cost-effectiveness of the beverage package recycling system. (I13) Both industries seem to work towards

a shared goal when it comes to the recycling of beverage packages. The brewery industry representative describes the industry dynamics in the context of the beverage package recycling as follows:

*"In the brewery industry, we have quite a good joint understanding of working towards the common benefits of the industry, and I believe that the retail industry has a similar understanding on their behalf."* (I12)

The collaboration between the retail and the brewery industry is very important in many stages of the beverage package recycling system. In addition to harmonization of the return processes of the beverage packages, joint coordination between the two industries is needed also for the transporting equipment (e.g. trolleys) standardization and sharing in the recycling system (I13). Cooperation is needed to ensure that the actors in breweries and retail, who need these package transporting equipment, have access to them at all times. This requires cooperation between competitors especially in the brewery side in addition to close joint coordination between breweries and retail, in order to keep the production going. (I13) A director from the retail industry describes the joint understanding of the situation as follows:

*"Everyone is well aware that it is not worth it to harm others by retaining package transporting equipment. The competition between us is in the consumers' minds and not in making the production more difficult for one another."* (I13)

The collaboration administered by Palpa between these two industries has also its challenges. The direct competitors and Palpa's owners in both industries, brewery and retail, seem to comprehend the common benefits of working together as representatives of their industries in the recycling system. Whereas, there is sometimes more tension between breweries and retail because, according to the brewery industry representative, the breweries pay the recycling fees of each product, which cover the costs of the system (I12). The recycling fees cover, for example, the costs of the reverse vending machines, the processing operations in the retail stores, transport cost and the like (I12). The brewery industry representative describes the issue of the cost allocation as follows:

*"Sometimes it is not possible to verify what are the actual costs. This is a challenging subject sometimes."* (I12)

**Brewery industry**

The main brewery industry actors contributing to the Finnish beverage package recycling system are Palpa's owners from the brewery side: Olvi Oyj, Oy Hartwall Ab and Oy Sinebrychoff Ab (Palpa, 2020). In the ecosystem map the linkages between these companies are marked with a dashed line, which indicates the coopetitive relationship between these major competitors of the brewery industry collaborating in the recycling process of beverage packages.

In addition to these major actors of the brewery industry, there are also smaller beverage producers in the recycling system. An industry and commerce organization in the ecosystem of the beverage package recyling system is The Federation of the Brewing and Soft Drinks Industry (Panimoliitto), which has been involved in establishing the beverage package return system to Finland in its early days (I11). The member companies of Panimoliitto cooperate in the recycling of beverage packages with multiple other beverage industry actors and retail industry actors through the recycling system administrated by Palpa (Panimoliitto, 2019; I11).

Beverages are also imported to Finnish retailers and the packages of the imported beverages are recycled within the same system as the packages of domestic goods. Customs are a part of the beverage package recycling system because of the imported goods. The role of the producers and importers is to bring the packages to the market, while Palpa charges the deposits and recycling fees. (Nurminen, 2017) The manufacturers and importers of beverages fund the recycling systems through these different types of payments (Palpa, 2020).

Package manufacturers are a part of the ecosystem of beverage package recycling, as the product design is a prerequisite for circular economy (I10). This has been taken into consideration in the recycling system simultaneously as the technological development has enabled the differentiation in bottle shapes and sizes (I13). The CEO of Palpa describes the connection between the product design in beverage packages and circular economy as follows:

*"If I may blow our own trumpet, beverage packages are a good example of well-functioning circular economy as the packages are designed to be as suitable as possible for recycling already in the beginning of the designing process."* (I10)

Juice producers are not obliged to the join the recycling system to exempt from taxes, but recently Palpa has been contacted by various juice producers wanting to join the

beverage package recycling system, even though there is no direct economic benefit (I10; I11). The CEO of Palpa points out that:

*"This demonstrates genuine [environmental] responsibility, as many want to join, even though there is no economic benefit for them [juice producers]"* (I10)

**Retail industry**

The ownership of Palpa in the retail industry is divided between Kesko Oyj, Inex Partners Oy and Alko Oy (Palpa, 2020; I13). Inex Partners Oy is a subsidiary fully-owned by SOK Corporation (Inex Partners, 2020), which is a major competitor in the Finnish retail industry. Inex Partners Oy provides warehousing and transportation services for the S-group (Inex Partners, 2020). Alko Oy is wholly-owned by the Finnish Government and the Ministry of Social Affairs and Health is responsible for steering and supervision of the ownership (Alko, 2020). The major competitors in the Finnish retail industry include two of Palpa's owners, Kesko, SOK as well as their competitor Lidl Suomi Ky. The collaboration between these major competitors is indicated in the ecosystem map with a dashed line. Lidl is a part of Palpa's recycling system for aluminium cans but Lidl has its own recycling system for plastic bottles (I10; I13).

In the beverage package recycling system, the retail stores receive deposit packages and pay the deposit to the consumer (Palpa, 2020). The retail companies also view the beverage package recycling system as a service-element for the consumers, as the retail stores offer an easy way to recycle and receive deposits (I13). As a director from the retail industry describes the matter:

*"From the perspective of retail, a well-functioning bottle return system is a significant service-element and for some consumers it can also be linked to the choice of retail store for shopping."* (I13)

The ecosystem of beverage package recycling system includes all retail outlets selling deposit packages as in Finland any retail outlet selling deposit packages is obliged to take back the empties (Nurminen, 2017; I10). In addition to retail stores, HoReCa actors take part in the recycling of beverage packages in Finland as hotels, restaurants, schools and different event organizers return the deposit packages through beverage suppliers (Palpa, 2020; Nurminen, 2017).

**Consumers**

Consumers play an important role in the well-functioning beverage package recycling system in Finland (I10; I12; I13). As a part of the ecosystem of beverage package recycling, consumers return the deposit packages to retail stores and kiosks (Palpa, 2020). Each year the average Finn returns 234 aluminium cans, 84 plastic bottles and 24 glass bottles (Palpa, 2019). The brewery industry representative describes the consumers' role and approach to returning beverage packages as follows:

*"It probably fits to the nature of Finnish people. Finns want to return the beverage packages."* (I12)

In addition to increasing environmental awareness among consumers, Finns have also learned the habit of returning (Nurminen, 2017). The Finns have a long tradition of recycling beverage packages, as it dates back to the Olympics and the arrival of Coca-Cola to Finland in the 1950s (I10). The deposit system has created a national habit of recycling bottles and cans for Finns, which has also resulted in social acceptability toward beverage package recycling (I13). Consumers have a vital role in the success and high return rates of the beverage package return system:

*" - - this [successful recycling system] would never be possible, if consumers wouldn't be willing to take the trouble of returning the packages. - - it is not seen as socially acceptable to throw a plastic bottle in the trash"* (I13)

**Recycling and transporting operators and RVM manufacturers**

Recycling and transporting operators as well as reverse vending machine (RVM) manufacturers are important supporting actors in the beverage package recycling ecosystem enabling the operations administrated by Palpa. Recycling operators in the ecosystem include companies such as Lassila & Tikanoja Oyj and Encore Ympäristöpalvelut Oy (Palpa, 2020). Recycling operators recycle the material of the beverage packages and Palpa receives the revenues of the material (Nurminen, 2017). The operators utilizing the materials sort and process the materials for reuse. Most of these materials are reused by the beverage industry as material for new beverage packages. (Palpa, 2020)

Transport companies contribute to the ecosystem by delivering empty packages to the operators (Palpa, 2020). Transport companies transport the packages collected in retail stores and receive a transportation fee from Palpa as compensation (Nurminen, 2017). Before transportation of the empty packages, baling operators bale the packages and

count the manual returns which aren't counted through reverse vending machines. Palpa pays for this service. (Nurminen, 2017; Palpa, 2020) Reverse vending machine manufacturers in the ecosystem of Finnish beverage package recycling system include companies such as Oy Tomra Ab, RVM Systems Oy and Scanding Oy (Palpa, 2020).

**Reference systems**

In the early days of Palpa, the Finnish system was unique: Palpa outsourced the operative sectors and Palpa was in charge of managing the operations and data (Palpa, 2015). Today, the Finnish beverage package recycling system isn't the only well-functioning recycling system for beverage packages. Other examples of national beverage package recycling package companies are AB Svenska Returpack in Sweden, Infinitum AS in Norway, As Endurvinnslan hf in Iceland, Dansk Retursystem A/S in Denmark and OÜ Eesti Pandipakend in Estonia (Palpa, 2020). These beverage package recycling systems have high return rates ranging from 82% in Estonia to a 96% return rate in the Norwegian system (Palpa, 2019).

The differences between these reference systems elaborate the fact that a high beverage package return rate can be achieved through various types of recycling systems. From example, in Sweden joining a deposit recycling system is mandatory for producers and importers, whereas in Finland joining Palpa's recycling system is voluntary (Nurminen, 2017; I10). In Norway the recycling rates define the amount of the package tax; the higher the return rate, the lower the tax (Nurminen, 2017). In Finland Palpa has 13 employees (Palpa, 2020) and outsources its operations, whereas in Denmark the Dansk Retursystem A/S has over 400 employees taking care of the operations of the recycling system (I10).

The reference systems are important for the Finnish beverage package recycling system, as especially in the Nordic countries a common interest has risen to cooperate in the context of beverage package recycling (I11; Pennanen, 2019) The CEO of Panimoliitto describes the collaboration efforts between the Nordic countries in beverage package recycling as follows:

*"We are trying to join forces, firstly between the Nordic countries, to collaborate in promoting the interests of beverage package recycling and forwarding the issues together as these kinds of systems are quite rare in Europe."* (I11)

A few other countries have also woken up to these issues recently. For example, Portugal has visited and familiarized with the Finnish beverage package recycling system.

(I11) The description of the current international situation by the CEO of Panimoliitto underlines the importance of reference systems:

*"Especially in this moment, when the use of plastic is tried to be reduced and we have the plastic directives, it would be very important to be able to extend these beverage package recycling systems everywhere."* (I11)

**Authorities and media**

The authorities don't directly contribute to the circulation of beverage packages or deposits. However, the authorities have an important role in enabling the recycling systems and advancing their operating environment. There are several authorities in the ecosystem of the beverage package recycling: Ministry of the Environment, The Pirkanmaa Centre for Economic Development, Transport and the Environment, Tax Administration as well as The Finnish Competition and Consumer Authority (Palpa, 2020). The deposit recycling systems of Palpa are approved and controlled by the Environmental Authority under the Ministry of Environment (Nurminen, 2017). The operations of Palpa are monitored by the Pirkanmaa Centre for Economic Development, Transport and the Environment (Palpa, 2020). Palpa takes competition law into consideration when facilitating the collaborating among the competitors in brewery industry and retail industry (I12).

According to legislation in Finland, joining a deposit recycling system is voluntary for producers and importers. Producers and importers have to pay packaging tax for beverage packages (Nurminen, 2017) but producers or importers are allowed a tax exempt if the company and its products are registered in a deposit recycling system (Nurminen, 2017; I10). In the Finnish beverage package recycling system retail outlets selling deposit packages are obliged to take back empty packages (Nurminen, 2017). The wide coverage of producers and importers registered to the recycling system managed by Palpa is mostly thanks to this regulatory control through the change in taxes in the beginning of the 21st century (I10).

Media is a part of the beverage package ecosystem (Nurminen, 2017), because of bringing up issues in the recycling of beverage packages (see e.g. Mehtälä, 2018) and spreading awareness of timely matters affecting or regarding the system among consumers, such as new features in the return locations (see e.g. Talouselämä, 2020).

### 4.1.2 RQ2: Coopetition in the beverage package recycling system and the facilitation of coopetition

The second research question aims to deepen the understanding of the relationships and interactions between the horizontal ecosystem participants in the beverage package recycling system. This subchapter presents the coopetitive relationships and the facilitative measures to enable coopetition in the studied ecosystem.

## Coopetition in the beverage package recycling system

The ecosystem participants operating in a coopetitive relationship in the beverage package recycling system are circled in red in the ecosystem map illustrated in figure 5.

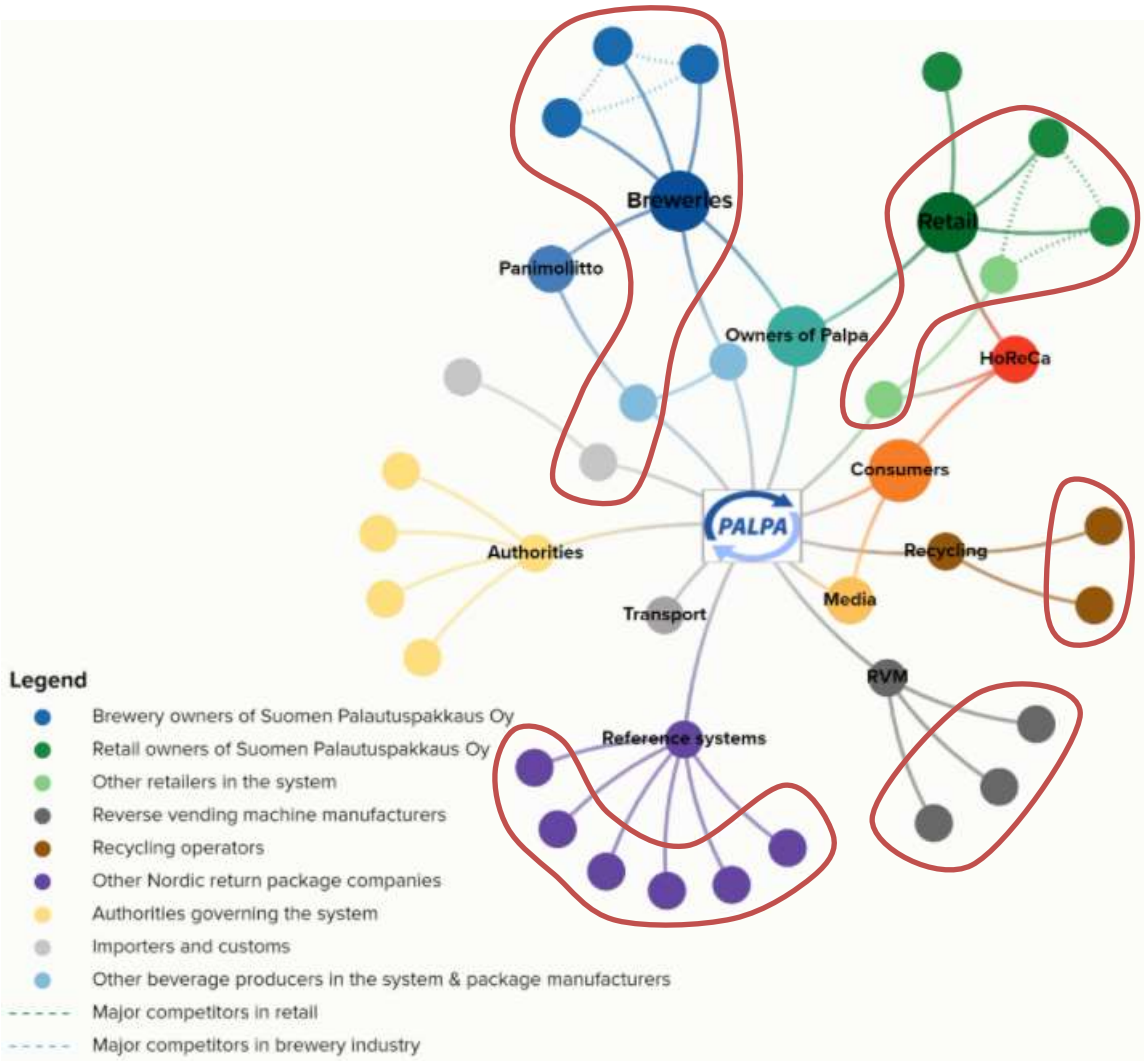


***Figure 5.*** *The coopetitive relationships in the ecosystem of the beverage package recycling system.*

**Coopetition in the brewery industry**

As illustrated in the ecosystem map of the beverage package recycling system in figure 5, coopetitive relationships can be identified in the brewery industry. The actors of the brewery industry cooperating and competing simultaneously in the beverage package recycling system, are circled in red in the ecosystem map. These actors include the three major corporations in the industry, other smaller beverage producers and breweries as well as importers. The major competitors of the brewery industry, Sinebrychoff, Hartwall and Olvi, cooperate in the beverage package recycling system as the owners of Palpa in addition to collaboration in the operations of the recycling system (I10). According to a brewery industry representative, there has been a shared interest towards developing a recycling system for the beverage packages from the very beginning of the recycling system development. The shared interest towards a recycling system stemmed from the use of the same bottles. (I12) Also, the potential cost savings promoted the development of the joint system within the brewery industry as a long-term manager from the brewery industry described:

*"The biggest factor to my mind is that everyone saw that in this small country with long haul distances, there is an evident opportunity for cost savings, because we use the same packages."* (I12)

The major competitors in the brewery industry have a shared outlook on the recycling of beverage packages and they are willing to put effort towards the common benefit of the industry (I12). Even though the major competitors comprehend the shared benefits of the collaboration, tensions inherent to the simultaneous cooperation and competition arise in the coopetition between the owners of Palpa. A board member of Palpa and the manager from brewery industry described tensions between the brewery owners of Palpa as follows:

*"Yes, there is [tension] from time to time and it is not always that easy. - - Deadlocks may come across in matters sometimes and the issues don't proceed. Maybe the development [of the recycling system] is sometimes and in some ways slow due to the fact that there are competitors working with each other."* (I12)

In addition to these major actors in the brewery industry, also other players, bigger and smaller breweries and beverage producers, collaborate in the operations of the Finnish beverage package recycling system. A vast majority of beverage producers belong to the recycling system and according to the produced volumes, nearly all are a part of the beverage package recycling system (I10). The Federation of the Brewing and Soft Drinks

Industry represents the bigger companies of the industry including the owner companies of Palpa as well as a few others (Panimoliitto, 2019; I11) whereas Pienpanimoliitto represents the smaller breweries in Finland (I11). These microbreweries and craft breweries collaborate also in organizing events and competitions in which the Finnish microbreweries and craft breweries are featured for the consumers (I11).

The collaboration between the small and the major breweries and producers regarding the beverage package recycling system has had its challenges in the past, as the taxation benefits of the recycling system are different for players with large versus small production volumes (I10; I11). Regarding the collaborative actions in the brewery industry, the CEO of Panimoliitto reflected as follows:

*"I suppose that in Finland there is more contrast on big [breweries] versus small [breweries]."* (I11)

The CEO of Panimoliitto also pondered about the former dynamics in the industry as follows:

*"There has probably been a bit of that [polarization between big and small breweries] along the line regarding the taxation questions - -."* (I11)

According to the CEO of Panimoliitto, a decision in principle to aim for the best possible collaboration between parties has been made recently. This includes for example supporting the taxation benefits of smaller breweries. (I11). The current situation from the perspective of Panimoliitto was described as:

*"Now we have very good collaboration."* (I11)

**Coopetition in the retail industry**

As illustrated in the ecosystem map in figure 5, there are multiple coopetitive relationships within the retail industry in the beverage package recycling system. On the retail industry side, the owners of Palpa are Kesko, Inex Partners (subsidiary of SOK) and Alko (Palpa, 2020). The major competitors in the Finnish grocery retail industry are Kesko, SOK and Lidl, from which Kesko and SOK collaborate in Palpa's board and all three major competitors collaborate in the operations of the beverage package recycling system (I12; I13). Even though Alko is one of the owners of Palpa on the retail side, Alko doesn't compete with the other retail owners as Alko is wholly-owned by the Finnish Government and tasked with the retail sale of beverages, which contain more than 5,5

percent alcohol by volume (Alko, 2020). The proximity of Alko increases the sales of grocery retailers, which can distort competition between the retailers (Mättö, 2014).

In Finland, it is mandatory for retail stores to accept returned deposit packages, if they sell these deposit beverage packages (I10). Therefore, all grocery retailers in Finland, big and small, take part in the collaboration of recycling the beverage packages while simultaneously competing for customers. One incentive for retail companies to advance the beverage package recycling system is company image (I10). According to a grocery retail industry representative, the collaboration between the competing actors in the grocery retail functions *surprisingly* well (I13). A director from the grocery retail industry describes the coopetition dynamics of the grocery operators in the recycling system as follows:

*"- - the competitors are able to collaborate surprisingly well and see this [recycling] as a matter that isn't a competitive factor between us. Taking a practical example from considering our shopping malls, we very often have a common bottle return location for grocery retail groups and even Alko. In other words, considering the beverage package recycling system as a competitive factor isn't a thing between the grocery retail groups."* (I13)

On the other hand, well-organized and clean return locations can attract customers (I10). From the retailer's perspective, the beverage package recycling system is a service element, which relates to the customers' retail store choice. (I13) As the CEO of Palpa depicts it:

*"A good return location can also be a loss leader. If there are two grocery stores on opposite sides of the street and in one of them the return system doesn't function properly; there are awful queues, it is dirty and other possible issues, the customers easily choose the other grocery store if they have deposit packages to be returned."* (I10)

Also, the retail industry representative noted that when there aren't shared return locations, many shopkeepers have probably invested a little more than necessary in the return location. Customer experience seems to be more important than the cost effectiveness of the investments done for the return location. Grocery stores have invested in multiple reverse vending machines or more effective reverse vending machines to take into account the customer experience related to the return of the deposit packages. (I13) The interviewee from the retail industry expressed it as follows:

*" - - to provide the best possible customer experience related to the return [of beverage packages], even though you can't make business with it."* (I13)

The same interviewee described the competitive situation and dynamics between the retail industry actors as follows:

*"Yes, we do compete, but we compete in different matters than how the recycling is organized. The situation of the operation between the competitors is surprisingly good."* (I13)

Even though the collaboration between retailers in the beverage package recycling system is organized well, there are some issues which can potentially create tensions between the major competitors in the industry. Lidl, as an international grocery retail chain, has its own internal European recycling system for plastic bottles and therefore the consumers don't receive deposits from Lidl's plastic bottles in the system managed by Palpa (I10; I13). Lidl is a part of the Palpa's recycling systems for aluminium cans and glass bottles (I10). The CEO of Palpa describes the cooperation with Lidl accordingly:

*"We are happy to take them in [to the plastic bottle recycling system] any time, but for the time being they have wanted to keep their own plastic bottle recycling. Therefore, Lidl bottles aren't eligible for a deposit under this system. But they, on the other hand, accept all the others' [bottles], so we do cooperate with them."* (I10)

The existence of Lidl's own internal plastic bottle recycling system creates some tensions among the competitors in the grocery sector. The other grocery retailers aren't too happy about Lidl's own plastic bottle recycling system, as they feel that Lidl is cherry-picking the benefits from both systems through selling products in Palpa's system and therefore accepting all products to be returned in their retail stores. (I13) The retail industry representative describes the situation as follows:

*"They kind of cherry-pick from both systems because they also sell products in Palpa's systems and therefore accept all products. But they have wanted to create their own system here in Finland and received permission to do it regarding their own plastic bottles. And yes, it is maybe partly even an element distorting competition."* (I13)

The two parallel recycling systems create some confusion and challenges for consumers as the consumers still return a share of Lidl's plastic bottles to Palpa's system and don't receive the deposits for them. The two parallel systems affect negatively primarily the

easiness of the bottle return for the consumers. (I13) The retail industry representative describes the situation from the perspective of Lidl's Finnish competitor:

*"If we consider the easiness of returning the bottles already as one value for the consumer, and the consumers have multiple options [for returning the bottles], the consumer easily returns the bottles to Lidl, because it is possible to return all the bottles there. From our point of view, there is a big risk, and from Lidl's point of view an opportunity, that then the shopping will also be done there [at Lidl]."* (I13)

According to the retail industry interviewee, the efficiency of the system could be even better, if a larger share of the bottle volume went through Palpa's system and wouldn't be divided into two separate systems (I13). The retail industry representative depicts the issue as follows:

*"If considered from another retail group's perspective, it's a shame that it is possible to have your own system in Finland. For sure the other retail groups have an equal opportunity to start building [their own systems], but we see the responsibility here that increasing confusion and complicating the consumers' operations is the opposite of our interests."* (I13)

**Coopetition among Nordic reference systems**

There are many examples of well-functioning deposit beverage package recycling systems especially in the Nordic countries. These deposit recycling systems can differ, for example, regarding the recycled materials, deposit values and legislation regarding the operators in the system. (Palpa, 2019) The competitive aspect of these systems could be seen as the competition of the best return rates and the best image, promoting also the country's environmentally sustainable image internationally. No operational competition can be detected from the relationships between the Nordic reference systems.

Regarding the collaboration between the Nordic systems, the CEO of Panimoliitto expressed the willingness of the Finnish system to cooperate with the Nordic reference systems in promoting the interests of beverage package recycling (I11). The cooperation is seen especially important regarding issues such as the European plastic directives which aim to decrease the amount of plastic bottle caps ending up in the seas by attaching the cap to the bottle with additional plastic (I11; I12; Pennanen, 2019). As the plastic bottles and their caps are successfully recycled in the Nordic countries, this directive would only increase the use of plastic and not provide any benefits, which is why the

Nordic countries want collaborate in advancing the development of beverage package recycling systems across Europe. (I11; Pennanen, 2019)

Regarding the collaborative actions between the Nordic beverage package recycling systems the retail industry representative reflected that:

*"And it is of course interesting to see how this market develops as at the Nordic level there are already some plans or operating models which connect these actors even more strongly under this common umbrella."* (I13)

**Coopetition among RVM manufacturers and among recycling operators**

As the shapes, sizes and other features of the beverage packages are standardized in the recycling systems managed by Palpa (I10; I12), also the competing operators manufacturing the reverse vending machines have to develop and manufacture their machines according to these common standards, which might include some collaboration within the field.

Palpa outsources the operations of the beverage package recycling system to external players and therefore employs, for example, multiple competing recycling operators (I10; Palpa, 2020) which have to run the operations of the system in collaboration with one another.

## Facilitation of coopetition in the beverage package recycling system

Managing the tension and paradoxes inherent to coopetition is key to achieve results in the collaboration between competitors. A third-party acting as a coordinator or facilitator can manage the tensions arising from the coopetitive relationships. (Kestemont and Chalant, 2013). According to the interviews with the key actors in the beverage package recycling system, Palpa facilitates the cooperation between competitors in the recycling system. Figure 6. illustrates the measures by Palpa regarding the facilitation of coopetition among the competitors in the Finnish beverage package recycling system.

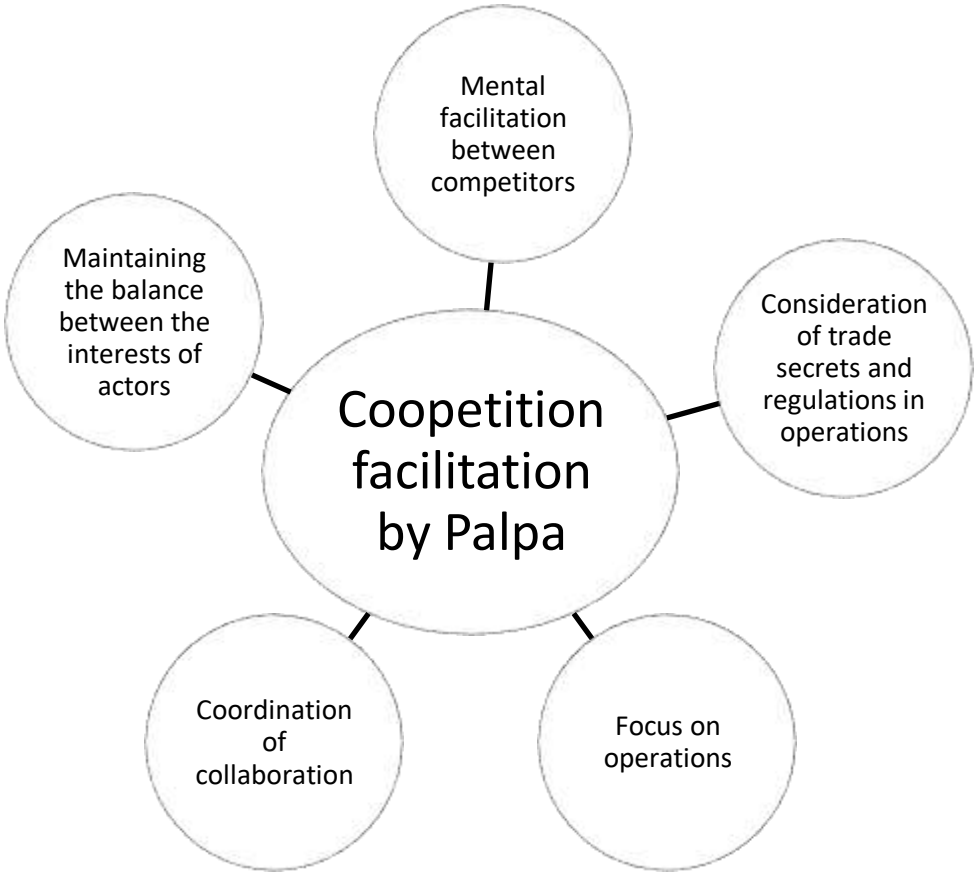


***Figure 6.*** *The facilitative measures by Palpa to enable coopetition in the beverage package recycling system.*

The facilitation of coopetition by Palpa in the ecosystem of beverage package recycling can be divided into five categories which illustrate the wide-range of activities on different levels. These measures and considerations are needed to enable effective collaboration between competitors in this particular ecosystem incorporating circular economy objectives. The coopetition facilitation of Palpa is discussed in more detail in the following subsections.

**Consideration of trade secrets and regulation in operations**

Palpa administrates the Finnish beverage package recycling system (I10) and facilitates the collaboration between the various actors in the ecosystem including competitors. In these circumstances it is important to take into account the trade secrets and other factors related to competition law. The current form of the Finnish beverage package recycling system was established in the early 2000s taking into consideration the brewery companies' concerns about competition law (I12). The situation was described by a long-term manager from a major brewery industry company as follows:

*"When we came into the 21st century, it was questioned whether the previous system was good enough concerning issues related to competition law. Even though we only spoke about how many new bottles we should procure, on some level it was possible to count the [production] volumes of others and so on. And these shouldn't be discussed in the same meetings between competitors."* (I12)

These issues are considered to be important drivers for the brewery industry when establishing the system managed by Palpa. In Palpa's system the brewery companies inform the forecasted sales to Palpa for the upcoming years. Only Palpa sees the production volumes of competing companies. Palpa's role includes processing the information and according to the received and processed information of production volumes, Palpa draws up its budget. (I12) The brewery industry representative described Palpa's mode of operation considering the trade secrets of competitors as follows:

*"But only Palpa sees the company-specific numbers in there [the budget]. And then when the matters are discussed in Palpa [meetings] with breweries or retailers only the totatility is seen there."* (I12)

The regulations have had an important role in engaging the actors to collaborate in recycling because when joining the system administered by Palpa the producers are exempted from the beverage packaging tax (I10). The chief advisor of the Chemical Industry Federation also underlines the importance of regulation in achieving economically viable solutions driving the change towards circular economy (I2). In the beverage package recycling system, the competitors respond to the regulatory pressures together (I13).

**Mental facilitation between competitors**

Palpa underlines neutrality in its operations (I10), which eases the collaboration between competing actors in the ecosystem (I12). The actors in the ecosystem value the fact that thanks to Palpa it is possible to discuss the operational aspects of the recycling system among all actors including competitors (I12). The brewery industry representative describes the effect Palpa's neutral positioning has on the collaboration as follows:

*"Yeah, I think that it is more about the fact that Palpa makes it easier for competitors to sit around the same table."* (I12)

There are no customer relationships within the recycling system as Palpa wants to keep the relations between the breweries and the retailers neutral because it is not desirable to have any cash flows not related to the operations within the recycling system. (I10)

The CEO of Palpa describes their objectives related to neutrality between actors in the system:

*"We want that the operations are as neutral as possible and [all actors] take care of the system's issues and don't use it for any kind of earnings logic or the like. This has to be about non-profit recycling activities and nothing else."* (I10)

Palpa takes care that there are no possibilities to form business arrangements within the recycling system. No customer relationships are formed within the recycling system because of the non-profit nature of operations and the legislation which regulates that all retailers selling deposit packages have to accept them. This ensures that there are no benefits of partnering within the recycling system. (I10) The CEO of Palpa concludes:

*"Yes, the idea is to keep these [market economy and recycling system] separate."* (I10)

**Maintaining balance between the interests of actors**

The ecosystem for the recycling of beverage packages consists of multiple actors and industries. Palpa's role in the system is to maintain the balance between the interests of different industries, i.e. retail and breweries, and between the interests of competitors (I10; I12). The brewery industry interviewee describes Palpa's role in maintaining balance as follows:

*"To my mind Palpa's role is mostly to operate from the return system's perspective and maintain the balance in a way that the system isn't based on the will of breweries or on the will of retail companies, instead Palpa ensures that the system is as efficient as possible and consumer-friendly and that the return rates are high - -."* (I12)

The retail industry representative notes that Palpa doesn't negotiate the pricing of the system with any actors in the system. The recycling fee is the same for everyone regardless of the volume; the fee per package is the same if you have a thousand or a million packages. The purpose of this procedure is to keep the threshold for joining the recycling system is as low as possible for new producers. (I13) Palpa has created clear and fair rules for all ecosystem participants (I11) and as the brewery federation interviewee describes the situation:

*" - - we have created a system and it works and there are clear rules of the game for everyone and so on."* (I11)

**Focus on operations**

Palpa focuses on managing the operational side of the recycling system and creates the structures needed for the operations in the system (I13). There is no lobbying or promoting any actors' interests in the beverage package recycling system. The system concentrates solely on recycling and all actors are welcome to join the system. Palpa runs the system with membership fees and recycling fees. (I10) The CEO of Palpa describes how the system's operations are organized:

*" - - a system, in which there is only the recycling operations and no lobbying or anything else. There is the membership fee and the recycling fees and anyone can join [the system] directly. Both of these systems [plastic bottles and aluminium cans] are open for everyone."* (I10)

The actors in the ecosystem value Palpa's operational role in the recycling system. Palpa builds the frames of reference for the system which enable the efficient operations in the system. Each actor then considers how to organize their own operations as smart as possible within the frames set by Palpa. Palpa has created the structures for the wide-ranging development of different product lines, for example considering the beverage package designs. (I13) Palpa runs the operations from the recycling system's perspective (I12).

The operations of Palpa are focused on the overall efficiency and comprehensivity of the recycling system as well as the consumers' perspective of the recycling process (I12; I13). Therefore, the beverage package system also promotes all industry actors to join the system including, for example, breweries with very small volumes as well as exported products. A director from the retail industry described the logic of Palpa's operations as follows:

*"- - Maybe if Palpa considered only its own efficiency, it wouldn't necessarily be very profitable to include the smallest breweries or imported products in this system. But as there is the responsibility of the functionality of the market as a whole it is important that also the batches of a thousand cans go through this system - -."* (I13)

As the passenger imports of beverages increased significantly some years ago, Palpa and the Finnish grocery retailers could have chosen *not* to accept any beverage packages which aren't in Palpa's system, to be returned to their reverse vending machines. The retail industry representative described that the situation was evaluated from the consumers' perspective, and as the consumers are willing and have the need to recycle

also the beverage packages from passenger imports, they decided to accept also these beverage packages which don't have deposit, even though these cans and bottles burden the system on some level. (I13) As the retail industry interviewee concluded:

*"But because Palpa's role is, in a way, to be this forerunner in Finnish recycling, so in this perspective, also the depositless cans are accepted."* (I13)

**Coordination of collaboration**

Palpa's role as a coordinator in the recycling system is seen as very important. The recycling system is efficient and consumer-centric thanks to Palpa's coordination between different actors and their operations in the ecosystem. (I12; I13) A director in the grocery sector describes the importance of Palpa's coordination in the system as follows:

"*It is actually really important that we have a coordinator like Palpa. [- -] If we didn't have this Palpa's kind of system and all grocery operators had their own systems - - it would be quite a hassle for all actors."* (I13)

A very important aspect for the ecosystem actors in the beverage package recycling system is that Palpa is a non-profit company which aims for the whole system's efficiency instead of profits. According to the retail industry interviewee, this also enables certain predictability for the actors as the recycling fees remain the same regardless of the market fluctuations. Through these kind of measures Palpa is able to create a sense of continuity and stability for the actors. (I13) As the CEO of Palpa points out:

"*The motive for the competitors to cooperate is the benefit of the industry as a whole, because these systems are non-profit, there are no dividends and no economic benefits."* (I10)

According to a senior expert in sustainable development, the need for change can also drive competitors to collaborate. The fierce competition in the Finnish retail sector has forced retailer chains to improve the sustainability of their operations. (I8; I9) One of the main objectives of the grocery retail industry is to improve the recycling rates (I8), and regarding beverage packages this is efficiently coordinated by Palpa.

### 4.1.3 RQ3: Alignment in the beverage package recycling system

The hypothesis of this study was that a minimum viable alignment is needed for coopetitive circular economy ecosystems to reach their objectives. For a functioning recycling system, such as the Finnish beverage package recycling system, there needs to be alignment among the actors and these alignments as well as misalignments can be identified and categorized in different dimensions of alignment and misalignment. The alignments and misalignments of the beverage package recycling system are presented in table 8.

***Table 8.*** *Alignment and misalignment in beverage package recycling system.*

| | **Technological alignment** | **Economic alignment** | **Cognitive alignment** |
|---|---|---|---|
| **Alignment of goals** | + The technological development, e.g. automation of RVMs and package handling, has improved the efficiency of the system (I12; I13).<br><br>+ Well-functioning technology in the return locations and the comprehensive network of return locations enable high return rates (I10; I12). | + The collaboration is driven by improved cost efficiency of operations for the retail and brewery industries (I10; I12; I13).<br><br>+ All stakeholders benefit from the overall efficiency and transparency of the recycling system. *"It is worth doing this together to maintain efficiency".* (I10; I13)<br><br>+ The aim of the collaboration facilitated by Palpa is to keep the costs of the system lower than paying the package taxes (I12).<br><br>+ Competitors agree recycling is not core business: *"This is not where we do business, this is where we enable an operational recycling system in Finland."* (I13) | + All ecosystem participants share the objective of aiming towards high return rates. High return rates are a precondition for cost-efficient operations and improved sustainability image. (I10; I11)<br><br>+ Competitors understand that keeping the operations simple and transparent for the consumers is important. *"It would be quite a terrible situation, if you had to sort packages to Kesko's, S-group's and Lidl's bags separately. That would turn against us."* (I13)<br><br>+ Successful recycling operations are a part of the breweries' and retailers' sustainability image. *"- - circular economy plays a really big role and it has become a sort of competitive advantage."* (I10; I11)<br><br>+ The companies understand that the recycling system benefits the entire retail industry and brewery industry and even though these major companies aim to maximize their own profits, they are able to see the benefits of working together in the recycling. (I10; I11) |

| | | | |
|---|---|---|---|
| **Alignment of practices** | + Continuous development of the system, packages and technology is beneficial for all actors → decreases costs and increases return rates (I10; I11; I13).<br><br>+ The harmonization of operation principles within the system improves e.g. the logistic operations and production capabilities. The compatible and transparent operations enhance the shared efficiency among industries and competitors. (I10; I13).<br><br>+ The deposit circulates in the recycling system and motivates consumers to return the packages (I10). | + The co-ownership of Palpa between the retail and brewery industries enables easy implementation of the decisions done by the board (I10; I12).<br><br>+ The retail industry and the brewery industry respond together to the regulatory pressures by organizing the recycling. *"- - change doesn't happen without some kind of pressure"*. (I11; I13)<br><br>+ Cost savings results from e.g. shared equipment and logistics, harmonized operations and joint return locations. *"- - we all save in this and do this smarter when we work together."* (I10; I12; I13)<br><br>+ The commercial side is kept separate from the recycling system. There are no customer relationships within the recycling system. (I10; I12; I13) | + The habit of returning beverage packages has created a strong culture for consumers to return beverage packages (I10; I12; I13).<br><br>+ The companies in retail and brewery industry respond together to the pressures from consumers. *"- - when there are responsible actors who want to do their part towards a responsible society that's when an operational system begins to take shape."* (I11; I13) |
| | | - The verification of the costs of recycling is challenging and can create tension between the retail and brewery industry. The differing interests of the retail and brewery industry cause disagreements sometimes. (I12) | - Lidl's separate system for plastic bottles causes misalignment between competitors and confuses consumers and thus decreases the efficiency of the system (I10; I13).<br><br>-Tension and challenges in the collaboration between big and small breweries due to differing benefits of the system. (I11)<br><br>- The different views and interests of the retail and brewery industries in negotiations can cause misalignment and hinder collaboration and decision making (I12). |

## Technological alignment

### Alignment of goals

Technological aspects have been of major importance in enabling the development of an efficient recycling system for beverage packages (I10; I12; I13). It has been the interest of all actors in the ecosystem to create a comprehensive system regarding returning locations and therefore the technical characteristics of the vast network of returning points have an impact on the efficiency of the system (I12). According to the CEO of Palpa, well-functioning technology of the return locations, in addition to deposits, consumers' habits and the comprehensive network of return locations, is one of the main factors for the high return rates in the Finnish beverage package recycling system (I10).

The efficiency of the recycling system is a joint interest and goal for all actors in the ecosystem as the efficiency of the system also reduces costs related to recycling and promotes the circularity objectives. Technological development has made the system more efficient and the advancements in technology are evident, for example, through the automation of the system and the package designs. (I11; I12; I13) A manager from the brewery industry commented on the efficiency objective as follows:

*"The system has to be efficient in order to encourage [beverage] producers and importers to join it."* (I12)

### Alignment of practices

Well-functioning return locations and overall system are in the interest of all actors in the recycling system (I10; I13). According to the CEO of Palpa, the beverage package recycling functions well in Finland because it has been made easy and compelling for the consumers through the deposit system, a comprehensive network of return points and well-functioning technology (I10). In addition to these factors, it is seen important that the recycling system has been able to develop and include different package materials and packages to the system (I11). Technological development has improved the efficiency of the operations (I12; I13). Continuous development of the system and the packages in the system is beneficial for all actors. Through advancing the functionality of the system the overall efficiency improves the potential of decreasing costs, increasing return rates as well as improving circularity which, in turn, enhances the image of beverage package recycling and all the actors involved in it (I10; I11; I13).

The beverage package recycling system is built on improving the logistic operations in the industries, promoting the development of packages and creating more coherent production capabilities and opportunities for the whole industry. The system is not about creating unique competitive advantage as the beverage brands are built on taste of different products rather than the packaging or logistics of the products which are, in turn, seen more as shared efficiency in the industry. (I13) Palpa ensures the transparency of operations within the recycling system and harmonizes the operations through creating guidelines for different actors (I10; I13). A director from a grocery company in the ecosystem describes the importance of harmonizing the operating principles in the recycling system from a retailer's perspective as follows:

*" - - when considering logistic efficiency it is important that the whole set of products function according to relatively similar principles in order for it to be easy and reasonable to arrange the operations in the stores."* (I13)

The deposit system is also seen as an important factor in the operations of the recycling system among the ecosystem actors (I10). The deposits of the packages act as incentives for consumers to return the empty packages (Palpa, 2020) and the deposit-system has been an important part of creating a culture of returning beverage empty bottles and cans in Finland (I10; I12; I13). The deposit circulates in the recycling system between manufacturers, retailers, and consumers while Palpa administrates the operations and payments based on the numerical data (Palpa, 2020).

## Economic alignment

### Alignment of goals

A shared objective for all actors in the beverage package recycling system is cost efficiency. Potential cost savings and cost efficiency of operations acted as a driving force in the early phases of beverage package recycling. The recycling system is created to be as efficient as possible for Palpa's owners and other retail and brewery companies as well as the consumers. Therefore, these matters are also guided by Palpa's articles of association and shareholder agreement. (I12) The system is continuously developed keeping efficiency in mind (I10) but according to a manager in the brewery industry maintaining cost efficiency is sometimes challenging (I12). The brewery industry representative comments the resilience of the recycling system as follows:

*"The cost-effectiveness and savings for all actors are probably why the system has developed and is still alive, and these have been the driving forces especially in the early stages."* (I12)

Collaboration in developing an efficient and transparent recycling system is important for all stakeholders, including consumers who enable the high return rates (I10; I13). A director from a major Finnish grocery chain and one of Palpa's owner companies describes the importance of cooperation as follows:

*"It is worth doing this together in order for the system to stay efficient and then there will be no extra costs."* (I13)

The beverage package recycling system is guided by the beverage packaging tax which means that being a member of an approved and operational recycling system exempts the actors from the tax (Palpa, 2020). The aim of the system administrated by Palpa is to keep the costs of the system lower than the costs of paying the beverage packaging taxes. In some cases, this is a challenge, due to the different characteristics of materials and production volumes in small breweries. (I12)

All actors in the ecosystem formed around beverage package recycling cooperate to maintain efficient operations. Competing actors have understood that recycling of beverage packages isn't about making business and competing. (I13) A director from a grocery chain describes the consensus among competing actors in the beverage package recycling system as follows:

"*In a way we all understand that this isn't the area where we do business but this is the area in which we enable a functioning recycling system in Finland. That is the core of why it is worth doing it together."* (I13)

**Alignment of practices**

The ownership of Palpa is divided between the brewery industry and the retail industry. The co-owners of Palpa work together to achieve economic benefits through efficient recycling for all actors in the ecosystem. (I10; I12; I13) Palpa's articles of association and shareholders' agreement guide the operations to be as efficient as possible for the owners of Palpa (I12). The board of Palpa consists of the same number of representatives from the brewery industry and the retail industry. After agreeing on matters in the board, the nationwide implementation is easy because a majority of the companies in the industries take part in the decision making and operations. (I10)

The economic interests are important for the actors in the ecosystem. The tax exemption is an example of a regulatory measure creating economic interest for joining a recycling system. Pressure for organizing the recycling comes from regulation and consumers. The regulation acts as an initial driver for collaboration in the recycling operations. The actors in the ecosystem respond together to the regulatory pressures through organizing the recycling of beverage packages. (I11; I13) A director from a major grocery food chain describes the effect of regulation as follows:

*"It is definitely an important part that there is a certain pressure, even though we economic operators don't always necessarily wish for pressures, but change doesn't happen without some kind of pressure."* (I13)

Cost-savings from the use of shared equipment and logistics have driven the companies to collaborate in the recycling operations (I12). Retailers share return locations in shopping malls to save costs (I13) and Palpa aims to harmonize operations to ensure cost-efficiency (I10; I13). According to a manager in the brewery industry, everyone understands that in a country with low population density and long distances there is an unambiguous opportunity to save in costs when utilizing the same packaging equipment for beverages and collaborate in logistics. (I12) The manager from brewery industry depicts the drivers to align for collaboration as follows:

*"Perhaps the biggest factor is that we all save in this and we do this smarter when we work together."* (I12)

Important for the efficient operations in the recycling system is that there are no competitive elements within the recycling system and the market logics are kept separate from the recycling operations (I10). The brewery industry interviewee notes that they aim to keep the commercial side completely separate (I12). According to the retail industry representative the competitors in Palpa's system are able to cooperate surprisingly well and they don't see the system as a competitive factor (I13).

Even though the ecosystem participants agree on the economic benefits of the system and collaborate to maintain a cost-efficient recycling system, some tension and misalignment came up in the interviews regarding the verification of costs within the system. The brewery industry representative described that there is some tension between the brewery industry and the retail industry concerning the costs of recycling because the brewery industry pays the recycling fees which cover the costs of the system. Sometimes it is challenging to verify the actual costs of the recycling activities in the retail stores, which can create tensions between the breweries and the retailers in the recycling system.

Also, the differing interests of the retailers and breweries sometimes cause disagreements. (I12)

## Cognitive alignment

### Alignment of goals

All actors within the recycling system share the objective of aiming towards high return rates. High return rates are the result of easiness of returning the beverage packages, deposits and the habit of returning. (I10) High return rates are a precondition for cost-efficient operations within the system as well as for the sustainability image of the recycling system. (I10; I11)

Through collaboration the actors are able to keep the operations simple and transparent towards the consumers. The retail industry interviewee notes that it is most important that the recycling system is straightforward for the consumer as extra effort for the consumers in the recycling would turn against the recycling system. For maintaining transparency and simplicity for consumers within the returning of beverage packages it is necessary for the competitors in the retail industry to collaborate. (I13) The retail industry interviewee describes the importance of taking the consumers into consideration in the operations within the recycling system as follows:

*"And maybe even more important is that it is simple and clear for the consumer. It would be quite a terrible situation, if you had to always sort the packages to Kesko's, S-group's and Lidl's bags separately. That would turn against us."* (I13)

Well-functioning recycling system and high return rates of beverage packages also enhance the sustainability image of the partners involved. The successful recycling operations are an important part of the breweries' and retailers' sustainability image. (I10; I11) The CEO of the Panimoliitto describes the importance of environmental sustainability for the companies as follows:

*"Clearly in all these companies, as in our companies, the circular economy plays a really big role and it has become a sort of competitive advantage."* (I11)

The ecosystem participants cooperate by common consent in the operations and in the development of recycling beverage packages. The benefits for the breweries are straightforward but there is also a big incentive for retailers to handle the recycling operations properly as there is a strong link to the sustainability image of retailers. (I10) In

addition, the return locations can be seen as a service element for the retailers' customers (I13). Even though major companies aim for maximizing their own profits, the companies are able to see the benefits of working together to promote recycling (I11). The brewery industry federation interviewee commented the dynamics of the brewery industry as follows:

*" - - the fact is that if there are such listed companies as we have, ultimately they aim towards their own profit. However, all companies of course feel that it benefits them."* (I11)

**Alignment of practices**

Finnish people have a long history of returning bottles, and thus taking the bottles and cans to the returning locations has become a strong habit for Finns over the years (I10). Finnish people have a need to return their bottles and cans and the recycling fits to the characteristics of dutiful Finns (I12; I13). The deeply ingrained habit of returning the beverage packages has formed a strong culture among Finnish people for beverage package recycling (I10). Finnish people might even feel anxious in foreign countries if there is no possibility to recycle the bottles (I13). All these cultural aspects have had a significant effect on the success of the beverage package recycling.

Nowadays there is also increasing pressure from the consumers for the retailers and breweries to handle the recycling appropriately. Through the beverage package recycling system, the actors respond together to the pressure coming from the consumers to take action in preserving natural resources and decreasing the use of materials (I13). The grocery retailer interviewee describes the situation as follows:

*"In a way, when there are two of these pressures [regulation and consumer] coming from the outside and when there are responsible actors who want to do their part towards a responsible society that's when an operational system begins to take shape."* (I13)

Even though the ecosystem is well-aligned concerning the cognitive goals and practices, Lidl's own separate system for plastic bottles causes misalignment among competitors and confuses consumers and therefore also decreases the efficiency of the system (I10; I13). The competitors of Lidl feel that Lidl being a part of Palpa's system as well as having a separate recycling system for plastic bottles can be seen as distorting competition because Lidl cherry-picks the benefits from both systems, which may affect consumer behavior (I13).

Within the brewery industry there have been some challenges in the collaboration between the big and small breweries because the taxation benefits of the recycling system are different for breweries with large versus small production volumes (I10; I11). The CEO of Panimoliitto reflected that earlier there have been tensions between major and small breweries but currently the collaboration is better (I11). In negotiations regarding the recycling system, its operations and their development, the retail industry and the brewery industry might have differing views and interests, which cause misalignment and hinders the collaboration and decision making (I12).

## 4.2 Case: Circular Economy Service Platform

This case looks into a development project of a platform aimed at advancing the utilization of forestry industry side streams. Circular Economy Service Platform (CEP) is a digital platform facilitating new business from industrial side streams. The focus is on the side streams and waste fractions from the forest industry. (CLIC Innovation, 2019a; Ståhlberg, 2019a) The challenge considering the forest industry's side streams is that the potential customers, the companies who could utilize the side streams, can't be reached effectively because the side streams of the industry are scattered. The vision initiating the project to develop the platform was to gather industry side streams, such as sludges, ashes and dregs which haven't been recycled before and convert these to recyclable products. The objective is to reduce waste going to landfills while maximizing the value of recovered side streams. (I3)

The aim of CEP is to serve as a customized platform applicable also to other industries and environments requiring different platform services (I3). The development of CEP is done in Finland and demonstration of the platform is planned to be done in Southeast Finland where most of the ecosystem key players are currently present. CLIC Innovation is an open innovation cluster which facilitates and coordinates the project execution of CEP development. Ten companies committed to collaborate in the development and launch of this digital platform. The companies collaborating in CEP development were UPM, Stora Enso, Metsä Group, Valmet, Andritz, Gasum, Fortum, L&T and Kemira. Evianet Solutions is the technology provider controlling the different modules and developing the digital environment. (I3; I4; CLIC Innovation, 2019b; Ståhlberg, 2019b) In addition to companies, the project includes supporting partners from research organizations; Lappeenranta University of Technology (LUT), Natural Resources Institute Finland (Luke) and Finnish Environment Institute (SYKE). Project coordination and support is managed through CLIC Innovation and the project is supported by the Ministry of Economic Affairs and Employment of Finland. (CLIC Innovation, 2019b)

The idea behind the platform development is built around the side streams and waste fractions produced (Clic Innovation, 2019b) from the three most important Finnish forest industry corporations (Rusko, 2011) Stora-Enso, UPM and Metsä Group. These three actors are major competitors in the Finnish forestry industry and they have shown willingness to cooperate with one another in the forestry industry also in the past (Rusko, 2011). These corporations position themselves strongly through environmental sustainability, as is evident in their strategies and overall appearance in the media and their

webpages. Stora Enso describes itself as “the renewables company”, UPM adds “beyond fossils” following the company’s name while Metsä Group adds “Forerunner in sustainable bioeconomy” to its description. (Stora Enso, 2020; UPM, 2020; Metsä Group, 2020)

The companies involved in the development of CEP fund the project because they want to supervise and influence the processing of the side streams. The companies have been involved in specifying the need for different services on the platform and presenting relevant cases for the development process. (I6; Ståhlberg, 2019b) For the forestry companies the most significant incentive in taking part in the development of is the appealing prospect of getting rid of their side streams and waste fractions in an easy and effective way. The collaboration in developing CEP is seen as an opportunity for improving the industry as a whole as well as individual companies and their business operations. (I3; Lahtinen, 2020)

The Circular Economy Service Platform (CEP) includes six service modules (CLIC Innovation, 2020; Ståhlberg, 2019a). The modules are designed to cover the core needs of circular economy (I3) and they provide services related to new technologies, present solutions, market integration, supply chain management, regulation and digital services (CEP, 2020). These six service modules are integrated to one another on the platform and the objective is that different companies can offer their services on the platform through these modules (I3; Ståhlberg, 2019a). Figure 7. illustrates the Circular Economy Service Platform which facilitates the production of new value adding products from the side streams and waste fractions from the forestry companies. The visualization of the digital platform illustrates the process in which the forestry companies input side streams and waste fractions to the platform and facilitated by the service modules, the side stream utilizer companies create new value adding products to the renewable product markets for construction, infra, nutrients or energy.

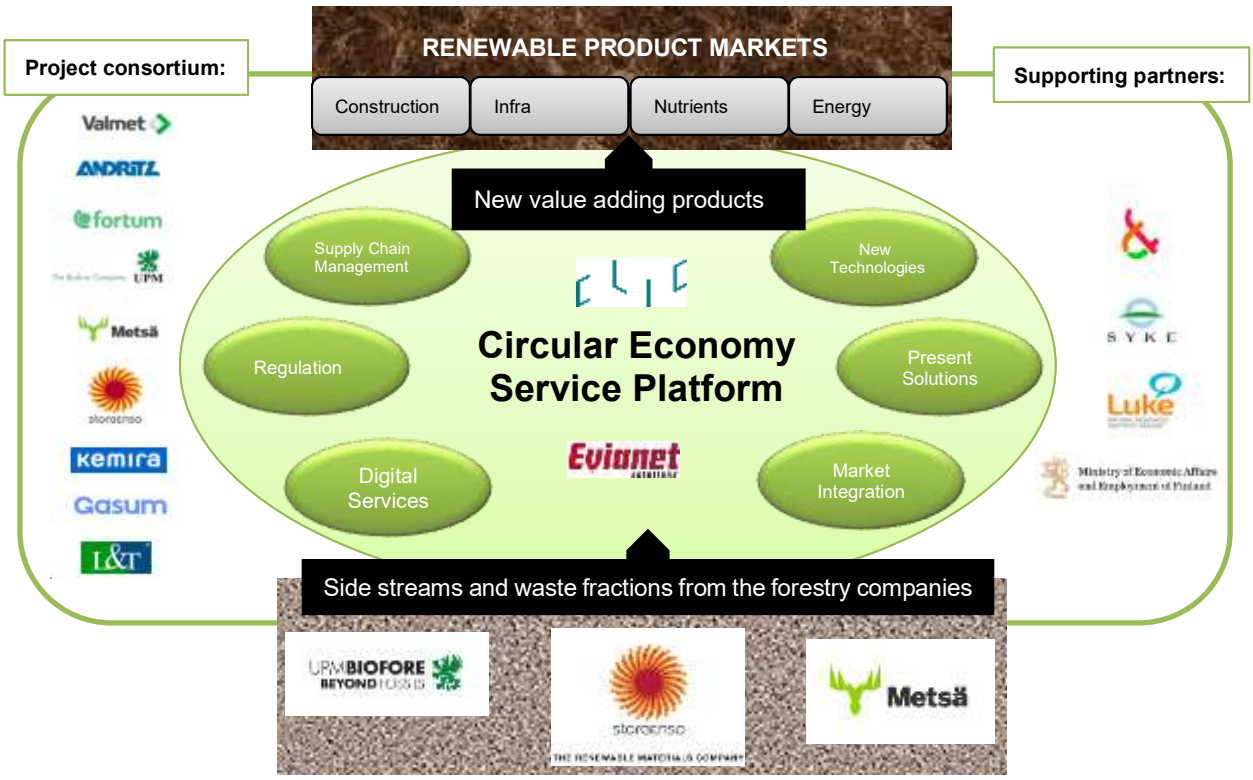


***Figure 7.*** *The Circular Economy Service Platform (CEP, 2020; CLIC Innovation 2019b).*

The service modules on the platform aim to cover the core needs of circular economy (I3). New Technologies and Present Solutions -modules aid the platform users with technical requirements, such as searching for ready-made solutions, funding for innovations as well as IPR and licensing. Market Integration -module provides information on market research, productization and value chain definitions (CEP, 2020; Ståhlberg, 2019a) supporting the whole value chain from the fractions to markets (I3). Supply Chain Management -module facilitates volume planning, supply chain optimization and gives information on fraction availability. Regulation -module includes directives and requirements, approvals and permissions as well as authority reporting. (CEP, 2020; Ståhlberg, 2019b) All data collected on the platform is organized, reported and analyzed in the Digital Services -module (I3) which provides databases and analytics, service integration and administration as well as document sharing (CEP, 2020). In addition to these digital services, also smarter analytics tools can be integrated with the platform. (I3)

The interviews were done near the planned launch of the CEP platform. Some of the interviewees were optimistic about the launch of the platform while others thought that it wasn't going to work. The website of the platform was online for more than a year, but the website has been closed in the beginning of 2021, which indicates that the project

wasn't as successful as was hoped for nor did it reach its objectives. This thesis aims to zoom in to the misalignments, tensions and needs for coopetition facilitation detected in the ecosystem as well as the roles, constituents and alignments in the ecosystem.

### 4.2.1 RQ1: The ecosystem of CEP

The first research question aims to discover the ecosystem formed for the development of the Circular Economy Service Platform. This section presents the actors and their roles and relationships in the ecosystem as well as the ecosystem constituents and drivers for ecosystem formation.

Drivers for the ecosystem formation for CEP project include aspects such as the forestry companies' zero waste goals and cost savings as well as the potential for other companies to create new business from side streams (I1; I3; I7). The forestry companies have a common objective to take care of the side streams as responsibly as possible with reasonable costs and preferably in a safe and easy way. The companies utilizing the side streams aim to create profitable and environmentally sustainable business from the forestry industry side streams. (I3; I6) To succeed in these objectives, companies and other actors have to work together and form an ecosystem in which these side streams create new value. To produce commercially competitive products from the side streams, the volumes of the side streams have to be large enough and these large volumes can be reached by combining the side streams of multiple forestry companies. The forestry companies aren't willing to invest in these operations alone as handling the side streams isn't their core business. (I7)

There are multiple different actors in the ecosystem developing CEP and the variety of actors is seen valuable (I5; I6; I7). In addition to forestry industry actors, there are companies providing services related to circular economy, research organizations and universities. There are also customer relationships between the ecosystem participants. (I6) As a manager from the forestry industry noted:

*"The good thing about it is that there is a wide variety of other actors involved in addition to the forestry industry. - - There is a critical mass of different types of actors."* (I6)

The platform functions through networked actors, in other words it is a network for different kind of companies which produce different kind of services (I7). According to another manager from the forestry industry the best result comes from collaboration between actors from different industries. There are competitors with similar challenges as well as service providers, equipment manufacturers, research organizations and according to

the interviewee usually this kind of combination of actors creates the best results. (I5) The networked actors in the ecosystem for the CEP project is illustrated in the ecosystem map created with kumu mapping tool in figure 8.

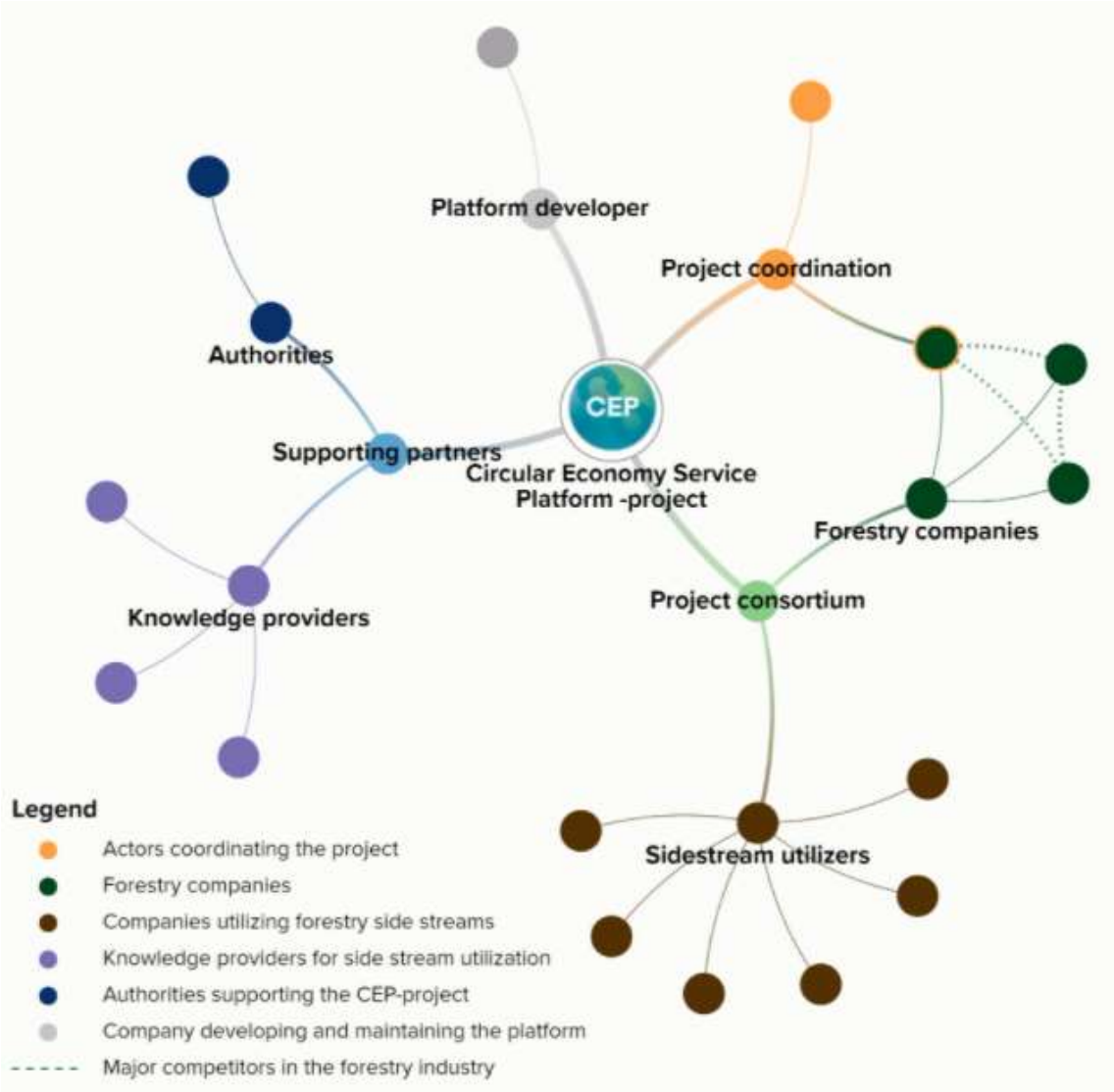


***Figure 8.*** *The networked actors of the ecosystem for Circular Economy Service Platform -project.*

There is no clear central actor (as opposed to Palpa in the beverage package recycling system) in the ecosystem for the CEP project and therefore the networked actors are mapped and connected to the project in the center. The various groups of actors in the ecosystem are discussed in more detail below.

## Project coordination and platform developer

The project is coordinated by CLIC Innovation, a non-profit company pursuing public-private-partnership model. CLIC Innovation aims to create and manage collaboration for innovation between academia and companies. (CLIC Innovation, 2020)

The open innovation cluster describes its mission as *"facilitating creation of breakthrough solutions in bioeconomy, circular economy and energy systems"*. CLIC Innovation is owned by leading international companies and Finnish research organizations. The board of CLIC Innovation in 2019 and in 2020 has had representatives from almost all organizations collaborating in the CEP project. (CLIC Innovation, 2020) The shareholders of CLIC have grouped into three different theme groups: bioeconomy, circular economy and energy systems. In the circular economy theme group, there are approximately ten companies and a similar amount of research organizations, which feel that circular economy is in their core and they participate actively. The three major Finnish forestry companies are essential actors for CLIC Innovation as they, among other companies, own the non-profit company and take part in multiple projects coordinated by CLIC (I1).

The interviewee from CLIC Innovation describes the organization's role as an orchestrator in the ecosystem because CLIC Innovation considers itself as a neutral actor in the project. The Head of Circular Economy in CLIC Innovation reflects on building collaboration between different actors as follows:

*"Building collaboration is what it is, as companies can have different reasons why they don't want to join the table. - - . Building collaboration is quite hard work in addition to applying and receiving funding of course."* (I1)

Even though CLIC coordinated the project, in practice the project was led by one of the project consortium company representatives (I4; I5; I6). The main driving force and leader for the development of CEP has been a director from one of the forestry companies, UPM. According to the interviewee from CLIC Innovation without the time and effort this director put in CEP, nothing would have been achieved in the project. (I1) The director from UPM would have preferred that his name would have been connected with CLIC Innovation rather than UPM to enhance the feeling of neutrality of the platform and the development process (I3). The idea for the project came from UPM and the company had pursued similar objectives earlier and used a partly similar system internally. The platform was based on a proof of concept by UPM. (I1; I5) UPM led the project and justified for other partners why this type of solution is necessary. For the most part UPM

has been in charge of pushing the development forward through the director working on CEP. (I5)

Evianet Solutions Oy was chosen for the platform development because of the company's long-term experience in developing platforms and networking different participants within projects. The CEP platform was ready for markets in late 2019 and the platform is improved by Evianet Solutions according the emerged needs and feedback from users. (I4) Evianet Solutions act as a third layer taking care of the platform and the platform development environment as a whole (I3).

## Project consortium

### Forestry companies

The three major Finnish forestry companies, UPM, Metsä Group and Stora Enso, collaborate in the development of CEP. According to the interviewee from Metsä Group, the side streams and other environmental issues are quite a safe context for collaboration between competitors within the industry and the forestry companies are willing to collaborate on these issues. On the contrary, in product development or R&D these competitors are not so keen on collaboration. (I5) The interviewee from UPM underlined that the forestry companies don't compete among the side streams which cover approximately 2% of their business. The core business covers 98% and that is where the forestry companies compete. The fact that CEP focuses on the side streams eases the collaboration between competitors. (I3)

UPM has acted as a driving force in the development of CEP and from the other forestry industry actors' perspective, the progress of the platform has been mostly UPM's responsibility because of their strong vision and previous experience in similar endeavors. A manager from Metsä Group described the roles in the ecosystem as follows:

*"Inevitably projects always build up in a way that someone leads the project, and in this case, it has been mainly UPM. They have created the idea and they have done a similar project earlier or used a corresponding system so they have pushed this strongly forward and indicated why this is needed. - - Others have been more or less as some kind of receivers. "* (I5)

The interviewee from Stora Enso described the company's role in the project as a member of the steering group attending the meetings, commenting the process of developing

the platform and taking part in the trial phase of the platform (I6). The Metsä Group representative in the project described the company's role as mainly a co-financier. Their motive for taking part in the project is to keep up with potential new solutions for side stream utilization. (I5) A manager from Metsä Group reflects on the company's role in CEP as follows:

*"Our role has been that we have been involved with defining what the platform should include considering functions needed on the platform and maybe generating reference cases to the platform."* (I5)

**Side stream utilizers**

The companies involved with the development of CEP in the role of side stream utilizers include Valmet, Andritz, Fortum, Kemira, Gasum and L&T. These companies together with the forestry industry aim to utilize the side streams and commercialize new value adding solutions and products (CLIC Innovation, 2019b). These companies represent different industries and business areas. For example, Kemira focuses on water purification (I2), Gasum produces biogas and Valmet is a technology provider (I3). The side stream utilization isn't core business for the forestry companies, whereas the objectives of CEP could be near the core business of Fortum and L&T (I1).

## Supporting partners

The supporting partners of CEP include knowledge providers and authorities. Knowledge providers include research organizations and universities involved in CEP. (CLIC Innovation, 2019b) Research organizations involved in CEP include Finnish Environmental Institute (SYKE) and Natural Resources Institute Finland (Luke) and they have provided reference services to the platform, such as technological and regulatory services (I1). In addition, LUT University took part in the early phases of the CEP development (I7).

According to the interviewee from the forestry company Stora Enso, the research organizations have an important role in CEP together with the regulatory aspects of side stream utilization. The interests of the partners of CEP are in the more challenging side streams which have waste statuses and therefore the productization of these side streams is challenging. (I6) A manager from Stora Enso underlines the importance of research organizations due to the challenges in side stream utilization as follows:

*"Research organizations and taking legislation into consideration have an important role and at times I felt that not enough effort was put into this even though the issue was aimed to keep visible."* (I6)

The knowledge providers also took part in the very early phases of CEP, for example, in the ideation of the platform and funding negotiations (I7). According to the LUT interviewee the knowledge providers' role in CEP can be considered, in a way, as subcontractors. The most challenging side streams with no existing processes for productization and commercialization are directed for the research organizations for further investigation. The research organizations' role is to resolve what to do with these difficult side streams and how to convert these side streams into utilizable materials or products. (I7) An Associate Professor of LUT describes the knowledge providers' role in CEP as follows:

*"We are a part of the network and we provide certain services but it is not part of the daily activities planned on the platform, rather when problems arise."* (I7)

The Ministry of Economic Affairs and Employment of Finland is a supporting authority of CEP (Clic Innovation, 2019b) and the CEP -project received funding from the Ministry of Economic Affairs and Employment (I3; I7). The project was funded roughly half by the nine project consortium companies and half by the Ministry of Economic Affairs and Employment of Finland (I1; I3).

### 4.2.2 RQ2: Coopetition in CEP and the facilitation of coopetition

The second research question aims to create understanding on coopetition in the ecosystem of CEP by looking into the coopetitive relationships and interactions between the competitors in the ecosystem and identifying the facilitative measures that would have been needed to facilitate coopetition in the ecosystem. Differing from the beverage package recycling case, the interviewees described facilitative measures which would have been needed for the collaboration to achieve its objectives.

#### Coopetition in CEP

The ecosystem participants operating in coopetitive relationships in CEP are circled in red in the ecosystem map in figure 9. Coopetition is evident in three distinct parts of the CEP ecosystem. The forestry companies, UPM, Stora Enso and Metsä Group, are in a coopetitive relationship within CEP. The knowledge providers collaborate in CEP while

being competitors to some degree. In addition, Fortum and L&T from the project consortium are competitors collaborating in CEP. These coopetitive relationships are discussed in more detail in the following subsections.

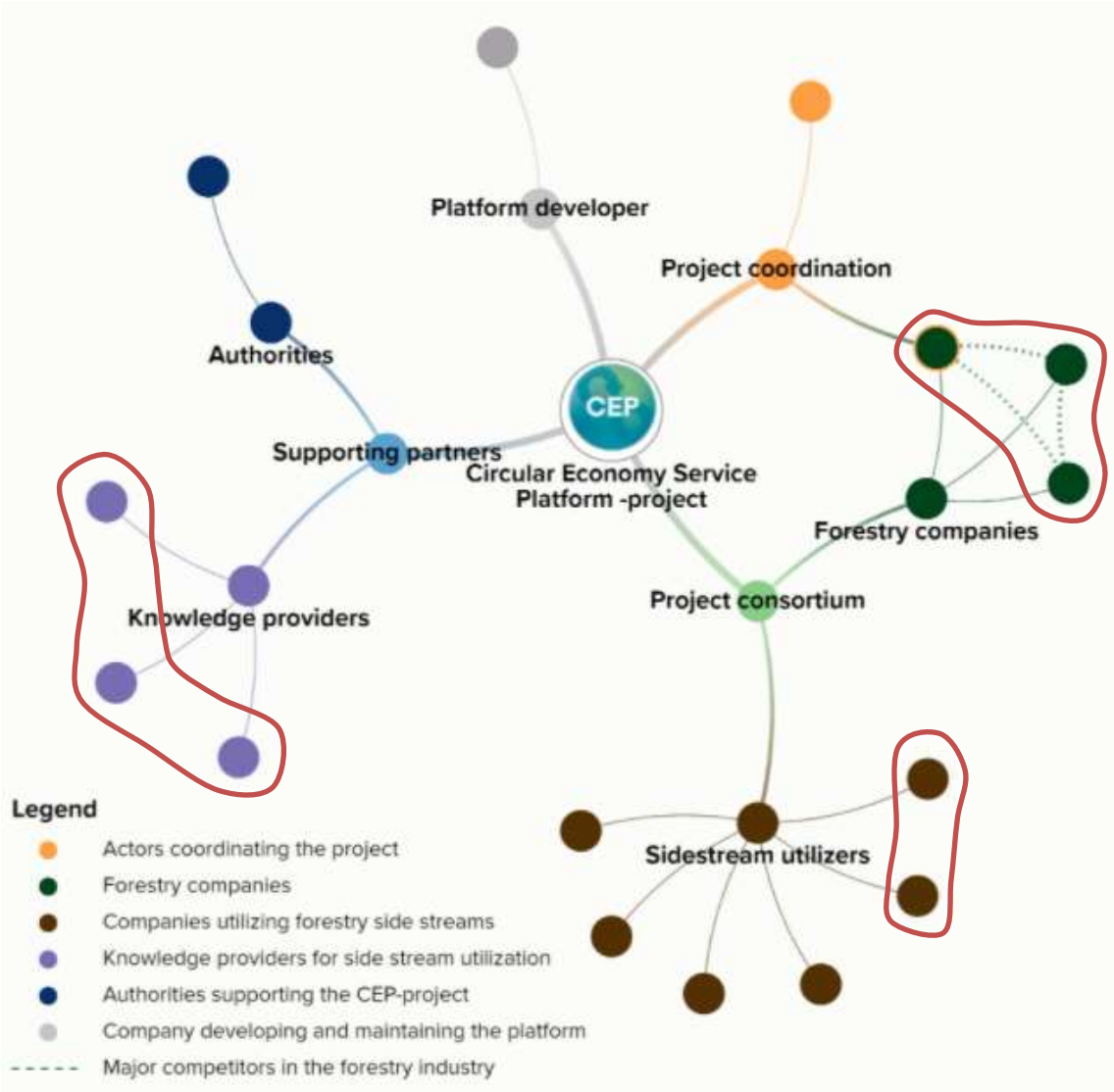


***Figure 9.*** *Identified coopetitive relationships in the CEP ecosystem.*

**Coopetition in the forestry industry**

The three major companies in the Finnish forestry industry are UPM, Stora Enso and Metsä Group and these companies joined forces to benefit the industry as a whole through CEP (I1). These forestry industry corporations produce similar side streams, waste and side products from their factories and the challenges are similar within the industry. Therefore, it is easier for the companies to find solutions to these challenges

together regarding, for example, new value chains and end-products. (I5) Through alliances and partnerships it is easier to find sustainable solutions for the side streams as the side streams aren't core business for any of the companies (I6). A manager from the forestry industry reflected on why it is beneficial to collaborate in side stream utilization for the forestry industry companies:

*"- - the main question is how to minimize the costs and maybe gain greater benefits including even non-economic benefits. These are essential to why it is beneficial for us to collaborate rather than doing this alone and trying to make business out of it."* (I6)

Side streams are an easy and safe business section to collaborate in for the forestry companies as it doesn't violate competition laws because side streams aren't any forestry company's core business (I5). Side streams aren't an area containing business secrets, it's rather a common challenge for the forestry companies. (I7) Competitors just want to get rid of these side streams and put them to some sensible use. Quite often the objectives for side streams are consistent among forestry industry competitors (I5) and the competitors think similarly on the subject (I7). According to a knowledge provider representative, being far enough of core processes and core competencies often increases the success of the project. The closer to the core process and the core of the company, the more the competitors want to protect their own secrets and operation modes. (I7)

There are also challenges in the cooperation between competitors. Competitors monitor each other's actions and if one of the partners doesn't want to continue in the ecosystem it may create a snowball effect decreasing the involvement of others as well. In addition, agreeing in various matters can turn out as challenging even if everyone is committed to the common objectives. (I5) A manager from the forestry industry reflects on the potential challenges in the collaboration between competitors as follows:

*"Challenges usually emerge, if the competition law or economic issues aren't negotiated clearly enough or the costs of taking part or breaking away are unclear or if there are other unclear contracts."* (I5)

In addition, the reputation of different companies and individuals can cause distrust among competitors in a coopetitive relationship. According to a forestry industry representative, companies and their employees have different reputations. Some are considered as very troublesome and unwilling to collaborate while others are considered to gather all knowledge to themselves and then obtain a patent on it. On the other hand, some are able to see shared interests and communication with them is open and direct.

(I5) A manager from the forestry industry concludes the thoughts about collaboration between different kind of actors as follows:

*“This might reflect the corporate cultures on the background.”* (I5)

**Coopetition among side stream utilizers**

The project consortium incorporates coopetitive relationships among the side stream utilizers in addition to the forestry industry. From the side stream utilizer companies Fortum and L&T are competitors collaborating in the development and operations of CEP. The side streams aren’t in the core of the forestry companies’ business, whereas the side streams are near the core business of partner companies Fortum and L&T (I1; I3). During the development phase Fortum and L&T were eager for someone to take responsibility of running the platform and initiating the operations. As it is a new mode of operation, challenges have emerged also in the search for a coordinating operator for the platform. (I1) The interviewee from CLIC Innovation reflects on the relations among the project consortium as follows:

*“It can be noticed that there are certain tensions. It is characteristic for that field. If I think about Fortum and L&T, for example, they are also clearly competing in some areas.”* (I1)

**Coopetition between knowledge providers**

The knowledge providers involved in the ecosystem are also horizontal actors and therefore working in a coopetitive relationship with each other while collaborating in the development and operations of CEP. The research organizations of CEP, including SYKE, Luke and LUT, provide for example reference services for the platform (I1). A research organization interviewee described the knowledge providers’ role on the platform as subcontractors providing solutions for challenging side streams (I7). No tension or paradox related to coopetition was identified between the knowledge providers in the interviews. The interviewee from LUT university referred to all the knowledge providers as *we* or *us,* which could indicate that the knowledge providers most probably didn’t view each other as competitors in the CEP ecosystem.

## The facilitative measures needed for coopetition in the CEP ecosystem

For ecosystems comprising of networked actors, including competitors, facilitation is needed to achieve system-level outcomes. As described in the introduction of the case CEP, the platform never achieved fully operational mode nor achieved the objectives set for it. The need for various forms of collaboration and coopetition facilitation arose from the interviews conducted on different actors in the CEP ecosystem. These facilitative measures were not performed in the CEP ecosystem, which may be one reason for why the project didn't achieve its objectives. The identified facilitative measures which were described as necessary for coopetition and collaboration in the CEP ecosystem are illustrated in figure 10. The illustration presents the measures but doesn't address the different levels, dimensions or the intensities of the presented measures

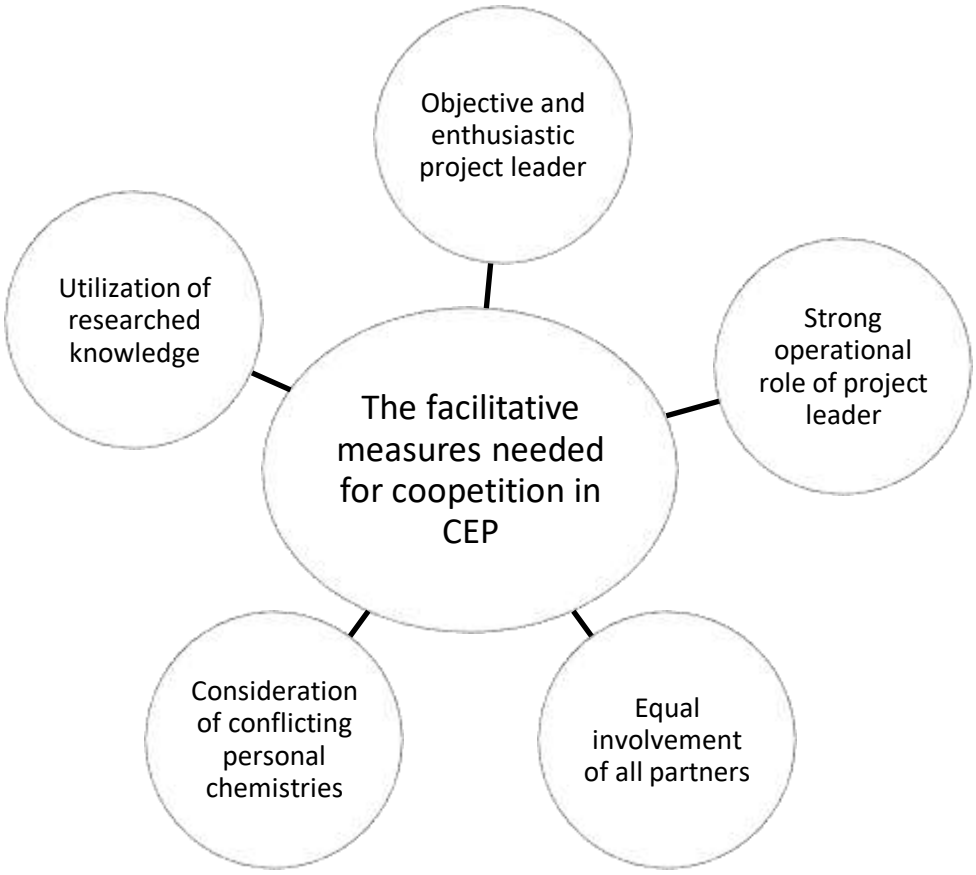


***Figure 10.*** *The facilitative measures needed for coopetition in CEP.*

The figure above illustrates the wide-range of different measures on different levels needed for coopetition in the case CEP. These measures and the underlying issues were

identified from the interviews of key ecosystem participants and these are further discussed in the following sections.

**Objective and enthusiastic project leader**

The prime mover in the development of CEP has been a director from UPM and according to the interviewee from CLIC Innovation without the time and effort put into this by the prime mover nothing would have happened in the project (I1). The director from UPM underlined the importance of objectivity for CEP, regarding the digital platform as well as the dynamics of the development project. The platform can't be administrated by UPM or other companies, such as Fortum or L&T because, according to the director from UPM, no competitor of the administrator of CEP would add anything to the platform. The director from UPM was also aware of the challenging situation of leading the project while being UPM's employee. (I3)

The other forestry companies and competitors of UPM, Stora Enso and Metsä Group, felt that an objective and enthusiastic project leader would have helped to create actual collaboration through CEP (I5; I6). The CEP-project has been perceived as too UPM-driven. According to the interviewed manager from Stora Enso a project manager detached from all the different actors would have been needed and there wasn't one in CEP. (I6) The interviewee from Stora Enso described the necessary managerial aspects for the emergence of successful collaboration as follows:

*"It would have helped these issues immensely if there were an independent project manager who would have driven this collaboration separately with each actor and then gathered these insights to forward collaboration."* (I6)

The issues in organizing collaboration between competitors have also been noticed in CLIC Innovation. The interviewee from CLIC Innovation described that there are situations in which issues have to be negotiated separately with each company as they might not give any comments to certain issues too close to their core business or ongoing innovation, in meetings where competitors are present. For CLIC Innovation as a coordinator in different projects between these forestry industry competitors among others, these negotiating positionings feel frustrating at times when the progress is slow. (I1)

**Strong operational role of project leader**

CLIC Innovation describes their role as essential in finding and networking different actors for joint initiatives and creating interesting projects for their shareholders (I1). CLIC Innovation has coordinated the CEP project together with the director from UPM but the issue with CLIC Innovation as a coordinator for the digital platform is that CLIC Innovation lacks operational capabilities needed for administrating the digital platform (I3; I6). The director from UPM comments that CLIC Innovation doesn't have staff for operational activities and CLIC can't administrate CEP because the CLIC as a non-profit organization can't accept certain commissions (I3). According to the director from UPM:

*"- - the existence of CLIC is connected to completely different things than these kinds of operational activities - -* " (I3)

The interviewee from Stora Enso wished for a stronger operational role from CLIC Innovation in the development of CEP. The manager from Stora Enso described CLIC Innovation's main contribution to the project on the practical level as making notes and arranging meetings. (I6) The manager from Stora Enso addressed the need for operational activity from CLIC as a coordinator as follows:

*"There should have been a stronger input maybe from CLIC's side to really drive this. Specifically taking it from the slide shows to actual operational action."* (I6)

The need for operational activity and a driving force for the collaboration within CEP was noted and underlined also by knowledge providers (I7). The Associate Professor from LUT University described the operational needs of CEP as follows:

*"There is still quite a lot to be done. A digital platform in itself is nothing yet. It is just a tool. It needs an enthusiastic and hard-working leader to get it going."* (I7)

**Equal involvement of all partners**

To succeed in collaborative initiatives involving horizontal actors it is important to involve all partners equally to avoid conflicts and improve the partners' commitment to the shared objectives. Ensuring that all partners feel that their opinions and insights are heard and taken into consideration equally is important for the long-term commitment of partners. According to forestry industry interviewees from Metsä Group and Stora Enso all project consortium partners didn't feel as equally involved in the development of CEP (I5; I6). The Stora Enso interviewee described the issue as follows:

*"Now this turned out as a bit of a one actor show"* (I6)

The representatives from Stora Enso and Metsä Group felt that the CEP project was based too much on UPM and their internal systems and experiences. The managers from Stora Enso and Metsä Group didn't see how actual collaboration could be initiated through CEP (I5; I6). A manager from Metsä Group described the collaboration as being strongly UPM-driven with CLIC Innovation as a coordinator while the others have been more or less in the role of receivers (I5). A manager from Stora Enso reflected on the feelings through the CEP development as follows:

*"It hasn't been somehow too easy. - - Some may feel that they haven't been heard that well."* (I6)

The manager from Stora Enso also noted that changes in company representatives for the project is a challenge when aiming to keep the operations transparent for all and engaging all partners (I6). All these identified issues may have led to the snowball effect, mentioned by the Metsä Group interviewee, of some project partners not willing to commit to continuing in the development and usage of CEP.

The interviewee from CLIC Innovation, on the other hand, described the three major forestry industry corporations as active and eager in committing to CE projects. According to the CLIC representative the forestry companies use CLIC Innovation as a tool. (I1) The Head of Circular Economy at CLIC Innovation described the collaboration with the forestry companies as follows:

*"They see the benefits and they demand, but they also give back. That is what I like."* (I1)

**Consideration of conflicting personal chemistries**

Along the interviews the issue of mismatched personal chemistries came up multiple times. It is seen as important that people working together get along (I5). This can be considered especially important in collaboration between competitors because these relationships are already filled with tension inherent to coopetition, thus it is necessary that individuals get along to achieve the shared goals of the collaboration. According to the interviews, in this particular collaborative project there has been tensions related to personal characteristics, which have affected the outcome of the project negatively.

The Metsä Group interviewee described that companies and individual employees in the companies have different kind of reputations. Some are considered as difficult partners

and reluctant to cooperate while others can be seen as a threat in IPR issues. These kind of presumptions and concerns can cause distrust among actors which inhibit collaboration. The interviewed manager from Metsä Group underlines the importance of personal relationships and considers the interaction between individuals as most important. (I5) The interviewee reflects on the issues of CEP regarding personal relationships as follows:

*"It is really hard for me to see that any digital solution would stop people working with those people who they have fun with."* (I5)

The manager from Metsä Group describes that it has been hard to see the human interaction concerning the side stream utilization moving to a digital platform (I5), whereas the manager from Stora Enso describes that the project hasn't been too easy because of challenges in communication and the feeling of not being heard properly. According to the Stora Enso interviewee, it wasn't easy to reach agreement and joint understanding within CEP, which was partly due to personal chemistries. (I6)

The notion of these issues within the CEP ecosystem became also evident in the interviews of project coordinators, as the UPM interviewee playfully referred to some actors as contrarians and the CLIC Innovation interviewee described their work as being a diplomat between the competing companies (I1; I3) These notes of discord weren't only between companies as also knowledge provider organizations were described to have expressed contradicting viewpoints (I3).

According to the manager from Metsä Group the main challenges of CEP are to find the reasoning for using the platform which culminates to the views of individuals (I5). The interviewee from Metsä Group describes the challenges related to individuals involved in developing CEP as follows:

*"- - this personifies to individuals' opinions and views on whether they believe that this kind of platform can solve something."* (I5)

**Utilization of researched knowledge**

When facilitating the collaborative endeavors involving horizontal actors, utilizing research knowledge for reasoning and ratifying decisions and solutions may be beneficial especially when the collaboration aims to untap new opportunities. The importance of exploiting research data in decision making and development, also came up in the interviews. The development of CEP was based on UPM's proof of concept (I1; I3) and the

project consortium aimed to utilize research in the development as research organizations were also included in the ecosystem of CEP (I7).

All partners weren't satisfied with the degree to which the development of CEP was based on researched knowledge. The interviewee from Stora Enso describes that research could have had a more prominent role in solving the challenges of side streams and in solving how to organize collaboration. The interviewee feels that the research organizations and legislation have an important role because the project consortium's interests are in finding ways to utilize the more challenging side streams. A manager from Stora Enso reflected on the role of research organizations and legislation in CEP as follows:

*"- - sometimes it has felt that the project maybe hasn't been able to put enough effort to it [research] even though it has been tried to keep it on display"* (I6)

The manager from Stora Enso described the need for researched knowledge in the development of CEP and the issues concerning utilizing research as follows:

*"I would perhaps have seen a bigger role for research perspectives, already from the beginning of the project, to solve how to benefit more from the challenging side streams and how to collaborate to do it. It would have maybe been better to be more prominent in the project. The project attempted to utilize research but somehow it just wasn't so easy."* (I6)

The important role of research was notified in CEP and the consortium tried to emphasize it but for some reason the utilization of researched knowledge could have been done better perhaps by focusing on the facilitative measures. The Stora Enso interviewee noted that for finding solutions, collaboration is necessary and there has also been a lot of collaboration within the forestry industry in other forums as well (I6).

### 4.2.3 RQ3: Alignment in CEP

The third research question aims to discover the alignment and misalignment dimensions identified in the Circular Economy Service Platform case. Table 9 presents the dimensions of alignment and misalignment of CEP.

***Table 9.*** *Alignment and misalignment in CEP.*

| | **Technological alignment** | **Economic alignment** | **Cognitive alignment** |
|---|---|---|---|
| **Alignment of goals** | + The project aims to create a platform (CEP) which facilitates the transactions related to side stream utilization (I1; I4; I7).<br><br>+ The aim in the development of CEP was to create a digital platform applicable for other CE ecosystems as well (I3; I4).<br><br>+ Anonymity and neutrality of the platform is regarded as important (I3). | + A joint understanding of the potential economic benefits (cost savings for forestry companies and possible sales for side stream utilizers) of collaboration in promoting side stream utilization (I1; I3; I5; I7).<br><br>+ Because the side streams are similar in the forestry industry, the solutions are also similar, which makes it easier to discover the value chains and end-products together (I5).<br><br>+ A common platform enables reasoned and cost-efficient side stream utilization and benefits all actors through facilitating their share of the work towards solving the material efficiency in the industry (I7). | + The ecosystem participants have a joint understanding of the challenge concerning forestry industry side streams. The objective is to advance the Finnish forestry industry as a whole, in addition to enabling individual value capture for companies. *"- - the companies see that if the whole industry improves, they benefit from it themselves."* (I1; I3; I7)<br><br>+ The forestry industry has zero solid waste targets and the objectives concerning side streams and environmental aspects are consistent among the forestry corporations (I1; I3; I5). |
| | - Anonymity and neutrality of the platform wasn't achieved in CEP, which hampered the development and launch of the platform (I5; I6). | | - Ecosystem participants have their own expectations and objectives of CEP which might be contradictory and cause tension and distrust between partners (I5; I6).<br><br>- It is challenging to get all actors to understand the shared goal and commit to work towards it (I3; I5). |

| | | | |
|---|---|---|---|
| **Alignment of practices** | +/- The visibility and openness of data on the platform is an issue for competitors but also a prerequisite for efficiency. *"There are challenges as this is a new mode of operation which requires certain openness on the platform".* (I1; I3)<br><br>+ The platform facilitates the collaboration between companies and no monetary transactions, such as cash exchange, are done on the platform (I3). | + The project consortium includes shareholders of CLIC Innovation and the project consortium companies funded the CEP project partly (I1; I3; I5; I6).<br><br>+ The forestry corporations' collaboration aims to save resources and costs. Dumping side streams is expensive, which is a driver to search for utilization opportunities. *"No company wants to do these things alone - - and invest in this kind of work load on their own."* (I2; I3; I7)<br><br>+ Collaboration regarding the side streams is relatively easy as isn't the core business of forestry companies and there are less risks of violating the competition laws (I5). | + The companies want to improve the image of the industry as a whole and gain non-economic benefits. *"- - improving the entire industry and its image is of course important in this."* (I1; I6)<br><br>+ The possibility for utilizing the side streams is a big driver for trust building to enable information sharing (I7). |
| | -The companies are reluctant to share information on the platform and need better reasoning for the use of the platform. *"Why would anyone use CEP? - - What is the information needed for?".* (I1; I2; I3; I5)<br><br>-Interface integration and harmonization of processes is challenging when developing a multi-actor platform (I4; I5). | -The CEP platform doesn't solve the issue of creating value chains for the utilization of the side streams. New actors with fresh ideas would have been needed. *"the value chain has to be discovered and it has to exist or it has to be created somewhere else than on such a platform."* (I5; I6)<br><br>-Some actors feel that verifying the benefits and added value of CEP is challenging (I5; I6).<br><br>-Other identified causes of misalignment related to the use of CEP include e.g. costs of participation and detachment, and unclear agreements (I5). | - Developing a platform is a matter of cooperation between people. *"people work with the people they have fun with"*. A digital platform doesn't replace it. (I5)<br><br>-Tension in the personal relations between ecosystem participants (I1; I3; I4; I5; I6; I7).<br><br>-Personal opinions of the platform among the ecosystem participants affect CEP. *"This is personified by people's opinions and views on whether they believe that this sort of platform solves something."* (I5; I6)<br><br>-The coexistence and joint development of competing companies has issues (I4). |

## Technological alignment

### Alignment of goals

Technological alignment refers to the means in which the ecosystem's transactions are handled technically, usually including a platform, which is exactly what this studied ecosystem is striving to develop. The CEP project aimed to create a digital platform, CEP, which facilitates the transactions related to utilizing side streams (I1; I4; I7). CEP is a

shared platform for a multi-actor network pursuing to unite the various actors and their separate systems. The objectives of CEP include cost-efficiency in operations and optimization of different technological solutions and interfaces. The idea of the operations facilitated by the digital platform, CEP, is to combine complementing processes while removing overlapping. Through this the partners using the platform are able to create more value for the customers. (I3)

The aim is to develop a digital platform which is suitable for serving the purposes of other circular economy clusters as well. (I3) When developing a platform for circular economy ecosystems, networks, hubs or the like it is important to take the different needs of companies and individuals into consideration. The variety of different kind of products and offerings is broad as are the different characteristics of the products and offerings. The harmonization of the processes isn't always simple. (I4)

The anonymity and neutrality of the platform is important for an operational platform facilitating collaboration and value creation. It is of major importance that CEP is managed by an objective organization because if it were a platform of a certain company, no competitor of the administrative company would join it. Companies won't utilize a platform in the name of their competitor. This is why the director from UPM didn't want CEP to be linked to UPM. (I3) The idea behind CEP was based on UPM's proof of concept but UPM didn't want CEP to be mixed with their internal systems. (I1) The other partners in CEP didn't feel that anonymity and neutrality was achieved in CEP, as they feel that CEP is too strongly based on UPM and they didn't feel that all actors in the project consortium were able to get their voice heard. (I4; I5) The aspects of the platform's anonymity and neutrality can be considered as technological misalignment as the aim was to develop a CEP taking these issues in consideration but anonymity and neutrality wasn't achieved, which hampered the progress of the project.

**Alignment of practices**

The openness and visibility of data in CEP has been an issue and concern for the project partners but the data issues can be seen as both alignment and misalignment. Some of the data in CEP are wanted to be public while for some of the data the CEP platform has to include a possibility to restrict the visibility only to certain companies (I4). The aim is that the producer of the data is in charge of defining who is able to see the data and who is not. The more data is visible on the platform, the more efficient and smart the whole

system is. But different kinds of restrictions are needed related to, for example, innovation. (I3) The interviewee from CLIC Innovation reflected on the challenges related to the openness of data:

*"There are also challenges because this is a new mode of operation and this requires certain openness to share the data of the streams on the platform as well as the possibility to mark to who the data is visible to."* (I1)

Sharing information on the platform feels challenging for the companies and causes misalignment between the project partners. The misalignment caused by the reluctance to share essential information can be categorized as technological and cognitive misalignment. The companies don't trust the platform nor the partners with their data and some data just can't be shared due to its sensitivity regarding, for example, innovation or trade secrets (I1; I2; I3). There is also uncertainty as to whether the data is securely protected so that trade secrets, such as recipes and availability information, can't be seen by unwanted parties (I4). According to a forestry industry manager a major challenge in the development of CEP is to find the reasoning to why anyone would share information and use the platform (I5). The Metsä Group interviewee describes the challenge of reasoning data sharing as follows:

*"That is maybe the biggest challenge. Why would anyone use CEP? What problem would it solve? What is the information needed for?"* (I5)

Companies protect their own business and they don't want to tell what they produce and what are the volumes of their production (I2). A Chief Advisor from the Chemical Industry Federation describes this as an "transparency game" in which the companies request the federation to restrict the visibility of data regarding the production outcomes and volumes of companies because it is possible to figure out the production processes and recipes from the outcomes. (I2) The interviewee from the Chemical Industry Federation describes the challenge of information sharing as follows:

*"It is not public information so the barrier is that companies don't really want to announce in public what [side streams] they have available for utilization."* (I2)

According to the Chemical Industry Federation interviewee, these kinds of public platforms and market places are really difficult as companies definitely will not share information, such as pricing, because it is a matter between business to business (I2). The project coordinator from UPM notes that the business transactions are done between the actors on the platform, thus the platform facilitates the collaboration but there is, for

example, no cash exchange on the platform (I3). The trade negotiations are not done on the platform (I5).

When developing a platform for multiple business actors a major challenge is the integration of different system's interfaces (I3; I5). All companies have their own distinct systems for managing data in factories and, for example, billing systems, which is a challenge for the interface of CEP with these various systems. The problem is that the data doesn't transfer automatically to an external platform such as CEP but someone has to manually insert the data to the platform, which isn't a welcome addition to the workload in the factories. The CEP interface should function in a way in which the data is transferred automatically. (I5) Also, the technology provider mentioned that the harmonization of processes is not simple (I4). According to the UPM interviewee coordinating the development of CEP, the objective of the platform is to serve as a common platform in a multi-actor network for multiple places and for all kinds of actors and their needs in a cost-efficient and optimized way (I3).

## Economic alignment

### Alignment of goals

The economic goals of the CEP ecosystem participants are well-aligned. All actors agree that joining forces to promote the utilization of side streams is beneficial for everyone (I1; I3; I5; I7). The Finnish forestry corporations aim to get rid of their side streams in an easy and cost-efficient way and working together accelerates achieving these objectives. The side stream utilizer companies, in turn, aim to transform these side streams to profitable products. (I1; I3) A forestry industry director describes the underlying situation for the CEP development as follows:

*"Those who have the side streams don't have the markets and they are not interested in it either - - whereas those who would have the markets don't have the side streams"* (I3)

The objective for CEP is that a common platform enables reasonable and cost-efficient side stream utilization which is beneficial for all ecosystem participants as it facilitates everyone's work load towards solving material efficiency in the industry (I7). Collaborating in the field of circular economy is beneficial for the forestry industry as a whole because the side streams are similar. Therefore, also the solutions are similar and it is easier to discover and create the value chains and end-products in collaboration within the ecosystem. (I5)

The side streams aren't core business for any of the forestry industry companies and the payback time of the investments on side stream processing is too long for an individual company to invest in the necessary systems alone. A platform gathering partners to a collaboration network working towards utilizing the side streams reasonably and profitably is beneficial for all, as everyone gets their own share of the work they put in. (I7) According to the Associate Professor from LUT University it is a win-win situation if the CEP project succeeds with creating a platform that facilitates collaboration. The interviewee reflects the possible outlook as follows:

*"If this really begins to operate properly, everyone wins. To my mind this is a good example that if this works it creates competitiveness for the whole area – to both ends of the platforms. It also creates job opportunities for the network working on this."* (I7)

**Alignment of practices**

The companies in the CEP project consortium are shareholders of the project coordinator CLIC Innovation (I1). The companies have also partly funded the CEP project (I1; I3; I5; I6). The forestry companies don't want to use too much of their resources on the side streams which cover only two percent of their production. The aim of CEP is to save resources for the forestry companies producing the side streams and provide some cost savings. Forestry companies don't seek for additional income through the utilization of their side streams. (I3) Dumping side streams to landfills is very expensive and therefore forestry companies want to develop utilization opportunities to their side streams (I2). Collaboration to advance side stream utilization is relatively easy for competitors as the side streams aren't in the core business of any of the competing companies and therefore there are less worries about violating the competition laws (I5). The companies want to cooperate because they aim for profitability and investing in these kinds of systems alone isn't reasonable (I7). An Associate Professor from LUT University describes the situation as follows:

*"No company wants to do these things alone and even big corporations don't want to invest in this kind work load on their own."* (I7)

Even though the economic goals shaping the collaboration are well-aligned and there is a joint agreement on the benefits of collaboration for all actors, some issues of misalignment of economic practices came up in the interviews. According to a forestry industry manager the biggest challenge for CEP is the value chains, referring to the process of transforming the raw material to a product to put on the markets. The platform doesn't

solve the value chains needed for side stream utilization (I5). The Metsä Group interviewee described the issue of value chains as follows:

*"The value chain has to be discovered and it has to exist or it has to be created somewhere else than on such a platform. - - If a value chain exists then the actors can just agree to use this platform."* (I5)

Because the platform doesn't solve the issue of creating value chains it is challenging to verify whether the value chains exist and if there are markets for the end-products. Operational value chains require entrepreneurs taking risks and creating demands for products and, according to a forestry company interviewee, a digital platform isn't the answer for the need of entrepreneurial risk-taking. (I5) According to a forestry industry manager it is difficult to see the benefits gained from the CEP platform and what challenge would CEP solve. Another forestry industry manager pointed out that for the forestry companies it would have been important to obtain new small actors to use the CEP platform, but this wasn't achieved in the project. The platform could have been beneficial if new actors with interest and new ideas for side stream utilization would have come along. The Stora Enso interviewee continued that if only old and established companies who already collaborate take part in CEP, the benefits are difficult to identify. The challenge is how to get CEP to really work and add value. (I6) Other challenges related to the use of CEP with the potential to causing misalignment among the ecosystem participants are, for example, competition law, economic issues, the costs of participation and detachment and unclear agreements (I5).

## Cognitive alignment

### Alignment of goals

The cognitive alignment concerning the goals of the ecosystem is fairly strong as the ecosystem participants have a firm joint understanding of the challenge concerning the forestry industry side streams. The objective for the forestry industry is to advance the industry as a whole in addition to enabling individual value capture for companies. (I1; I3; I7) The interviewee from CLIC Innovation described the objectives for collaboration in the forestry industry as follows:

*"It seems as, in addition to concentrating on their own interests, the companies see that if the whole industry improves, they benefit from it themselves. "* (I1)

The forestry industry has zero solid waste targets and to achieve these goals solutions are needed for the challenging side streams that account for approximately two percent of their production. As the Finnish forestry corporations are major listed companies, it is important that the goals set are also achieved when promised. (I1; I3) The forestry industry companies are willing and feel safe to cooperate concerning the side streams and environmental issues. Whereas, for example, in product development the companies don't want to cooperate. Concerning the side streams the goals are quite often consistent. (I5)

The CEP ecosystem participants, as other actors thriving for advancing the circular economy, have understood that it is not worth working alone as it is more efficient to work in the same place, in the same eco-industrial park and under the same infrastructure. There are many good examples of industrial symbiosis in eco-industrial parks in which companies collaborate utilizing the side streams of others as raw materials. (I2) A forestry company interviewee described the rationales for side stream utilization as follows:

*"Our focus is all the time on our core business (98%), but we are also in charge of the side streams (2%). We have to handle the side streams in a legal, sustainable and established way in which the handling can be monitored and controlled. The two percent would go to this circular economy cluster."* (I3)

But even though there is strong cognitive alignment and joint understanding of the goals of the collaboration, also challenges and misalignment emerged in the interviews. When initiating collaborative projects, all actors have their own expectations and objectives for the outcome. The best situation is when the individual objectives meet the general objective of the project. If there are actors with contradictory objectives it can cause tension and distrust between the project partners. (I5) The challenge in the development of CEP has been that every actor has a slightly differing vision of what the project is aiming for. The waste management companies want to do business and the forestry companies want to deal with the side streams as responsibly as possible with reasonable costs. There can be differing views and interests between competitors as well as in the customer-supplier interface. (I6)

The project leader from UPM felt that it has been challenging to get everyone to understand the shared goal and commit to work towards it. It has been challenging to drive the transition from the old habits and old way of thinking within the ecosystem and see the bigger picture. (I3) Another forestry industry interviewee described that the challenge is that some of the ecosystem participants aren't willing to continue or are not interested in

using CEP. Competitors monitor one another and if others don't want to continue, there might be a snowball effect, implying that it is easier for others not to continue if others quit. (I5)

**Alignment of practices**

The companies in the project consortium have joined the collaborative project with different expectations and objectives but it seems that in practice all companies are willing to enhance the image and reputation of the industry and field of business as a whole. According to the CLIC Innovation interviewee, the project pursues to advance and develop the forestry industry across Finland in addition to companies seeking self-interest (I1). A forestry industry manager describes the drivers for collaboration in the forestry industry as follows:

*"Surely the companies pursue their own interests, but improving the entire industry and its image is of course important in this."* (I6)

The LUT University interviewee highlighted that CEP facilitates a win-win situation, if it takes off properly, as it creates competitiveness for the whole area and to both ends of the platform when functioning as planned. In potential areas for CEP, the companies who are willing and have the needed competencies have to be found. However, building trust is vital as sharing information needed for the platform, is not without concerns for the companies. According to the LUT University interviewee, side stream utilization is a bigger driver than the doubts arising from sharing information. (I7) Among project consortium companies this isn't as self-evident because some forestry company representatives expressed that it is hard to verify the benefits of sharing information to CEP (I5; I6).

In some of the interviews, personal relationships and interaction between people came up when discussing the dynamics of the collaboration for CEP. A manager from the forestry industry underlined that developing a platform is a matter of cooperation between people and described the issue as follows:

*"I trust in the interaction between people and I consider it as a top priority. For me it is really hard to see that a digital platform would replace people working with the people they have fun with. - - it is really hard to see how the interaction between people could move to a digital platform."* (I5)

The interviewee felt that this wasn't understood by everyone within the ecosystem participants. Another interviewee from the forestry industry felt that everyone wasn't listened to equally in the CEP development (I6). Tensions in the personal relationships between the ecosystem participants seemed to be causing misalignment (I1; I3; I4; I5; I6; I7). Interviewees didn't directly refer to tensions related to personal relations within the ecosystem, but the tensions and disagreements become evident between the lines from the interviewees' speech and expressions. One interviewee referred to another project participant as contrarian and to another as quarreler. One of the interviewees described the project as ponderous. One interviewee pointed out that the different reputations of companies and individuals may cause distrust within the ecosystem. Some interviewees mentioned that the managing the project must have been somewhat unrewarding and the project leader from UPM described the progress of the project metaphorically as follows:

*"I have been pulling this sled of stone for two years now and at the moment mostly on snowless land."* (I3)

Another issue that came up in the interviews was that the CEP project is too strongly affected by the personal opinions of the digital platform and its characteristics among the ecosystem participants. A manager from the forestry industry described the issue as follows:

*"This is personified by people's opinions and views on whether they believe that this sort of platform solves something."* (I5)

If some are critical towards the proposed solution from the beginning, it might lead to them being reluctant to cooperation. Criticism towards the benefits and added value of CEP came up during the interviews and this, in turn, might have hampered the collaboration. (I5; I6)

According to the platform developer viewing the CEP project from a different perspective, the coexistence of competing companies and the challenges of joint development have created some misalignment within the ecosystem. The interviewee from Evianet Solutions describes that different companies take different attitudes towards the collaboration. Some actors watch from the sidelines and want to learn from others, but are careful to open their own thoughts. The CEO of Evianet Solutions describes the dynamics within the project consortium as follows:

*“Joint development is not yet too easy for the companies. Caution is clearly involved. Fortunately, there are strong actors such as the project leader from UPM.”* (I4)

# 5. KEY FINDINGS AND CROSS-CASE ANALYSIS

This chapter presents the key findings of the study summarized in table 10 and provides a cross-case analysis in which the cases of the study are compared and their differences analyzed. Both cases are from Finland and the actors have formed an ecosystem around solving a circular economy challenge. Both cases entail horizontal actors and some kind of facilitation for coopetition within the ecosystems are needed. The cross-case analysis is performed according to the three key research themes. Firstly, the analysis looks into the differences in the ecosystems concerning drivers, constituents, roles and relationships. Secondly, the coopetition within the ecosystem and the facilitative measures of the cases are analyzed. Thirdly, the alignment and misalignment within the ecosystems are compared.

The cases were chosen to provide different insights to circular economy ecosystems in Finland and the cases differ in many fundamental aspects which might, for their part, have an effect on the research results. The Finnish beverage package recycling system is an established recycling system with a history dating back to the 1950s, whereas the ecosystem of CEP has formed around a project developing a digital platform and the idea of the platform has existed only for a couple of years. The beverage package recycling system has an established and simple value chain in which the brewery industry produces and the retail industry sells the products, whereas discovering and establishing the value chains for side stream utilization are a challenge for CEP. The launch of CEP didn't reach its objectives and the site was closed in the beginning of 2021 which indicates that the project wasn't a success. On the contrary, the beverage package recycling system can be seen as a very successful recycling case with very high return rates and well-functioning collaboration with Palpa operating as the central actor.

The key findings of the study regarding ecosystem, coopetition and alignment and their studied dimensions are summarized in table 10. The comparative analysis of the studied cases proceeds in subchapters 5.1, 5.2 and 5.3.

***Table 10.*** *Summary of key findings*

| | Beverage Package Recycling System | Circular Economy Service Platform -Project |
|---|---|---|
| ECOSYSTEM | **Drivers** | |
| | Main drivers for the comprehensive and established ecosystem are regulation and cost savings of cooperation. Palpa was established to administrate the recycling system as a third-party central actor.<br><br>Regulatory guidelines driving the recycling system development are the package tax exemption for producers and obligatory return locations for retailers. | For forestry companies the main drivers are discovering safe, easy and cost-efficient ways to get rid of their side streams, whereas the side stream utilizer companies aim to create new business from the side streams.<br><br>Responding to pressures to promote environmental sustainability and enhance the sustainability image of the companies and the industries also drove the ecosystem formation. |
| | **Actors, roles and relationships** | |
| | Palpa is the central actor administrating the recycling system. Palpa is owned by the major breweries and retailers in the system. Palpa's brewery owners as well as the retailer owners have horizontal relationships in the ecosystem.<br><br>In addition to the brewery and retail industry, the comprehensive ecosystem includes various other actors, such as, authorities, reference systems, consumers, media and support operation companies. | The project consortium includes forestry corporations and side stream utilizer companies from different industries. The project consortium partly funded the project. The forestry corporations as well as some side stream utilizer companies have horizontal relationships in the ecosystem.<br><br>The ecosystem includes also actors coordinating and supporting the project such as authorities and knowledge providers.<br>The ecosystem entails customer relationships. |
| COOPETITION | **Coopetitive relationships** | |
| | There are coopetitive relationships within the retail industry and the brewery industry.<br><br>The ecosystem entailed horizontal actors cooperating among the RVM manufacturers and recycling operators. The reference systems can be regarded as coopeting ecosystems. | The three forestry industry corporations are in a coopetitive relationship.<br><br>Coopetition was also identified between two of the side stream utilizer companies as well as among the knowledge providers. |
| | **Coopetition facilitation** | |
| | Palpa's successful coopetition facilitation measures include focus on operations, coordination of collaboration, maintaining the balance between the interests of actors, mental facilitation between competitors and consideration of trade secrets and regulations in operations. | The facilitative measures that would have been needed in the CEP project include objective and enthusiastic project leader with a strong operational role, equal involvement of all partners, consideration of conflicting personal chemistries and utilization of researched knowledge. |

| | | |
|---|---|---|
| ALIGNMENT | **Technological** | |
| | Cooperation improves the efficiency, comprehensivity and operationality of the recycling system.<br><br>Palpa harmonizes the operations within the system. | The ecosystem aims to develop CEP to facilitate side stream utilization and to be suitable for other CE clusters as well.<br><br>Sharing data is essential for the platform, but it was also a concern for companies as anonymity and neutrality weren't achieved for the platform in the project. |
| | **Economic** | |
| | The companies in the recycling system agree that recycling is not core business. The administrative company, Palpa, is owned by companies in the brewery and retail industries.<br><br>Competitors respond to regulatory pressures together through collaboration in recycling; the system has lower costs than paying the beverage package taxes.<br><br>Palpa ensures transparency within the system and the recycling system is kept separate from the market economy; there are no customer relationships in the recycling system.<br><br>Collaboration enables cost efficiency for all actors, but the verification of the costs of recycling in retail stores is challenging. | If CEP became operational, the collaboration would provide economic benefits through cost savings for forestry companies and new business for side stream utilizers.<br><br>Collaboration in the forestry industry regarding the side streams, is seen as easy and safe for the companies because side streams aren't core business for the companies.<br><br>Due to the similarity of side streams in the forestry industry, it is easier to discover the value chains and end-products in collaboration, but some partners feel that the platform would not solve the challenge of creating value chains for side stream utilization.<br><br>To some project partners the verification of benefits and added value of CEP is challenging. Misalignment concerning the use of CEP could originate from e.g. unclear agreements and costs related to CEP. |
| | **Cognitive** | |

| | | |
|---|---|---|
| | Companies respond together to pressures from customers and the recycling operations are a part of the companies' sustainability image.<br><br>The ecosystem aims towards higher return rates with consumer-friendly operations and transparency, but Lidl's actions have a negative effect on consumers and competitors.<br><br>All actors agree that everyone benefits from the recycling system, but some misalignment and disagreements were identified between the interests of the retail industry and the brewery industry as well as between big and small breweries. | The ecosystem has a joint understanding of the challenge considering the forestry industry side streams; companies want to solve the challenge together as the investments are too big alone.<br><br>The forestry industry has consistent objectives concerning side streams and environmental aspects and the project aims to benefit the industry as a whole and gain non-economic benefits.<br><br>The ecosystem participants have different expectations and objectives for CEP, which might cause tension and distrust. It is also challenging to achieve commitment among partners to work towards the shared goal.<br><br>There are tensions between the personal relations of project participants and the personal opinions affect the project progress.<br><br>The joint development of competing companies has its challenges. |

The findings presented in table 10 are discussed and analyzed between the studied cases in the following subchapters.

## 5.1 Ecosystem comparison

**Drivers**

For the beverage package recycling system, the main drivers for a comprehensive and established ecosystem are the regulatory aspects and cost savings through cooperation in recycling. In the ecosystem emerged around CEP the forestry companies also aim for cost savings while discovering a safe and easy way to get rid of their side streams and simultaneously the side stream utilizers aim to create new business from the side streams. Regarding the establishment of Palpa to administrate the Finnish beverage package recycling system, it was important for companies in the brewery industry to have a third-party central actor to take care of issues related to competition law.

Nowadays, the environmental aspects and enhancing their sustainability image and efforts are very important especially for large corporations committed to a variety of sustainability goals, which is a driver for cooperation to all actors in both ecosystems. The environmental aspects have become increasingly relevant in recent years and therefore the ecosystem formation of CEP was more driven by, for example, circular economy than

the beverage package recycling system which has been operational already before the increasing societal focus on sustainability. The regulatory guidelines of the package tax exemption for producers and obligatory return locations for retailers have most probably enhanced the comprehensivity of the beverage package recycling system through the years.

**Actors and their roles and relationships in the ecosystems**

The studied ecosystems comprise of a different combination of actors. In the core of the CEP ecosystem are the companies forming the project consortium, including the three forestry corporations and side stream utilizer companies. The project consortium is supplemented by project coordination by CLIC Innovation and other supporting actors, such as platform developer, knowledge providers and authorities. In the CEP ecosystem there is no clear central actor and the ecosystem map is created with the CEP -project in the center. In the beverage package recycling system, Palpa is a clear central actor and the ecosystem is formed around Palpa. The beverage package ecosystem is an established and comprehensive ecosystem including, for example, multiple authorities, reference systems, media and consumers in addition to the companies producing and selling beverages. The major breweries and retailers own Palpa and, in turn, the development of CEP was partly funded by the project consortium companies.

The CEP ecosystem consists of individual companies from different industries willing to collaborate, whereas the ecosystem formed around Palpa includes almost actors from the retail and brewery industries as well as a wide variety of other actors linked to the recycling system and Palpa's operations. The ecosystem formed around Palpa is partly guided by regulations as in Finland all producers belonging to a recycling system are exempted from packaging tax and all retailers selling their products are obliged to accept the beverage packages. These regulations ensure a near to complete coverage of committed actors from brewery and retail industry. The ecosystem of CEP is formed fairly recently and it hasn't had the opportunity to evolve and strengthen over time, which is probably one reason why the commitment of ecosystem participants wasn't regarded too strong.

Consumers have an extremely important role in the beverage package recycling system as they enable the high return rates by returning the beverage packages. Because of the involvement of consumers, media is also an essential part of the ecosystem through bringing up issues and spreading information concerning the recycling system. CEP is a

business-to-business network in which consumers play no part and media's role is minimal. Palpa has corresponding reference systems in other countries for bencmarking their operations. Especially the reference systems in Nordic countries were regarded as important for the ecosystem. There are a few digital platforms targeted at promoting circular economy in Finland and abroad (Lahtinen, 2020), but these weren't mentioned as significant examples or benchmarks for CEP in the interviews.

Another interesting and distinctive aspect of the studied ecosystems is that CEP includes customer relationships within the ecosystem, whereas the beverage package recycling system is kept strictly separate from any earning logics. The CEO of Palpa underlined that the system concerns only non-profit recycling activities and nothing else. Palpa's role in the ecosystem is to manage the operational side and the recycling system focuses on operations. On the contrary, the project consortium of CEP includes customer relationships, but the digital platform facilitates only collaboration between companies and no monetary transactions are done on the platform. The ecosystem of the beverage package recycling system doesn't include any research organizations, whereas in CEP the involvement of research activities and knowledge was regarded of great importance and the ecosystem included multiple knowledge providers.

## 5.2 Coopetition and the facilitation of coopetition in the ecosystems

### Coopetitive relationships

There are multiple coopetitive relationships in the studied ecosystems. This study focused especially in the coopetition in the brewery industry and the retail industry in the beverage package recycling case as well as the coopetition in the forestry industry within CEP. Coopetitive relationships were identified also in other parts of the studied ecosystems. In the CEP ecosystem, two of the side stream utilizer companies are competitors collaborating in CEP and some tensions were identified. The knowledge provider organizations for CEP also compete for similar resources, but no competitive settings were discovered regarding this particular project. In the beverage package recycling system case, coopetition was identified also among the RVM manufacturers and different recycling operators. In addition, the reference systems for the Finnish beverage package recycling system can be seen as horizontal actors or as coopeting ecosystems and the interviewees described that the Finnish ecosystem is willing to cooperate with the other Nordic beverage package recycling systems regarding for example lobbying in EU.

The coopetitive relationships in brewery, retail and forestry industries were based on a shared understanding of common objectives in both studied cases and the companies collaborating wished to benefit their entire industries in addition to appropriating value for themselves. Especially improving the environmentally sustainable image of the brewery, retail and forestry industries was highlighted in the interviews. Improving efficiency regarding, for example the costs of operations in recycling or handling side streams, was seen as important for both brewery and forestry industries. Some tensions inherent to coopetition were identified in retail, brewery and forestry industries, but the reasons were dissimilar. In the retail industry, Lidl's actions regarding the recycling systems created some tensions between the major competitors in the industry, whereas in the brewery industry coopetitive tensions emerged in negotiation situations within Palpa's owner breweries and between small breweries and major brewery companies. In the forestry industry, challenges were related to joint development, unclear agreements as well as the relationships between people and companies due to the different corporate cultures and reputations.

Coopetition isn't a new way of business for these industries. The forestry industry in Finland has a long history of coopetitive actions and initiatives of producing win-win-win situations, benefiting the coopetition partners as well as the consumers (Rusko, 2011). An interviewee from the brewery industry described that the brewery industry actors have understood the benefits of collaboration in recycling and collaborated in the field, long before Palpa was established to administrate the recycling system. The actors in the retail industry collaborate in multiple agreements, including the material efficiency agreement for the industry as well as agreeing on not giving out free plastic bags to consumers (I8; I9).

**Facilitative measures of coopetition**

The fundamental difference in coopetition facilitation between the studied ecosystems is that the interviewees of the beverage package recycling system described successful measures in which Palpa facilitates the collaboration between competitors, whereas, on the contrary, the CEP interviewees brought up what kind of facilitative measures and actions would have been needed for the collaboration in CEP to succeed.

Even though the studied ecosystems differ in many ways, the desired facilitative measures in the CEP case were surprisingly consistent with the facilitative measures Palpa performs in the beverage package recycling system. The interviewees for the CEP case underlined that an objective and enthusiastic project leader would have been

needed to facilitate collaboration between horizontal actors. Correspondingly, the importance of neutrality and an **objective coordinator** was also underlined by competitors cooperating within the recycling system managed by Palpa as it eases the collaboration between competitors mentally and operationally. It became also evident in the CEP case that the **mental facilitation** is important as the facilitator should consider the conflicting personal chemistries within the ecosystem to ensure that the personal opinions of others don't inhibit the project progress.

The ecosystem participants in the beverage package recycling system valued Palpa's strong **operational focus** and similarly the project partners in CEP felt that a project leader with a strong operational role would have been needed for the CEP ecosystem to achieve its objectives. Another issue in the CEP project was that all project partners didn't feel equally involved in the project; **equal involvement** of all project partners might have strengthened the overall commitment to the project. Maintaining the **balance of interests** between the different of actors, including competitors and different industries, was seen as an important facilitative measure performed by Palpa within the recycling system. There are clear and fair rules for all actors which implies, for example, that Palpa doesn't negotiate prices with any actors; the recycling fee is the same regardless of the volume.

Regarding Palpa's administration of the recycling system, the consideration of **trade secrets and regulations** was perceived as valuable especially in the brewery industry which had previously, before Palpa, had worries about competition law. Facilitated by Palpa's recycling system the competitors are able to respond to the regulatory pressures together. Similar issues didn't explicitly come up in the CEP case, but because unclear agreements and competition law were regarded as a potential source of tension in the use of the platform, the consideration of trade secrets and regulations is relevant regarding the CEP case as well. In turn, according to the CEP interviewees more focus should have been put to the utilization of **research** knowledge as CEP aimed to untap undiscovered potential from side streams. Utilizing research didn't come up in the beverage package recycling system interviews, but researched knowledge could also aid the continuous development of an established system. The identified ways of facilitating coopetition in two very dissimilar cases are combined and illustrated in figure 11 to present the dimensions of coopetition facilitation.

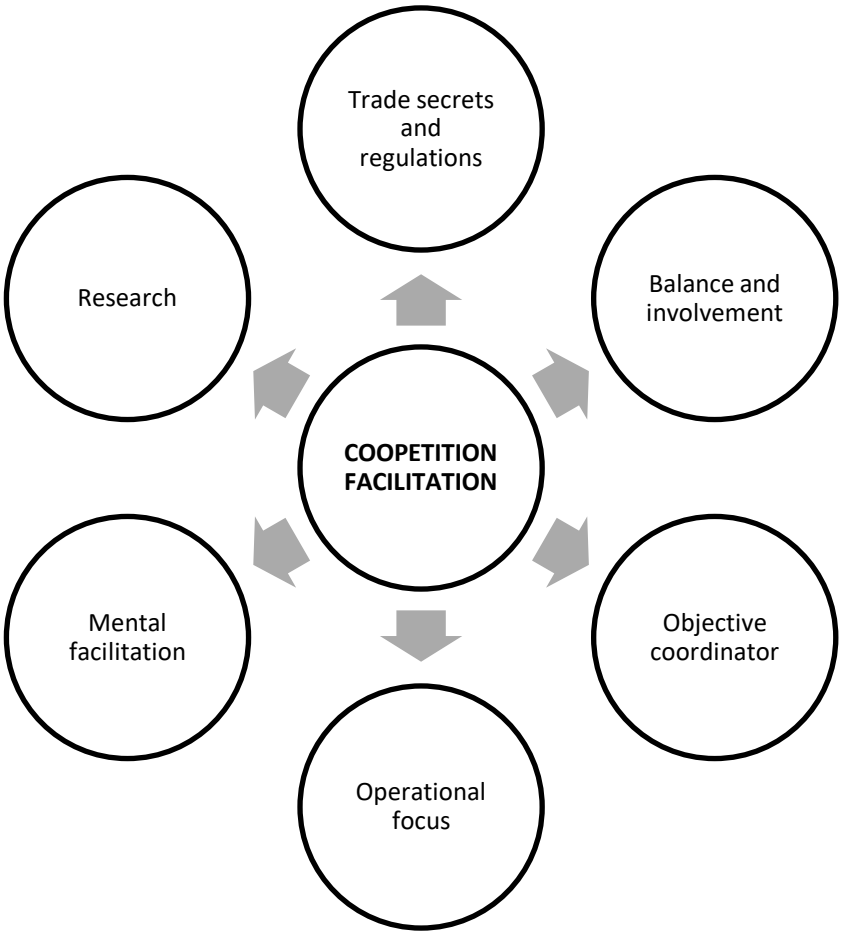


***Figure 11.*** *The dimensions of coopetition facilitation.*

## 5.3 Alignment and misalignment comparison

**Technological alignment and misalignment**

As the cases entail very different solutions for advancing circular economy, the dimension of technological alignment and misalignment differ fundamentally. In the CEP project, the aim of the collaboration was to develop a digital platform to facilitate the side stream utilization, whereas the collaboration in the beverage package recycling system enhances circular economy by efficient recycling. In the beverage package recycling system, the cooperation between a wide variety of actors improves the efficiency, comprehensivity and operationality of the recycling system. The Finnish beverage package recycling system is administered by a central actor, Palpa, which harmonizes the operations for all ecosystem participants.

Similar issues regarding technological alignment turned up in both cases: neutrality and transparency in operations is important when it comes to the collaboration between competing organizations. Palpa as a neutral central actor between companies enables the transparency in the recycling system's operations. Regarding CEP, sharing company-specific data is essential for the platform, but because anonymity and neutrality for the platform weren't achieved in the project, the companies didn't want to share information on the platform.

**Economic alignment and misalignment**

The joint understanding of economic benefits promotes economic alignment in both cases. Regarding the CEP case, the economic benefits could materialize only if the platform became operational and thus the side stream utilizer companies were able to create new business from side streams and the forestry companies could save costs. Similarly to the economic benefits of the forestry industry, collaboration in recycling operations enables cost savings for the brewery and retail industry in the beverage package recycling system. The fact that the operations don't concern the companies' core business eases the collaboration for the retail and brewery industries regarding recycling and for the forestry industry regarding side stream utilization.

The beverage package recycling system is organized in a way that the costs of taking part in recycling through Palpa's system are lower than paying the beverage package taxes. Palpa ensures transparency in the recycling system and there are no earning logics for companies within the recycling system. No customer relationships are allowed within the recycling system to ensure that the operations focus on non-profit recycling, whereas in CEP there are customer relationships and the aim of the digital platform is to facilitate new business from side streams. However, the underlying idea of CEP is to facilitate collaboration between companies to enable side stream utilization but the digital platform in itself doesn't facilitate any monetary transactions.

In the beverage package recycling system economic misalignment emerged between the brewery and the retail industry as the verification of the costs of recycling for retailers in the retail stores is challenging, which creates some tension between the industries as the brewery industry covers the costs by paying recycling and membership fees. Regarding CEP, according to some project partners the verification of the benefits and added value of CEP is challenging and misalignment in the use of CEP could potentially arise from unclear agreements and costs related to the platform.

Because the side streams in the forestry industry are similar for all companies, it is easier to discover the value chains in collaboration, but the creation of new value chains was seen by some forestry company representatives as an issue that could not be solved through a digital platform. New actors and new value chains would have been needed for CEP, whereas the beverage package recycling system entails a simple and established value chain in which the brewery industry produces the beverages and the retail industry sells them and the recycling of the packages is done in collaboration.

**Cognitive alignment and misalignment**

In both cases the ecosystem participants understand that the collaboration benefits the different industries by improving the sustainability image of the industry as a whole, in addition to possible economic benefits. In the beverage package recycling system, the companies respond together to the pressures coming from consumers. The premise for the CEP project was that all actors have a joint understanding of the challenge considering the forestry industry side streams and the companies are willing to solve the challenge together as the investments are too big alone. The objectives concerning side streams and other environmental issues are consistent among the forestry industry corporations.

The ecosystem for beverage package recycling system aims towards even higher return rates by focusing on consumer-friendly operations and transparency, but Lidl having its own recycling system for plastic bottles, confuses consumers and distorts competition and thus causes misalignment within the ecosystem. During the CEP project, personal relations of project participants have caused tensions and the personal opinions of the feasibility of the digital platform have affected the project progress. In addition, the joint development of competing companies has had issues in the CEP project. Commitment to the project and the shared goal has been challenging to achieve among the CEP project partners.

The ecosystem participants of CEP have different objectives and expectations for CEP, which causes tension and distrust among the ecosystem participants. The side stream utilizer companies' interest is to create new business whereas the forestry companies want to take care of their side streams as responsibly as possible in an easy, safe and cost-efficient way. Conflicting interests were also identified between the retail and brewery industries in the beverage package recycling system. An interesting finding resulting from the issues between different industries in the studied cases, is that competing actors

can actually have stronger alignment than the different industries involved in the collaborative ecosystem, because the competitors have similar objectives and interest for the collaboration.

# 6. CONCLUSION

## 6.1 Theoretical contribution

This study contributes to ecosystem, coopetition and alignment literature by providing empirical insights of multi-actor collaboration in ecosystems entailing competitors, in the context of circular economy. The empirical analysis of two very different circular economy ecosystems including horizontal actors provide profound insights regarding the multi-collaboration in ecosystems formed around a shared objective and value proposition. The ecosystem literature lacks understanding on different kinds of circular economy ecosystems (Aarikka-Stenroos, Ritala and Thomas, 2021) and this study contributes to the understanding of circular economy ecosystems by illustrating and analyzing two different ecosystems including the drivers, participant composition and their roles and relationships. The existing literature benefits from these contextual details and in addition to contributing to the unaddressed research gaps of, for example studying coopetition in ecosystems, the study supports the findings of previous ecosystem literature (see e.g. Autio and Thomas, 2014; Adner, 2017; Thomas and Autio, 2020) by, for example, underlining the importance of alignment and participant interdependence within the ecosystems and noticing the important role of use side participants, such as consumers in the recycling operations, in ecosystems.

These purposively selected cases and their comparative analysis contribute to solving the challenge of balancing collaboration and competition within an ecosystem (Hannah and Eisenhardt, 2018). The studied ecosystems entail multiple coopetitive relationships which affect the dynamics and operations within the ecosystems. The analysis of the studied ecosystems identifies the coopetitive relationships within the ecosystems and analyzes these special relationships including, for example, the drivers, possible tensions and dynamics. These empirical insights of coopetition dynamics and relationships in ecosystems add value to the research studying coopetition in multi-actor and multi-industry ecosystems.

These studied coopetitive ecosystems consist of multilateral coopetition and according to the empirical findings, in these types of ecosystems the facilitation of tensions inherent to inter-organizational coopetition is key to succeed in the ecosystem's objectives. Earlier research on managing tension and paradox related to coopetition has called for more insights on the issues (Kestemont and Chalant, 2013; Fernandez, Le Roy and Gnyawali,

2014) as the challenge of coopetition facilitation lacks understanding from different ecosystems, industries and situations. Both ecosystems of this study provide profound insights of the coopetition facilitation needs from different industries. The comparative analysis of successful facilitative measures of the third-party actor in the beverage package recycling system versus the failed coopetition facilitation in case CEP adds value to defining the enabling factors of coopetition (see e.g. Choi, Garcia and Friedrich, 2010; Kestemont and Chalant, 2013; Fernandez, Le Roy and Gnyawali, 2014; Planko *et al.*, 2019). Similarly to earlier research, the studied cases demonstrated that common vision and objectives in the ecosystem entailing competitors, are important for collective value creation in addition to a wide variety of other coopetition enablers (Planko *et al.*, 2019). According to the empirical results of this study, the coopetition enablers defined by Planko et al. (2019) should also include the facilitation of coopetition.

In particular regarding the coopetition facilitation, the studied cases provide profound insights to the desired role and tasks of the third-party central actor facilitating collaboration between competitors and minimizing tensions, which have been called for in previous research of managing coopetition (Choi, Garcia and Friedrich, 2010; Kestemont and Chalant, 2013; Fernandez, Le Roy and Gnyawali, 2014). The qualitative gathering of necessary facilitative measures for coopetition by a third-party central actor is one of the key contributions of this study. The empirical results also shed light on the effect of different organizational configurations and ecosystem compositions on the success of coopetition objectives (Fernandez, Le Roy and Gnyawali, 2014) as well as the behaviors of dominant and smaller coopetition partners in industry-wide coopetitive relationships (Choi, Garcia and Friedrich, 2010) which complement the understanding of the prerequisites of collective horizontal coopetition.

Coopetition has been studied in some environmental sustainability contexts (see e.g. Peloza and Falkenberg, 2009; Hahn and Pinkse, 2014; Melander, 2017; Stadtler, 2018), however previous literature provides no studies of multi-actor collaboration in circular economy ecosystems including multiple coopetitive relationships from different industries. This multiple case study from Finland answers to the calls to create more understanding on the opportunities, drivers and requirements of coopetition in different industries to address environmental sustainability challenges (Volschenk, Ungerer and Smit, 2016; Christ, Burritt and Varsei, 2017; Manzhynski and Figge, 2020) by analyzing and comparing the collaboration in two ecosystems composed of multiple organizations and multiple industries aimed to advance circular economy with different value propositions and success rates.

Lastly, the qualitative research done for this thesis enhances the understanding of the effects of alignment and misalignment in ecosystems (Adner, 2017; Ingstrup, Aarikka-Stenroos and Adlin, 2020; Thomas and Autio, 2020). The dimensions and categorizations of different alignment types have attracted interest in ecosystem literature recently (Ingstrup, Aarikka-Stenroos and Adlin, 2020; Thomas and Autio, 2020). This study contributes to the stream of literature by presenting a new structuring model for identifying and categorizing alignment and misalignment. The proposed model includes technological, economic and cognitive dimensions which are further divided into the alignment of goals and practices. This categorization is applied to the alignments and misalignments identified in the studied ecosystems. The identification, categorization and analysis of the wide variety of alignments and misalignments improve the understanding of alignment in ecosystems by contributing to the discussion of the underlying issues and mutual understanding of multi-actor collaboration.

## 6.2 Practical implications

This study helps practitioners to understand and assess the opportunities and challenges related to multi-actor collaboration including competitors and other actors in circular economy ecosystems. The findings of the study provide valuable implications for managers and different stakeholders on how to organize collaboration in circular economy ecosystems striving towards industry-wide benefits. As Finland aims to lead the global circular economy transition (Sitra, 2021) the pace of initiating new collaborative actions and forming circular economy ecosystems is bound to accelerate in the coming years. Therefore, the profound empirical insights of this timely study will help to overcome the challenges and avoid the pitfalls of multi-actor collaboration.

On the other hand, multi-actor collaboration involving a wide variety of stakeholders including competitors from multiple industries has its benefits, as the interviewees 5, 6 and 7 described. A combination of different stakeholders including, for example, competitors with similar challenges joining forces with various support actors and companies as well as research organizations usually provides the best results (I5). As demonstrated in the study, well-organized, administrated and facilitated multi-actor collaboration enables impactful outcomes in circular economy initiatives. Key practical contributions of this study are concluded and discussed below one by one.

1. *A committed and comprehensive ecosystem of actors, including a third-party central actor, has to be established to achieve impactful system-level outcomes of multi-actor collaboration.*

In order to achieve sustainability outcomes with major positive system-level impacts from multi-actor collaboration, the ecosystems have to include a wide variety of committed actors representing different organizations with different competencies, capabilities and knowledge. An administrative, third-party central actor is of great importance for an operational and efficient ecosystem, especially regarding ecosystems that include horizontal actors encountering tensions inherent to coopetition. On the other hand, including coopetitive relationships may benefit the dynamics of the ecosystem because competitors typically have similar interests and objectives which can potentially improve the overall alignment among ecosystem participants but certain issues (discusses in more detail in the subsequent implications) have to be carefully considered when engaging competitors in collaborative initiatives.

2. *The third-party central actor should have a strong operational role in the ecosystem and focus on coordinating and easing the collaboration between the ecosystem participants.*

An objective third-party central actor is vital for enabling the collaboration in an ecosystem involving competitors. The central actor should have a strong operational role taking care of coordinating the activities within the ecosystem, in addition to coordinating the collaboration between the ecosystem participants in a fair and even-handed way. Objective administration of the ecosystem's operations is key for efficient multi-actor collaboration. When coordinating the operations and collaboration between competing ecosystem participants it is important to take into consideration issues, such as trade secrets and competition regulation, to reduce the competitors' concerns related to coopetition. The need for a specific person or a whole organization, depending on the ecosystem size and objectives, facilitating the collaboration has to be taken into consideration already in the planning phase, as sufficient resources have to be allocated to the facilitation of collaboration. Best results from collaboration are bound to emerge if the central actor is in charge of the facilitation of collaboration as well as administrating the operations. This, of course, depends on the aim and scope of collaboration. Reflecting to the initial case identification, concerning agreements the operational burden isn't so demanding as it might be for platforms or let alone entire systems, such as recycling systems.

3. *Maintaining the balance between the interests of different actors and ensuring equal involvement of all partners is important for efficient collaboration in ecosystems. Mental facilitation between competitors and consideration of conflicting personal chemistries promotes collaboration.*

The ecosystems' central actors, acting as coopetition facilitators, have to focus on maintaining the balance between the interests of different actors and ensuring the equal involvement of all partners to enable efficient operations through collaboration. In multi-actor collaboration in a wide-ranging ecosystem, different and even conflicting interests are bound to arise. Therefore, balancing between the different interests of competitors or even conflicting interests of different industries within the ecosystem, is vital for productive collaboration. The core partners of the ecosystem, often competitors, have to be equally involved in the collaborative initiative to ensure sufficient commitment to the shared objectives of the ecosystem. The neutrality of the central actor as well as the transparency of the operations ease the collaboration between competitors and reduce the risk of tensions harming the collaboration. Managing the possible tensions, arising from, for instance incompatible personal chemistries, and reducing the risk of conflicts are important for collaboration. To conclude, mental facilitation, especially between competitors, is needed to enable multi-actor collaboration.

4. *The utilization of researched knowledge supports and enhances the collaboration in new modes of operation and when the collaboration aims for new developments and improvements.*

Utilizing research benefits multi-actor collaboration in many situations. When ecosystem partners pilot new modes of operation or seek to discover and develop new modes of operation, utilizing researched knowledge may facilitate the creation of new ideas and tools as well as support the reasoning behind the suggestions and solutions for other ecosystem participants. Grounding the reasoning of ideas, suggestions or solutions on scientific knowledge instead of, for example, opinions or individual interests, can improve and ease the ecosystem's joint decision making. Continuous development and improvement are also important in established ecosystems and utilizing research can help these ecosystems to maintain or improve their efficiency and competitiveness.

5. *For an ecosystem to achieve system-level outcomes, it is important to ensure the joint understanding of the collective challenge to be solved and the shared benefits of the collaboration.*

For an ecosystem to achieve its objectives and create system level outcomes, alignment between ecosystem participants is needed. Most importantly, the collaborators need to share the understanding of the collective challenge to be solved by collaboration as well as the mutual benefits for all ecosystem participants. Strengthening the understanding

of a shared challenge, objective and benefits can also improve the commitment of participants to the ecosystem's endeavors. Companies seek primarily to gain individual benefits and profits, which underline the importance of comprehending the mutual benefits gained from collaboration. These benefits can be, for example, cost savings or industry-wide non-economic benefits, such as improved sustainability image. Collaborators can also respond together to pressures from regulation or consumers as joint operations are likely to have more impact and be more efficient regarding operations, resources and costs. A win-win situation and the realization that a *rising tide lifts all boats* form a strong base for fruitful collaboration between committed ecosystem participants.

## 6.3 Limitations and quality assessment of the study

The study succeeded in providing profound and insightful results on the researched phenomena. However, some limitations regarding the chosen methodology and research contexts were confronted. The study approached the research objectives with a multiple case study method by purposively sampling two dissimilar circular economy ecosystem cases from Finland. Demonstration of the reliability of a qualitative study is challenging because in qualitative studies the researcher may influence the results of the study in various ways as discussed in chapter 3.5 of this thesis.

According to Lincoln and Guba's (1985) evaluative criteria, the quality of qualitative research can be assessed by looking into the *credibility, transferability*, *dependability* and *confirmability* of the study (Lincoln and Guba, 1985). The **credibility** of the study was ensured by familiarizing with the research topics through literature review as well as getting to know the industry dynamics of the studied cases through initial expert interviews and secondary data before conducting the interviews for the cases. Data triangulation as well as reflecting the findings to previous research also contributes to the reliability of the study. The results include novel findings as well as insights which resonate with previous research done in the researched areas, for example the widely unaddressed issue of facilitating collaboration in ecosystems (see e.g. Kestemont and Chalant, 2013; Yrjönkoski, Seppänen and Hyrynsalmi, 2018), which, in turn, improves the credibility of the study.

On the other hand, the credibility of the study might be affected by the purposeful sampling of interviewees as the interviewees were chosen based on the presumption of their key role in the studied ecosystem or, alternatively, by the recommendation of a previous interviewee in the ecosystem. Even though the interviewees of both cases present a good variety of organizations within the studied ecosystems, the choice of interviewees

can be questioned. Regarding the beverage package recycling system, smaller breweries or retailers or authorities could have added value to the insights, whereas for the case CEP interviewing some side stream utilizer companies would have been reasoned for widening the perspectives and experiences of the development project. Then again, the purposefully sampled interviewees gave an excellent and robust data base to focus the findings on the chosen coopetitive relationships in specific industries including retail, brewery and forestry industries. The credibility of the study might also be negatively affected by the insufficient quality of the interviews, because interviews are verbal reports and therefore bias, inaccurate articulation, communication issues or defective memory may have had an effect on the results. Especially regarding the tensions and misalignments in the studied ecosystems, there is a risk that the interviewees left something unsaid of the negative aspects of collaboration either consciously or unintentionally.

The **transferability** of the study aims to demonstrate the applicability of the findings in other contexts (Lincoln and Guba, 1985). The transferability was addressed by presenting comprehensive background information of the studied cases as well as describing the special characteristics, contexts and current situation of the cases. The transferability of the study is hampered by the lack of international understanding provided by the studied cases. The initial case identification and thus also the selected cases include cases only from Finland, which neglects the international aspects of horizontal collaboration in circular economy ecosystems. The Finnish context of the cases may have significant effects on the results, which can prevent the transfer of the results to international contexts especially to other continents where cultural differences are even more prominent than inside Europe.

For instance, regarding the beverage package recycling, Finns were described as dutiful and the culture and habits of Finnish people have an immense effect on the success of the beverage package recycling system. In Finland, businesses can rely to non-contractual governing in ecosystems, at least to some extent, and people tend to trust one another. In addition, in a small country it is not so easy for a company to keep a low profile, disappear or hide behind masses, if the company fails to keep promises or agreements. These factors among others inhibit the transferability of the study to international contexts. On the other hand, choosing two cases from the same country can be justified with enabling more accurate cross-case analysis due to the same institutional logics. Furthermore, the industries involved in the studied cases as well as the cyclical fluctuations have an effect on the transferability of the study.

If the study has high credibility, the **dependability** is usually on a good level as well. The dependability refers to consistent and repeatable findings. (Lincoln and Guba, 1985) To achieve high dependability the implementation of the research is described in detail in the methodology chapter, including important aspects such as the methodological choices and data gathering. The research design of the study fits to the studied phenomena as case study is an appropriate strategy for studying holistic phenomena in their real-life contexts (Robson, 2002). The case selection was justified based on the appropriate differences between cases and the insights the cases provide on the research topics. The case selection for the study was successful because the cases provided rich insights from two different circular economy ecosystems.

However, it should be acknowledged that there is no clear evidence that these cases were able to provide more robust results than other cases identified in the preliminary case identification. It can be speculated, whether the selected cases are too different due to the underlying difference that the case beverage package recycling system is an established recycling *system,* whereas the case CEP is a very recent project aiming to develop a digital *platform*. The comparison of the findings from the cases might have been more robust, if the cases presented similar categories (see table 4.); case CEP could have been studied together with another digital platform, for example Materiaalitori, for even more plausible comparison, whereas case beverage package recycling system studied together with another recycling could have given even more accurate findings. It is evident, that the timeliness of the case CEP and the strong impact on national circular economy of the beverage package recycling system case, weighed in the case selection. Both cases involve interesting industries regarding the Finnish circular economy field and the studied ecosystems' value propositions are of high impact for the circular economy, which also made them appealing for further analysis based on the initial case identification.

The **confirmability** of the study refers to the degree of neutrality or the extent to which the findings of a study are shaped by the respondents rather than the researcher's motivation, interest or bias (Lincoln and Guba, 1985). As reflected above regarding the case selection, in addition to other justifications, the case selection was based on the researcher's perceived interest in the selected cases to some extent. Other issues possibly hampering the confirmability of the study include the researcher's unintentional effect on the interviewees' answers as well as the reflection of the researcher's own interests in the framework creation, data analysis and grouping of the findings. Even though the results present all the issues and topics that came up in the interviews, the researcher

has focused the analysis on the subjects perceived as most interesting while possibly leaving the analysis of some subjects to a more superficial level.

## 6.4 Proposals for future research

The proposals for future research are based on interesting insights arising from reviewed literature and the empirical findings as well as the limitations of the study discussed above. Firstly, more research studying multi-actor collaboration in circular economy ecosystems as well as coopetition and coopetition facilitation in ecosystems is needed, as these research themes appear under-researched. Multiple-case studies featuring circular economy ecosystems from different contexts with different objectives would contribute the understanding of how to organize collaboration when aiming for system-level outcomes.

As this study was limited to look into only two cases, the other cases identified in the preliminary case identification could be studied to gain more insights of the research field in Finland. For example, an overviewing study of all the identified cases of horizontal multi-actor collaboration to advance circular economy objectives from Finland, would provide interesting insights from the national coopetition for circular economy field. Focusing on coopetition for circular economy cases from a single country, potentially improves the comparability of the cases due to the national institutional logics. When assessing the case selection and its limitations for this study, fruitful opportunities for multiple-case studies came up in the preliminary case identification. For instance, a comparative case study looking into the different industry-wide agreements for advancing circular economy and sustainability objectives, could provide a nice outlook on the dynamics of different industries. Other interesting research opportunities based on the preliminary case analysis are, for example, analyzing the differences in ecosystems and their constituents on different platforms; Materiaalitori versus CEP or Maapörssi versus LoopRocks. Also, studying New Plastics Center and PLASTin project could provide fresh insights from the circular economy of plastics in Finland.

For improving the generalizability of the empirical insights gained from this study, multiple-case studies from different industries and different geographical locations are needed. The collaboration between the Nordic beverage package recycling systems came up in the interviews. Studying the coopetitive actions among the different recycling systems for beverage packages in Nordic countries as well as the differences in the ecosystems would provide valuable insights for further operational development of the

systems as well as interesting theoretical contributions. The coopetition between different recycling systems could contribute to the understanding of coopetition between ecosystems, a matter widely unaddressed in the field of coopetition, as previous research has recognized the formation of group-to-group competition (see e.g. Gnyawali and Park, 2011) while research on competition and collaboration between ecosystems could provide valuable findings for advancing joint objectives on a larger scale.

An important proposal for future research came up in the interviews for this case. Multiple interviewees pondered on how the Finnish beverage package recycling system could serve as a reference case for other recycling systems (I9; I11; I13). Because of the high return rates of the beverage packages, the recycling system has a significant positive impact to the circular economy and the question is; what could be learned from the beverage package recycling system as a reference case for other recycling systems under development? Naturally, an efficient recycling system as a reference is beneficial when creating a similar system for beverage packages and thus some interviewees considered how the Finnish beverage package recycling system could serve as an export product to countries with no national recycling system for beverage packages. On the other hand, recycling systems for other materials or products can benefit from reflecting on the operations and organization of the Finnish beverage package recycling system. For example, in Finland deposit solutions for restaurants' take-away packages are under development (Uusitalo, 2019) and insights from the beverage package recycling system are valuable for the development. According to these views, more research on successful recycling operations are needed.

Reflecting the empirical findings of this study to the theoretical insights that were left out of the scope of the study, provide interesting subjects for future research. For example, studying the agency of different stakeholders (see e.g. Hill and Jones, 1992) in the context of horizontal collaboration in circular economy ecosystems would broaden the understanding of the phenomena. In addition, applying theoretical insights of ecosystem strategy and shared leadership (Adner, 2017) to practical implications for managers and ecosystem coordinators and facilitators could improve the operations and collaboration within ecosystems. Further discussion on ecosystem collective identity in the context of coopetitive circular economy ecosystems would add value to studying alignment in ecosystems as ecosystem collective identity is seen to help bind the ecosystem participants together (Thomas and Autio, 2020). These insights could further guide organizing and motivating ecosystem participants to collaborate towards shared sustainability goals.

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# APPENDIX A: SECONDARY SOURCES

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# APPENDIX B: INTERVIEW STRUCTURES AND QUESTIONS

**Interview structure and questions in Finnish for initial expert interviews:**

*Introduction*:

- Saako haastatteludataa hyödyntää tutkimuskäytössä?
- Saako haastattelun äänittää?
- Mikä on roolinne ja vastuunne edustamassanne organisaatiossa?

*Questions to guide the semi-structured interviews*:

- Millaisia suuria toimialamuutoksia on havaittavissa kiertotalouden/kestävyyden suuntaan eri toimialoilla? (metsäteollisuus, vähittäiskauppa, kemianteollisuus, tekstiiliteollisuus)
- Miten kilpailijayhteistyö on ollut mukana ratkaisemassa yhteisiä isoja ongelmia?
- Miten kilpailijat ratkaisevat yhdessä ongelmia?
- Ketkä johtavat muutosta?
- Onko toimialoilla huolta kartellista?
- Millä intresseillä muutos tehdään kiertotalouden suuntaan? (reaktiivisesti regulaatioiden kautta vai proaktiivisesti regulaatioita ennakoiden?)
- Onko tavoitteena oma etu vai yhteinen etu?
- Keitä ovat mukana olevat eri toimijat? Mitä eroja ja yhtäläisyyksiä toimijoilla on? (koko, markkinasegmentti, kilpailijuuden taso, markkinaosuus, sijainti)
- Keitä ovat strategiset toimijat kilpailijoista?
- Miten muutos näkyy asiakkaalle arvoketjussa?

**Interview structure and questions in Finnish for the case Beverage Package Recycling System**:

*Introduction*:

- Saako haastatteludataa hyödyntää tutkimuskäytössä?
- Saako haastattelun äänittää?
- Mikä on roolinne ja vastuunne edustamassanne organisaatiossa?

*Questions to guide the semi-structured interviews*:

- Voisitteko kertoa pullonpalautusjärjestelmän kehittymisestä: tärkeät tapahtumat, virstanpylväät, tärkeät toimijat aikajanalla?
- Mitä toimijoita suomalaisessa pullonpalautusjärjestelmässä on mukana?
- Organisaationne rooli suomalaisessa pullonpalautusjärjestelmässä?
- Teollisuuden/kaupan rooli pullonpalautusjärjestelmässä?
- Mistä yhteistyö lähti liikkeelle?
- Miksi kilpailijat ovat lähteneet yhteistyöhön?
- Palpan ja panimoliiton rooli fasilitaattorina?
- Uudelleentäytön ja materiaalihyödyntäminen roolit pullonpalautusjärjestelmässä?
- Miten toimijat ovat järjestäytyneet? (sopimuksellinen rakenne, taloudelliset insentiivit, koordinaatiomekanismit, jaettu ymmärrys toimijoiden kesken)
- Miksi pullonpalautusjäjestelmä on onnistunut? Avaintoimijat?
- Kilpailijoiden välinen yhteistyö? Oman edun tavoittelu vai yhteinen hyöty? Kilpailijoiden motivaatiot/driverit yhteistyöhön?
- Miksi kilpailijoiden kannattaa tehdä yhteistyötä pullonpalautusjärjestelmässä?
- Miten viranomaisohjaus on vaikuttanut pullonpalautusjärjestelmään?
- Tunnistettujen katalyyttien vaikutus: regulaatiot ja politiikka, teknologia, liiketoiminta ja johtaminen, kielellisyys ja visuaalisuus?

*Closing*:

- Haluaisitteko vielä lisätä jotakin tai tuleeko mieleen jotakin muuta aiheeseen liittyvää?

- Onko Teillä suositella muita keskeisiä haastateltavia järjestelmään liittyen?

**Interview structure and questions in Finnish for interviews for the case Circular Economy Service Platform**:

*Introduction*:

- Saako haastatteludataa hyödyntää tutkimuskäytössä?
- Saako haastattelun äänittää?
- Mikä on roolinne ja vastuunne edustamassanne organisaatiossa?

*Question examples to guide the theme interviews for the case Circular Economy Service Platform*:

- Mikä on ollut organisaationne rooli digitaalisen alustan kehittämisessä?
- Miksi CEPin kehittämiseen on lähdetty mukaan?
- Miten yhteistyö rakentuu CEP:issä?
- Miten organisaationne on kokenut CEP hankkeen edistymisen?
- Miksi metsäteollisuuden kannattaa tehdä yhteistyötä kiertotalouden alueella?
- Driverit ja motiivit yhteistyöhön metsäteollisuudessa?
- Tavoitellaanko omaa etua vai koko toimialan parantamista ja hyötymistä sitä kautta?
- Minkä verran metsäteollisuuden kilpailijat ovat tekemisissä keskenään CEPin kehittämisessä vs CEPin käyttämisessä?
- Mitä haasteita kilpailijoiden välisessä yhteistyössä on?
- Onko alustan kehittäminen yhteistyössä helpompaa ei-horisontaalisten toimijoiden kanssa kuin kilpailijoiden kanssa?
- Yhteisen digitaalisen alustan haasteet yksittäisen yrityksen näkökulmasta, onko jokin tietty asia mikä asettaa epäilyksiä? Toisaalta tuoko jotain erityisiä hyötyjä / etuja / edistääkö toimintaa?
- Nyt kun palvelua yritetään ottaa käyttöön, onko ilmennyt erityisiä kitkatekijöitä? Mitä ja mahdollisesti miksi?

- Onko organisaationne tietoinen mitä dataa CEP kerää, miten dataa integroidaan ja analysoidaan?
- Kuinka koette, että CEP tulee hyödyttämään koko toimialaa / useita tekijöitä / kiertotaloutta yleensä?

*Closing*:

- Haluaisitteko vielä lisätä jotakin tai tuleeko mieleen jotakin muuta aiheeseen liittyvää?
- Onko Teillä suositella muita keskeisiä haastateltavia yhteistyöhön liittyen?