NORWEGIAN SCHOOL OF ECONOMICS

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Circular Economy in Norway

A Qualitative Study of How Collaboration Across Firms, Industries and Sectors Act as an Enabler of a Circular Economy in Norway.

by

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Master Thesis in Strategy and Management & Marketing and Brand Management

NORWEGIAN SCHOOL OF ECONOMICS

Preface

This master thesis is one in a series of papers and reports published by the Center for Service Innovation (CSI). CSI is a coordinated effort by NHH to focus on the innovation challenges facing the service sector and involves 20 businesses and partners. It aims to increase the quality, efficiency and commercial success of service innovation, and to enhance the innovation capabilities of its business and academic partners. CSI is funded through a significant eight year grant from the Research Council of Norway and has recently obtained status as a Centre for Research-based Innovation (SFI).

Acknowledgements

The subject of this Master Thesis is business strategy and sustainable business models in a circular economy. Over the course of our study, we have developed an intrinsic interest and concern for processes taking place at the intersection of business and environment. The study has provided us with valuable insights to how economies can become more sustainable, to the point where it has affected our daily lives in a positive manner. Hopefully, our study will induce similar effects on the reader.

Firstly, we would like to sincerely thank our supervisor, Lars Jacob Tynes Pedersen, for good facilitation, rich feedback and constructive ideas through the whole process. Our discussions on the subject, and beyond, have been greatly valued. Your engagement both in the subject and in our work has been of great inspiration and surpassed what we expected from a supervisor. Thank you for your fantastic help and involvement.

Secondly, we would like to extend our gratitude to all interviewees from the 15 companies for their time and valuable input, which allowed us to incorporate first-hand insight into our thesis.

Thirdly, a thank you goes to Cilia Holmes Indahl for providing us with suggestions for our research topic. In addition, our spiritual mentor, Håvard “Rybczinsky” Helgesen, offered the invaluable tip that “when it comes to the writing, you just write”. Thank you. Also our thesis partners My Marlene Mjaaland and Eirik Tveit deserve something.

Lastly, our gratitude goes to our family and friends for their continuous support during the whole process of writing our Master Thesis.

Now, enjoy!

Arber Zagragja

Jon-Kristian Rydningen

Abstract

Volatile resource prices, supply disruptions, economic losses and environmental strain has lead researchers and businesses to seek for an alternative to the linear production model. Circular economy has risen as a sustainable alternative, both economically and environmentally. Research has pointed to huge value gains both nationally and globally. However, circular business models are yet to be widespread among businesses. To address this scarcity of circular businesses in Norway, we look into strategic elements that could explain the situation today, as well as Norwegian industry's way forward. Through this, we recognize collaboration as a competitive strategy that should be evident in a transition to a circular economy in Norway.

We study 15 cases that all have incorporated principles of circular economy to varying degree. To assess the strategic elements of their business models, we conduct interviews on the subject of collaboration in relation to their circular operations. The Relational View created a basis for the structure of our interviews and the further discussion, as well as theory on value generation through collaboration. The thesis discusses interview findings relevant to the research on circular economy and Norwegian industry's characteristics. Eventually, we map the 15 companies' business models, and discuss this in relation to some of Norway's comparative advantages.

Our findings provoke the conclusion that collaboration is essential for how businesses transition to, and operate, circular business models. Moreover, Norwegian industry's characteristics of trust and reciprocity generate favorable conditions for close collaborations. Collaborating in clusters and industrial parks further enhances the strategic benefits, as it is proposed to facilitate for specialization, knowledge-sharing, relation-specific investments, and utilization of complementarities. Lastly, increased involvement and risk-taking from the government's side, is suggested as imperative for a circular economy to be feasible in a larger scale.

Hereby, our thesis contributes to the emerging literature on circular economy and circular business models. Exploring this in the context of circular businesses in Norway, enables us to provide businesses and researchers with a comprehensive overview of the circular economy in Norway today, and in the years to come.

Contents

FIGURES

TABLES

1 Introduction

1.1 Background and Actualization

By the start of the industrial revolution, mankind had already adopted a linear model of production and consumption. This "take, make, use, waste"-model, where natural resources are extracted, manufactured, used, and eventually disposed of, has led to crucial omissions and put enormous strains on the environment (McDonough & Braungart, 2010; Murray, Skene, & Haynes, 2015). Gro Harlem Brundtland headed a commission which goal was to formulate "A global agenda for change", with the intention of presenting "long-term environmental strategies for achieving sustainable development by the year 2000 and beyond" (WCED, 1987, p. 5). However, as the publication came simultaneously with deregulation of banking, globalization of capital markets, IT innovations and off-shoring production, which lead to dramatically increase in consumption, the report was perhaps overly ambitious (Murray, Skene, & Haynes, 2015). Nevertheless, as of May 2nd 2016, 177 countries have signed the Paris Climate Change Agreement on reducing CO2-emissions to below two degrees pre-industrial level, in order to limit global warming (United Nations, 2016).

The global population is expected to reach 9 billion by 2050, which will put increased tension on natural resources as demand for food and energy intensifies (Riding, et al., 2015). Already, the volatility of resource prices has experienced an upsurge (EMF, 2012), proving that the linear model is a threat not only to the environment, but as to how the economic system functions (Jordens, 2015). The supply disruption, increased resource prices, depletion of natural capital, and regulatory trends are all drivers that has made researchers, businesses and policy makers look for new business models and industrial systems (EMF, 2012).

A primary alternative is that of the circular economy (CE). Although it is not a novel concept, it is only recently that it has become a popular topic. Circular economy is characterized as an economic and industrial system where production processes and products are designed to maximize value over lifetime, without creating waste. Therefore, the concept of the circular economy is that it results in positive economic, environmental and social impact (Leising, 2016), through operating in accordance with the cycling principles of energy and materials to sustain natural systems (Zhu, Geng, & Lai, 2011). The circular economy is "restorative or regenerative by intention and design" (EMF, 2012, p. 7), and considers the potential across entire value chains (Vanner, et al., 2014).

An imperative facet is that the intentions of a circular economy exceeds the pursuit of mere waste prevention through motivating technological, organizational and social innovation throughout the value chain (Vanner, et al., 2014). Thereby, value chains "design out" (EMF, 2012, p. 7) waste from the beginning. The net cost savings of transitioning to a circular economy has been estimated to 630 billion euros per year in the EU alone (EMF, 2012), while worldwide the economic benefit has been estimated to 4.5 trillion by 2030 (Lacy & Rutqvist, 2015). Some of the opportunities of implementing a circular economy model has already been leveraged by leading organizations like Renault, IKEA and Unilever (EMF, 2013).

1.2 Research Problem

Despite the many benefits of adopting to the principles of circular economy, only a small portion of Norwegian businesses have started the transformation (NHO, 2016). Studies have identified several barriers and lack of enablers that impede the likelihood of a business implementing a more circular business model. For instance, these can be lack of incentive systems, lack of technology, regulation, lack of willingness among industries, lack of financial support, lack of transparency (EMF, 2012; Bastein et al., 2013; Vanner, et al., 2014). A key solver of several barriers to circular economy is collaboration, which is proposed as a fundamental enabler of the transition to a circular economy (EMF, 2012; Bastein et al., 2013; Sempels, 2014; Vanner, et al., 2014; Jordens, 2015; NHO, 2016).

Both scientific communities and policy makers have taken interest in studying the circular economy as a phenomenon. In Norway a special interest has aroused among politicians in the wake of the severe impacts the oil crisis had on the Norwegian economy (NHO, 2016). There is reason to expect that this interest will continue to grow in scientific communities since, in 2015, the Norwegian government appointed an expert committee to propose an overall strategy to promote "green competitiveness" towards 2030 and the low-emission-society in 2050 (Regjeringen, 2015). Although research has made considerable contributions to the study of the concept, and clearly elucidates its principles, little attention has been given to the specific role of collaboration as strategy in a transition to a circular economy, and most importantly, whether businesses in a circular economy today value the beneficial potential of collaboration.

1.3 Research Question and Objectives

Our thesis is meant as a contribution to filling the apparent knowledge gap by providing exploratory empirical insights on the role of collaboration in circular business models. Circular cross-sector collaborations in Norway is the focal point of our research, which seeks to answer the following research question:

How can cross-sector collaboration act as an enabler of a circular economy in Norway?

The research question is deliberately explorative, because scientific research on the circular economy phenomenon is still at an early stage (Murray, Skene, & Haynes, 2015). Nevertheless, to provide some direction to the exploration, we use existing theory as means of guidance. The Relational View was developed by Dyer and Singh (1998), and is a theoretical framework that builds on and complements theory on collaboration. This way, the research question frames and structures our study by focusing on a particular aspect of collaboration in the context of circular economy.

To further guide us in answering the research question, we will include some specific research objectives that we will try to achieve on the way to our conclusion:

- OBJECTIVE 1: *To investigate the strategic benefits of collaboration towards a circular economy.*
- OBJECTIVE 2: *To examine drivers, enablers and barriers of a transition to a circular economy.*
- OBJECTIVE 3: *To highlight the role of interaction between the government, academia and the industry in a transition to a circular economy?*
- OBJECTIVE 4: *To consider the potential for a circular economy in Norway.*

These objectives will be answered through our assessment of the firms and organizations that we have studied. In addition to the Relational View, literature on sustainable and circular business will be helpful in further elaborating on our objectives, as to better conceptualize them, as well as in evaluating the factors most important for answering our research question.

1.4 Scope and Delimitations

For our thesis to be feasible, it is important to make reasonable delineation of the scope and be clear about delimitations (Saunders, Lewis, & Thornhill, 2012). In our study, we have limited our sample to 15 companies, which affects the generalizability of our findings (cf. section 3.5.2). The reason for this is a combination of the time limitation associated with a master thesis (cf. section 3.4) and the opted methodology of our study (cf. chapter 3).

As mentioned above, the focal point of our research is cross-sector collaborations in circular business. We define this as collaborations that, to at least some extent, operate according to one or more principles of circular economy (van Renswoude, ten Wolde, & Joustra, 2015). More specifically, the main unit of analysis is the business unit (i.e. registered legal entity) within the collaboration that is directly involved in circular processes and/or routines on an operational level. The reason for this is that we believe these firms will have the most experience with circular business models in practice, and thus be best equipped to provide us the rich information we need to answer our research question (Yin, 2003). However, this might also paint a biased picture of reality (Saunders, Lewis, & Thornhill, 2012). Ideally, we would have scrutinized complete circular value chains, but that is simply not feasible within the given timeframe.

Since there is little scientific research on circular economy, we have had to resort to less scientific reports to support our thesis (e.g., KPMG, 2003; Lacy, Keeble, & McNamara, 2014; Innovasjon Norge, 2015; Innovasjon Norge, 2016; NHO, 2016). We recognize that the authors of such reports may have a vested interest in producing findings in a certain way, and that this might obscure the objectivity of the report. For this reason, we ask that the reader has this in mind when evaluating the thesis.

Finally, there are natural delimitations related to choice of methodology, but these are accounted for in chapter 3 Method. In chapter 6 Conclusion, we provide suggestions for further research beyond the mentioned delimitations.

1.5 Thesis Structure

The rest of the thesis will be structured as follows: In chapter 2 Literature Review we will firstly elaborate on the principles of circular economy, before we go further into prior research on the subject. We will shed light on barriers, drivers and enablers that have been identified in the literature, and thereby justify why we have chosen to analyze collaboration as an enabler. Subsequently, we discuss theory on collaboration and networks, eventually presenting the Relational View. Chapter 3 Method describes our chosen research design, -strategy and -methodology. Also, we highlight strengths and weaknesses of our method. In chapter 4 Findings from Data Collection and Analysis, we present the findings from the data collection and analysis. In chapter 5 Discussion of Findings, we discuss our findings in light of the presented literature and in broader context, namely Norwegian industry, and account for circular business models. Finally, in chapter 6 Conclusion, we synthesize our findings and their implications, outline the limitations of our study, and provide suggestions for further research.

2 Literature Review

In this chapter we present a review of literature relevant for how we will answer our research question. The first subsection presents the Relational View (Dyer & Singh, 1998)*, and we argue why the framework is suited for the context of circular economy (cf. section 2.1). The section concludes with a summary of peer critiques of the Relational View (cf. section 2.1.1). Second, a brief background for the Relation View is presented (cf. section 2.2). Then relevant literature on circular economy is accounted for, to better understand the concept (cf. section 2.3). Finally, we review research appropriate for explaining collaborative networks as an enabler of circular economy (cf. section 2.4), and conclude the chapter with a summary of the preceding subsection (cf. section 2.4.1) The main purpose of the literature review is to establish fundamental knowledge on, and gain broader insight into, relevant topics.*

2.1 The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage (Dyer & Singh, 1998)

According to Dyer and Singh (1998), a firm's critical resources may go beyond firm boundaries and may be embedded in routines and processes that are linked through various organizations. Through collaboration, partners can create a sustained competitive advantage. As there is an ever increasing amount of firms connected through alliances and networks, focusing on these collaborations as the unit of analysis is deemed as increasingly important.

The main unit of analysis in Dyer and Singh's (1998) framework is interorganizational collaboration routines and processes. The theory focuses both on how relational rents are earned *and* preserved as a competitive advantage. Dyer and Singh (1998) define relational rent as "a supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific partners" (p. 662).

Through assessment of various studies, Dyer and Singh (1998) propose four determinants for how competitive advantages can be attained through network relationships. In addition, they propose a number of sub-processes that facilitate the realization of relation rents stemming from the aforementioned sources. By examining the various mechanisms that preserve relation rents created through network collaboration, the framework extends on the narrow view that is the within-industry or within-firm view. Thus the authors propose a tool for assessing the competitive advantage attained through interorganizational relations. The framework is illustrated in *Figure 1* below, followed by a brief explanation of each determinant and associated sub-processes.

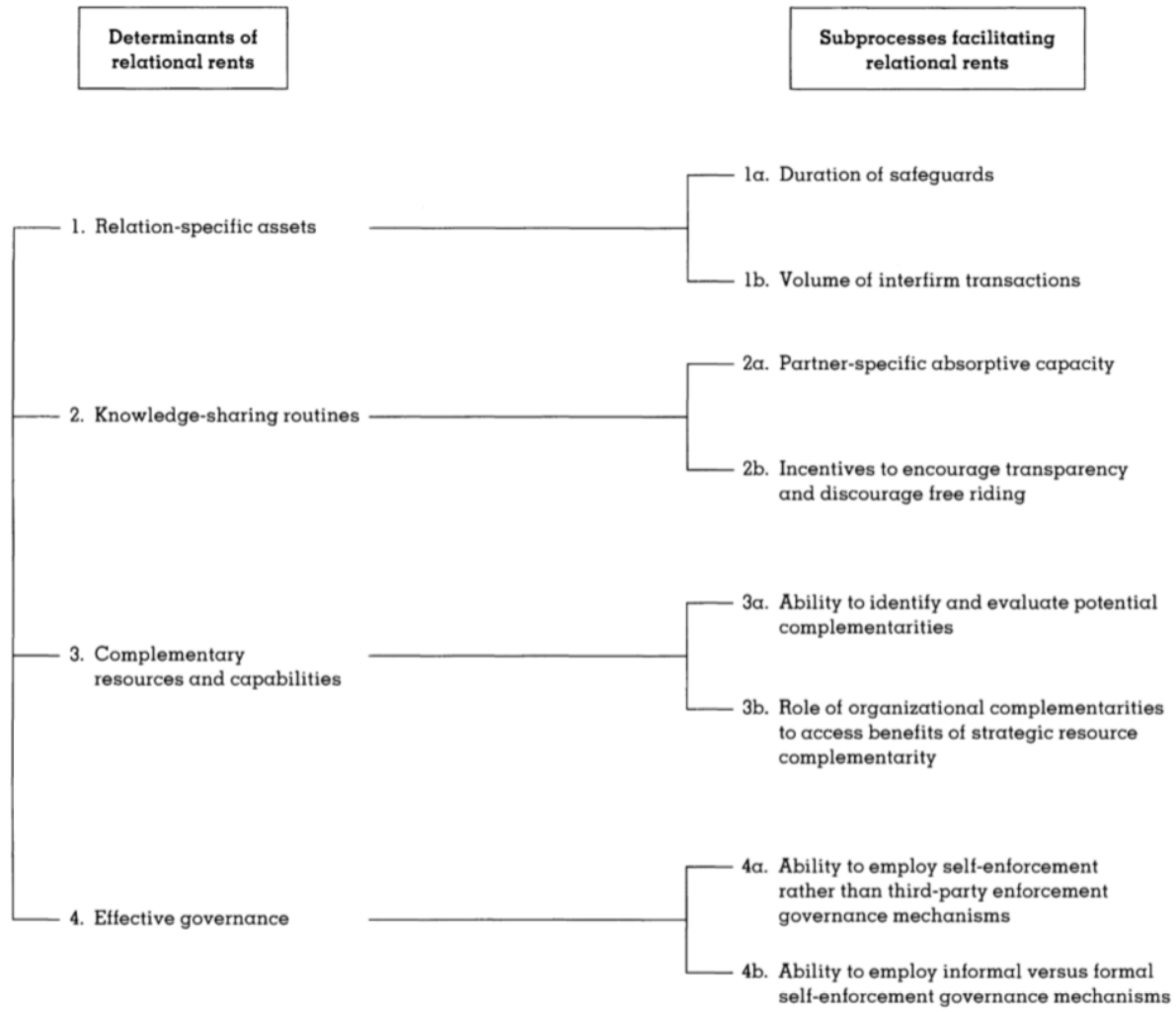

Figure 1: Determinants of Interorganizational Competitive Advantage*. The figure shows the proposed sources for relational rents on the left side, and the associated facilitating sub-processes on the right side. Source:* (Dyer & Singh, 1998).

In the following, we briefly explain each determinant and the associated sub-processes, in the same order as depicted in Figure 1 above.

Interfirm Relation-Specific Assets

Dyer and Singh (1998) emphasize that it is necessary that the firms' activities are specialized or unique in order to develop a competitive advantage. Perry (1989) and Williamson (1985) argue that when firms are willing to make relation specific investments, they can achieve production gains in the value chain. Dyer and Singh (1998) refer to Williamson's (1985) study, which presents three types of asset specificity: (1) site specificity, (2) physical asset specificity, and (3) human asset specificity (see Table 1 below).

Type of asset specificity	*Explainaition of what and why*
Site specific investments	Invesments in propoerty and infrastructure can reduce inventory and transportation costs. This is made possible when successive production stages take place close to each other.
Physical asset specific investments	Invesmtents in physical assets tailored to the collaboratio, e.g. customized machinery and tools. This can result in product differentiation and improved quality through increase product integrity and fit.
Human asset specific investments	How long-term relationships within the network can provide transaction-spcific know-how, e.g. dedicated supplier engineers who learn the systems and procedures of buyers. As engineer-specialization increase over time, the relationship accumulate specialized information and know-how.

Table 1: Asset specificity. *Illustration of the three types of asset specificity. Source: (Williamson, 1985)*

Relational rents generated through relation-specific investments, are attained through decreased value chain costs, increased product differentiation and quality, and more rapid product development cycles (Dyer & Singh, 1998).

Sub-processes

By safeguard, Dyer and Singh (1998) mean mechanisms that prevent opportunistic behavior by committing the parties to the collaboration. Safeguards affect alliance partners' ability to attain rents through relation-specific investments. These can be both the time period of the safeguard and the volume of transactions. The governance structure influences the relationship partners' ability to invest in relation-specific assets. The *volume of interfirm transactions* refers to how increased scale and scope of transactions between alliance partners increases the value of their transactions. This will influence partners' ability to substitute special purpose assets for general purpose assets.

Interfirm Knowledge-Sharing Routines

Various scholars have argued that interorganizational learning is pivotal for competitive advantage, claiming that organizations repetitively learn through collaboration with other organizations (March & Simon, 1958; Levinson & Asahi, 1996; Powell, Koput, & Smith-Dorr, 1996). Powell, Koput and Smith-Dorr (1996) concluded that the main source of innovation in the biotechnology industry was the network rather than the individual firm. Dyer and Singh (1998) claim that alliance partners tend to be a critical source of innovation. Through the development of superior interfirm knowledge-sharing routines, the alliance partners create a competitive advantage, increasing the potential for attaining relational rents (Dyer & Singh, 1998).

Sub-processes

Dyer and Singh (1998) separate between knowledge through *information* and *know-how*. Information can be shared "without the loss of integrity once the syntactical rules required for deciphering it are known" (Kogut & Zander, 1992, p. 386). Know-how on the other hand, comprise tacit and complex knowledge. As this makes it difficult to codify, know-how is difficult to imitate and transfer. Therefore, Dyer and Singh (1998) claim that networks that are effective at transferring know-how, have an increased potential in outperforming their competitors.

The firm's and the network's ability to take advantage of the various sources of knowledge, comes as a function of the *absorptive capacity* of the recipient of the shared knowledge, meaning "the idea that a firm has developed the ability to recognize and assimilate valuable knowledge from a particular alliance partner" (Dyer & Singh, 1998, p. 665). The firm's ability to gain knowledge arises from cooperation that enables firms to identify and transfer know-how across organizational boundaries. This ability is often developed informally over time through cross-organizational interactions. The second sub-process relates to the partners' alignment of incentives to encourage transparency and discourage free riding, as significant transfer-costs can occur. Such incentives can either be formal (e.g. equity arrangements), or informal (e.g. reciprocity mechanisms).

Complementary Resource Endowments

Through leveraging on alliance-partners' complementary resources, firms can attain relational rents (Dyer & Singh, 1998). Dyer and Singh (1998) define complementary resource endowments as "distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual endowments of each partner" (p. 666). It is implicit that for the relevant resources to provide a competitive advantage through an alliance, neither firms nor other partners can purchase the resources in a secondary market. Therefore, alliance partners should aim to provide idiosyncratic resources to the alliance as these can, when combined, result in synergies making the complementary resource endowments more valuable, rare, and difficult to imitate (Barney, 1995).

Sub-processes

Entities are assumed to differ in their ability to identify potential partners because of variations in prior network experience, internal procedures for identifying and evaluating potential partners, and position in own network. For instance, experience in alliance management can entail a more precise evaluation of types of partner/resource combinations that can foster above-normal returns. However, the partners' ability to realize the identified potential is conditioned by the partners' *organizational complementarity*. Dyer and Singh (1998) emphasize that relational rents can only be attained if the partners have compatible systems, processes and organizational cultures (i.e., organizational complementarity).

Effective Governance

Governance of the collaboration has a crucial part in the potential for relational rents. In itself, effective governance can reduce transaction costs. In addition, it can increase alliance partners' willingness to engage in value-creation initiatives, thereby influencing the other three determinants (e.g., what relation-specific investments are made, how much knowledge will be shared and the ability to leverage potential complementarities).

Dyer and Singh (1998) separate between two groups of governance that can be used by alliance partners (see Table 2):

	Third-party enforcement	Self-enforcing agreements
What:	Legal contracts with the state or through a legetimate organization authority, in which no third party intervenes to determine whether a violation has take place.	Formal safeguards (e.g. equity or asset investments) or Informal safeguards (e.g. Trust, reputation or reciprocity).
Why:	A mean to control opportunism, and an economic incentive to cooperate.	Reduce transaction costs.

Table 2: Governance types. *The Relational View prefers self-enforcing mechanisms to third-party enforcement (Dyer & Singh, 1998).*

Sub-processes

Dyer and Singh (1998) propose that self-enforcing safeguards are more effective at attaining relational rents because they lower contracting costs, monitoring costs, adaption costs and incentivize value-creation initiatives. In addition, self-enforcing mechanisms are harder to imitate. Furthermore, the partners' ability to employ informal (e.g., trust and reciprocity) rather than formal (e.g., legal contracts) self-enforcement governance mechanisms, is proposed to increase the potential for relational rents. This as a consequence of lower marginal costs and imitation barriers. Informal safeguards are both complex and idiosyncratic to the relationships in the network, which make such mechanisms hard to imitate. Nevertheless, informal safeguards require time to develop, and can give incentives to act opportunistic. Therefore, these mechanisms may need other forms of safeguards in addition, like contracts, in order to fully safeguard the partnership.

In conclusion, Dyer and Singh (1998) present four mechanisms which can preserve the competitive advantage that is gained through collaboration that eventually create relational rents (see Table 3). These mechanisms create barriers to imitate partnering behavior.

Interorganizational asset interconnectedness	Through exisitng relation-specific investments, subsequent relation-specific investments become feasible.
Partner scarcity	Ability to identify partners that possess complementary resources and/or relatoinal capabilities. Early movers can through this create a imitation.
Resource indivisibility	Through collaboration, investments and complementarity, partnerships become difficult to imitate through idiosyncratic and indivisble resources.
Institutional environment	Through trust, relational rents can be generated and sustained. Both formal and informal rules create complex environments that encourage cooperative behavior and controls opportunism.

Table 3: Mechanisms that preserve relational rents. *The four mechanisms create barriers to imitate partnering behavior* (Dyer & Singh, 1998).

Because of factors like causal ambiguity (e.g. an outsider cannot always tell which factors lead to competitive advantages in a given alliance), complementarity, indivisibility, and time compression diseconomies (e.g. some mechanisms or resources take time to establish), relational rents can be hard to identify and imitate.

2.1.1 Criticism of the Relational View

Jap (2001) criticizes the Relational View's notion that specialized supplier networks are necessary, and that these networks "interrelate the use of idiosyncratic investments, knowledge-sharing processes, complementary capabilities and effective governance to create competitive advantages" (Jap, 2001, p. 19). As Jap (2001) argues, there is a limitation in the Relational View as to how the interrelating factors are developed, maintained, and impair competitive advantages in a long-term perspective.

Dyer and Singh (1998) propose that the potential for relational rents increases the more partners invest in knowledge-sharing routines. However, the Relational View does not take into account the possibility of valuable knowledge residing outside the established network. The significance of this possibility has been thoroughly documented by Burt (1992) and Capaldo (2007).

Finally, in their study of more than 2500 German companies, Gesing et al. (2015) found that formally governed market-focused collaborations (e.g., supplier and customer) were more strongly associated with innovation than informally governed science-focused collaborations (e.g., universities and research institutions). This contradicts the Relation View's notion of informal governance being superior.

2.2 The Relational View – Background

The identification of how competitive advantages and economic rents develop, has long been a focus in management literature (Lavie, 2006). Assessing the background of the Relational View is therefore essential as it can give increased insight to the competitive advantages of collaborations, which are the strategic sources of rents, and how it is obtained. In this section we compare the Relational View with two acknowledged theories on competitive advantages.

The Industry Structure View, often associated with Porter's (1980) industrial organization framework, is largely concerned with the overlaying industry forces rather than detailed actions of individual entities. Further, as Porter's (1980) framework mainly analyzes competition as a factor, rather than cooperation, alliances between entities are merely assessed as collusive arrangements (Lavie, 2006).

The resource-based view (RBV), associated with Barney (1991), has assessed a single entity apart from its network and interorganizational relations, thus neglecting the significance of relational rents that Dyer and Singh (1998) discuss. In order to analyze firm resources, and for the resource to become a source of sustained competitive advantage, Barney (1995) developed the VRIO framework which assesses whether a company's resources are Valuable, Rare, Imitable, and Organized. The *organized* part of the framework asks whether the firm is organized to capture value, where efficient management systems, processes, policies, organizational structure and culture must be in place.

Lavie (2006) notes that the RBV "undermines the essential contribution of the resources of alliance partners" (Lavie, 2006, p. 638) and that "alliance partners play a significant role in shaping the resource-based competitive advantage of the firm" (p. 638). In addition, the RBV encourages know-how protection rather than sharing, whilst Dyer and Singh (1998) motivate systematic sharing of relevant know-how.

From a general point of view, Porter's (1980) five forces framework highlights several competitive conditions that are important for the development of the relational view: entry barriers, price, quality and capacity competition, complementarities, and supplier and buyer power (Porter, 1980). Nevertheless, the industry structure view has strategic motives that go against those of the relational view. For instance, it encourages increasing the amount of suppliers in order to increase bargaining power, whilst the Relational View encourages increasing supplier relations through knowledge sharing and relation-specific investments. (Dyer & Singh, 1998).

What is notable in Lavie's (2006) study, is how Dyer and Singh's (1998) framework presents relational rents as a result of resource complementarities between collaborative partners, and that relational rents are thereby greater for complementary alliances than for alliances where partners control more homogeneous resources.

Even though the two views on competitive advantages (Porter, 1980; Barney, 1991) have been significant contributors to understanding the sources of rents, Dyer and Singh (1998) notes that "they overlook the important fact that the (dis)advantages of an individual firm are often linked to the (dis)advantages of the network of relationships in which the firm is embedded" (p. 660).

2.2.1 Collaborative Procurement: A Relational View of Buyer-Buyer Relations (Walker et al., 2013)

A study of particular relevance for the purposes of our thesis, is Walker et al.'s (2013) study of enablers and barriers for collaboration in the procurement industry, which incorporates the Relational View as a tool to identify success factors. Walker et al. (2013) apply the Relational View in a particular context, and highlight other empirical studies that have applied the framework of Dyer and Singh (1998) in different contexts (Chen & Paulraj, 2004; Wu & Choi, 2005). This substantiates the relevance of the Relational View and the methods enacted. For that reason, our method was inspired by Walker et al. (2013). Knowing that the framework has successfully been applied in other empirical assessments of complex relations is reassuring, seeing that our cases differ in the characteristics of their collaborative networks.

2.3 The Circular Economy – An Economic and Industrial Model

In the proceeding subsections, we present the concept of circular economy. This will provide the reader insight important to better understand the subsequent analysis and discussion. The following discussion will elaborate on (1) principles of CE, (2) drivers, enablers and barriers of a circular economy, (3) circular business models, and (4) the current state of the circular economy in Norway today.

2.3.1 Circular Economy Principles

The circular economy is an industrial model "that is *restorative* by intention; aims to rely on renewable energy; minimizes, tracks, and eliminates the use of toxic chemicals; and eradicates waste through careful design" (EMF, 2012, p. 22). An important facet of the circular economy concept is how it distinguishes between the consumption of biological components and use of technical components (see Figure 2 below). Through design, biological components will re-enter the biosphere, while technical components (e.g. plastics and metals) is meant to circulate without ever entering the biosphere (Ingebrigtsen & Jakobsen, 2007; Braungart & McDonough, 2009; EMF, 2012; Lacy & Rutqvist, 2015; Webster, 2015).

A circular economy encourages a more performance-based system where "selling performance instead of goods is the most profitable form of a circular economy" (Stahel, 2014, p. 47). As such will manufacturers and retailers retain material ownership, and act as service providers – gaining future resource security, but accepting liabilities for the products' performance (Stahel, 2010). This is assumed to generate innovation in business models and in the durability of products, facilitating disassembly and remanufacturing.

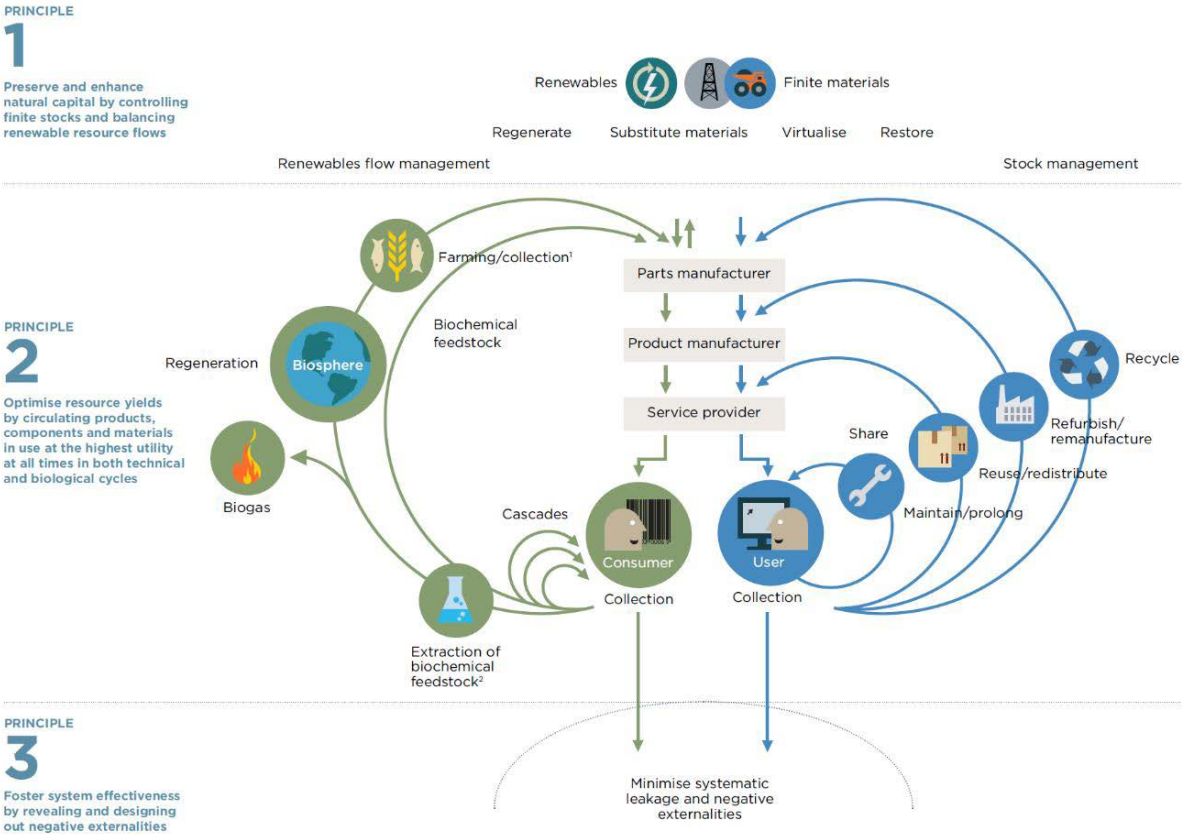

Figure 2: Outline of a circular economy. *The figure illustrates the continuous flows of biological and technical components in a circular economy. Source: (EMF, 2012).*

A seen in Figure 2, both technical and biological components flow in circles. There are four sources of core economic value creation that can be identified in Figure 3:

Power of the inner circle: The concept of inner circles relates to a component's ability to circulate without losing value. The tighter the circle, the larger the potential for savings on material, labor, energy, capital, as well as on costs of environmental externalities. Since resource prices are increasing, as with end-of-life treatment costs, the arbitrage, rising from comparing the inefficiencies along the linear chain with the circular model, becomes more attractive in the beginning of the circle.

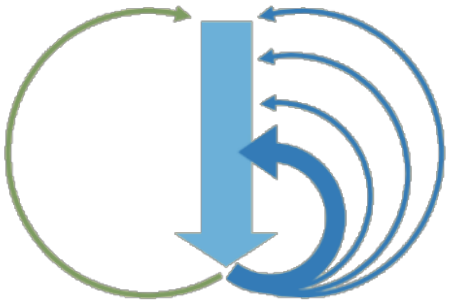

Figure 3: The power of the inner circle. *Source: (EMF, 2012).*

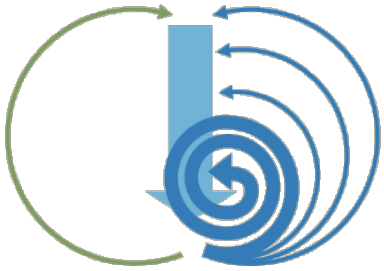

Figure 4: The power of circling longer. Source: (EMF, 2012).

Power of circling longer: The value of materials, components and products is created and preserved through consecutive cycles or by spending more time within the same circle, thereby keeping them in the circular economy longer. A benefit is the arbitrage potential in stability of resource prices, however, increased operating and maintenance costs could minimize this potential.

Power of cascaded use and inbound material/product substitution: EMF (2012) identifies an arbitrage opportunity in the cascading of products, components and materials. The arbitrage value lies in how cascading across different product categories leads to lower marginal costs of reusing the cascaded material, versus using virgin resources and their embedded costs (e.g., labor, energy, material).

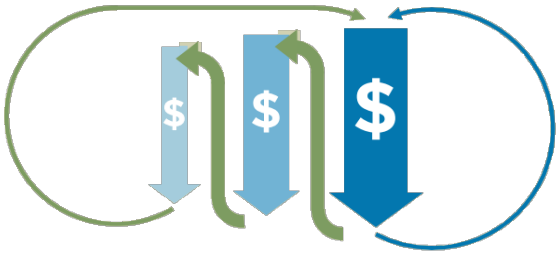

Figure 5: Power of cascaded use and inbound material/product substitution. Source: (EMF, 2012)

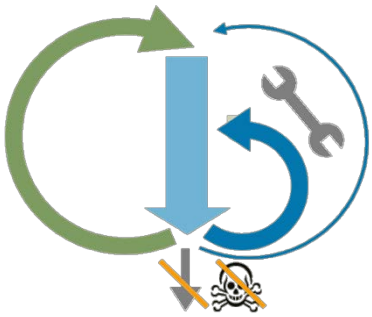

Figure 6: The power of pure, non-toxic, or at least easier-to-separate inputs and designs. Source: (EMF, 2012)

Power of pure, non-toxic, or at least easier-to-separate inputs and designs: The fourth lever concerns how products and components are designed to use pure materials and to be non-toxic. In the cycling process, pure cycles enable better separation of materials and components at the end of a lifecycle, which facilitate reuse.

2.3.2 Drivers, Enablers and Challenges of a Transition to a Circular Economy

In this subsection, we shed light on key drivers, enablers and challenges of a transition to a circular economy, identified through review of relevant research. Tables 5-7 summarize the findings. The Ellen MacArthur Foundation's (2012) research stands as a basis for the subsequent discussion.

Through their study, *Towards the Circular Economy: an economic and business rationale for an accelerated transition*, the Ellen MacArthur Foundation (2012) identified four building blocks to mainstream the circular economy (see Table 4).

1. Skills in cicular product design and production:	Choice of materials, standardization, design and processes that minimize waste and facilitates disassembly
2. Skills in building reverse cycles and cascades:	Cost-effective and quality preserving collection, extraction and treatment methods
3. New business models:	Convert good circular designs into attractive value propositions
4. Enabling factors to improve cross-cycle and cross-sector performance (see below):	
Cross-cycle and cross-sector collaboration facilitating factors E.g. joint infrastructure management and product development	
Favorable investment climate Availability of financing and risk management tools	
Rules of the game to quickly reach scale E.g. regulations through taxation and tariffs	
Education Raising awareness about circular economy and its implcations, as well as incorporating circular concepts in education curricula	

Table 4: Four building blocks to mainstream the circular economy (EMF, 2012). *The building blocks are highlighted in grey, with keywords in blue. The enabling factors are listed and highlighted in green.*

These building blocks, seen in the context of our research objectives, are all important. However, to narrow the scope of our research, we have chosen to focus on one enabling topic, namely cross-sector collaboration. As seen in tables 5-7, collaborative mechanisms are identified throughout the literature as important in enabling the circular economy, underpinning our choice of focus.

Various barriers and unfavorable mechanisms pose a threat to the circular transformation (see tables 5-7). Firstly, there is a lack of incentive systems from tax authorities and regulators (Mazzucato, 2013; Matthies, et al., 2016; Sauvè, Bernard, & Sloan, 2016). This is problematic as such systems are crucial in speeding up the process of adopting circular business models (Mazzucato, 2013; Matthies, et al., 2016; Sauvè, Bernard, & Sloan, 2016). EMF (2012) suggest that increased regulation toward corporate social responsibility, standardization, certification and accounting could help scale the process (Ingebrigtsen & Jakobsen, 2007; Lu, 2014;

Genovese, Acquaye, Figueroa, & Lenny Koh, 2015; Pan, et al., 2015; Ghisellini, Cialani, & Ulgiati, 2016; Niero, Negrelli, Hoffmeyer, Olsen, & Birkved, 2016; Witjes & Lozano, 2016). An additional barrier is capital investments (Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Webster, 2015; Leising, 2016; Wijkman & Skånberg, 2016). Market failure in the form of risk aversion is still a significant reality (EMF, 2012), and should be mitigated to increase investments in both businesses adapting to a circular model, as well as new markets emerging from new usage of waste. Firm legislation and better economic framework is proposed as supporting actions (Ingebrigtsen & Jakobsen, 2007; EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Webster, 2015; NHO, 2016; Sauvè, Bernard, & Sloan, 2016; Wijkman & Skånberg, 2016).

Table 5: Barriers impeding the transition towards a circular economy. *The table lists barriers that impede the transition to a circular economy, identified in various literature.*

Theme	Notion	Source
Cultural resistance	Risk aversion, extra effort.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Tukker, 2015)
Current product design	Both financial incentives and legal systems support the linear economy.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Tukker, 2015; Leising, 2016; Matthies, et al., 2016; NHO, 2016)
Commodity and energy prices	Subsidization of non-renewable commodities and energy.	(EMF, 2012; Lacy & Rutqvist, 2015; Webster, 2015)
Lack of transparency	Environmental costs not reflected in product prices.	(EMF, 2012; Leising, 2016)
Investments	The transition demands large up-front investments.	(Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Webster, 2015; Leising, 2016; Wijkman & Skånberg, 2016)
Shareholder Power	Limited liability. Demand short-term profit.	(Barton, 2011; EMF, 2012; Barton & Wiseman, 2014; Glass, Cook, & Ingersoll, 2015; Leising, 2016)
Infrastructure	Information exchange systems, reverse logistics issues.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Leising, 2016)
Education	Limited knowledge on the benefits of of CE.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Tukker, 2015; Leising, 2016)
Technology and Innovation	Lack of high-tech collection and separation systems. Focus on fossil fuels and linear technologies. Lack of investment.	(Braungart & McDonough, 2009; Mathews & Tan, 2011; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Leising, 2016)
Lack of Collaboration	Knowledge transfer, resource origin.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013)
Financing	Incentives, tax reductions.	(Geng & Doberstein, 2008; Mathews & Tan, 2011; EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Tukker, 2015)
Bio-side Suppliers	Suppliers of raw materials have an advantage over those of residual raw materials.	(Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013)
Product Components	Used components more expensive than the resale margin.	(Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013)
Regulation	Inefficiencies, inconsistencies, risk-aversion.	(Yong, 2007; Geng & Doberstein, 2008; Mathews & Tan, 2011; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Matthies, et al., 2016; NHO, 2016; Sauvè, Bernard, & Sloan, 2016)

Table 6: Enablers of circular economy. *The table lists enablers of circular economy, identified in various literature.*

Theme	Notion	Source
Collaborative Platforms	Cross-chain and cross-sector collaboration.	(Braungart & McDonough, 2009; EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Sempels, 2014; Vanner, et al., 2014; Jordens, 2015; Lacy & Rutqvist, 2015; Tukker, 2015; Ghisellini, Cialani, & Ulgiati, 2016; Leising, 2016)
Financing	Availability of financing and risk management tools.	(Ingebrigtsen & Jakobsen, 2007; EMF, 2012; Vanner, et al., 2014; Matthies, et al., 2016; NHO, 2016)
Regulation	Regulations in areas such as taxation and tariffs, and incentives systems.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Vanner, et al., 2014; Matthies, et al., 2016; NHO, 2016; Sauvè, Bernard, & Sloan, 2016; Wijkman & Skånberg, 2016)
Education	Raising awareness about CE and its implications, and incorporating CE concepts in education curricula.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; NHO, 2016; Sauvè, Bernard, & Sloan, 2016)
A New Economic Framework	Changes to existing fiscal system, measurement systems.	(Ingebrigtsen & Jakobsen, 2007; EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Webster, 2015; NHO, 2016; Sauvè, Bernard, & Sloan, 2016; Wijkman & Skånberg, 2016)
Technology and Innovation	Technology development, improved materials, and labor and energy efficiency.	(Ingebrigtsen & Jakobsen, 2007; EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Tukker, 2015; Lacy & Rutqvist, 2015; NHO, 2016; Wijkman & Skånberg, 2016)
Security of Supply	Long term security of supply of resources.	(Ingebrigtsen & Jakobsen, 2007; EMF, 2012; Leising, 2016; NHO, 2016)
Decoupling of resources	Economic growth independent of increased use of energy and resources, and environmental pressure.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Jordens, 2015; Leising, 2016; Wijkman & Skånberg, 2016)
Clusters	Logistics, infrastructure, communication.	(EMF, 2012; Vanner, et al., 2014; Leising, 2016; NHO, 2016)

Table 7: Drivers of a transition to circular economy. *The table lists drivers of a transition to circular economy, identified in various literature[1].*

Theme	**Notion**	**Source**
Resource scarcity	Trade barriers, high prices, price volatility.	(EMF, 2012; Leising, 2016; NHO, 2016)
Price volatility	High and unsecure resource prices.	(EMF, 2012; Leising, 2016)
Financial crisis	Companies need to save costs, price volatility.	(Leising, 2016)
Regulation	Increased costs on linear processes.	(Ingebrigtsen & Jakobsen, 2007; Yong, 2007; Mathews & Tan, 2011; EMF, 2014; Ghisellini, Cialani, & Ulgiati, 2016)
Performance Economy	From ownership to services.	(Tukker, 2015; EMF, 2014; Sempels, 2014; Stahel, 2014; Lacy & Rutqvist, 2015; Leising, 2016)
Infrastructure	Increased urbanization means simple logistics, and reverse logistics becomes more cost effective.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Leising, 2016; NHO, 2016)
New Business Models	Business models that encourage to buy a service rather than a product.	(EMF, 2012; Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013; Sempels, 2014; Lacy, Keeble, & McNamara, 2014; Matthies, et al., 2016; NHO, 2016)
Reverse Cycle	Less energy intensive.	(EMF, 2012)
Climate Change	Ecological footprint.	(NHO, 2016; Wijkman & Skånberg, 2016)

[1] In the reviewed literature, it appears to be broad consensus regarding the driving forces of circular economy. For the sake of convenience, we have focused on referring to the most prominent papers, albeit a range of papers on circular economy could be cited.

2.3.3 Circular Business Models

Our thesis will encompass various firms and industries. This section is therefore meant to provide an understanding of how to map the variety of firms presented in our thesis. As circular business models get a foothold throughout the Norwegian economy, firms will need to consider strategic measures that will affect their competitiveness. Business model innovation is assumed to be one of the measures firms need to consider to attain an economical sustainable position as a circular business (EMF, 2012; Bastein et al., 2013; Sempels, 2014; NHO, 2016).

Jørgensen and Pedersen (2015) present a three-part model which explains how to create, deliver and capture value from business opportunities (see Figure 7). The "create"-component explains why a customer should buy or use a product or service. The "capture"-component describes how a company can attain profit itself while providing value to its customer. "Deliver" refers to the key activities (i.e. delivering value to its customer) and key resources (firm assets) of a firm (Jørgensen & Pedersen, 2015).

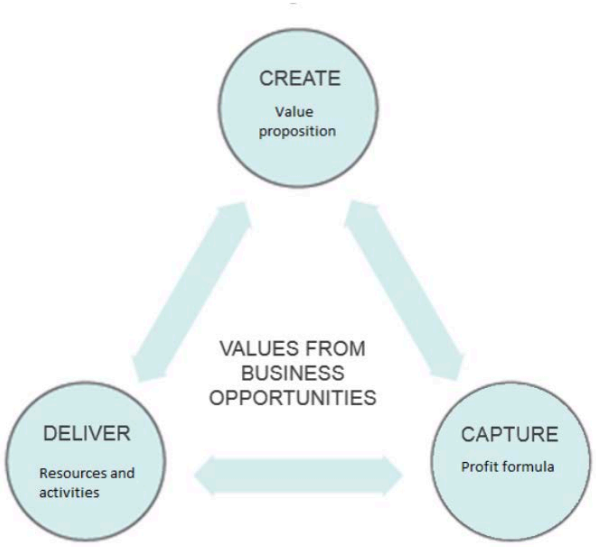

Figure 7: Values from business opportunities. *The figure shows how businesses can create, deliver and capture value. Source: (Jørgensen & Pedersen, 2015).*

Traditional business models limit the possibility of incorporating the circular concept as they externalize environmental and societal costs (Jordens, 2015). Therefore, the development of circular business models is a necessity when facing external costs from climate change, regulations, resource depletion, etc. (Jordens, 2015).

Through analysis of 120 case studies of companies that are generating productivity improvements in innovative ways, Accenture has provided one of the first studies that identifies successful business model categories within the circular framework (Lacy, Keeble, &

McNamara, 2014). According to Lacy, Keeble and McNamara (2014), companies are implementing "the circular economy as a framework for growth and innovation towards 'Circular Advantage'" (p. 2). The result of the study is the categorization of the studied companies into five innovative circular business models (Table 8):

Model type	Explaination of model
Circular Supplies:	A provider of fully renewable, recyclable or biodegradable resources, thereby supporting circular production and consumption systems.
Resource Recovery:	The model facilitates for elimination of meterial leakage in a business, as well as maximizing economic value of product cycles.
Product Life Extension:	Through maintaining, repairing, upgrading, remanufacturing and remarketing products, material value is prolonged, instead of being wasted. Thus, the extension of a company's products and assets is enabled.
Sharing Platforms:	Encourages collaboration across product users, either individuals or organizations.
Product as a Service:	This model is in accordance with Stahel (2014), and inspires a substitute to the model of 'buy and own'. Products can for instance be used by several customers through a lease arrangement. The sharing economy is as such a viable model.

Table 8: Circular business models. *The table lists the five circular business models identified by Lacy, Keeble and McNamara (2014), and gives a short explanation of each of them. In combination, the models complete a closed, circular value chain (see Figure 8).*

As illustrated through Figure 8 below, the five business models can be used either singularly or in combinations as means of helping businesses accomplish resource productivity gains.

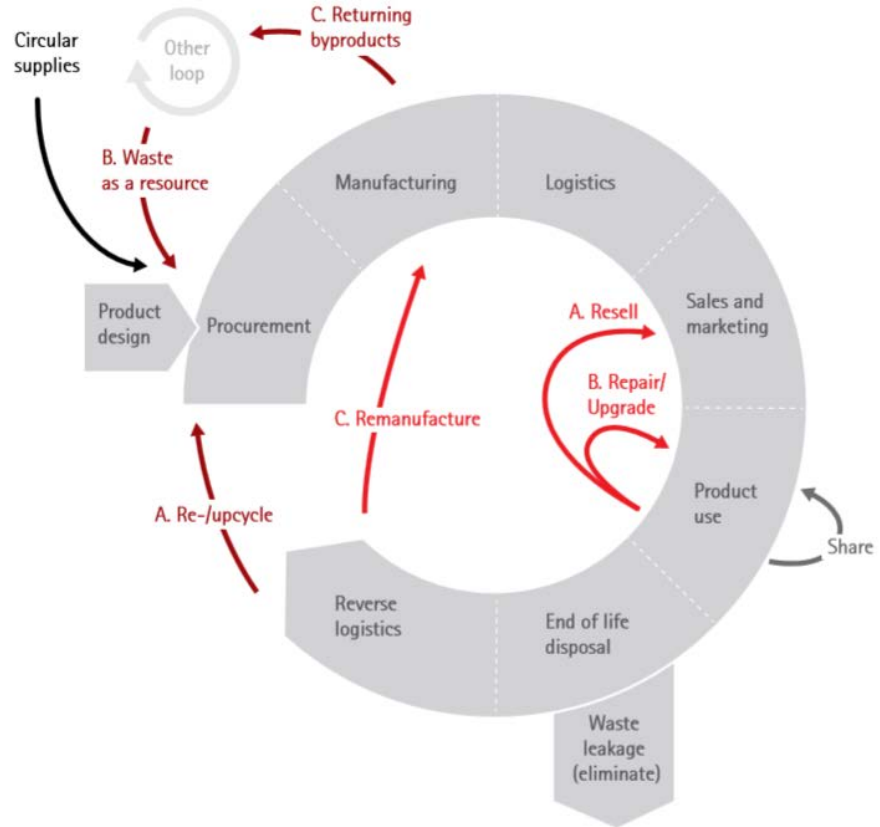

Figure 8: Circular value chain. *The figure shows how the five circular business models, in combination, complete a closed, circular value chain. Source: (Lacy, Keeble & McNamara, 2014).*

As we can see from Table 8 and Figure 8 above, the business models of Lacy et al. (2014) correspond to the four sources of core economic value creation (cf. Figures 3-6) (EMF, 2012). Additionally, businesses can experience improved differentiation and customer value, reduced costs and risks, and generate new revenue streams (Lacy et al., 2014). Lacy et al., (2014) points to how "initially, market disruption through circular business models was driven by startups" (p. 15) and that "now large multinationals are making serious moves as well" (p.15). The circular business model proposed by Lacy et al. (2014) will pose as a tool for assessing firms' and organizations' transition to a more circular model.

2.3.4 The Current State of Circular Economy in Norway

Before we move on to literature specifically on circular economy and collaboration, this subsection seeks to inform the reader about the current state of circular economy in Norway. The purpose is to augment the reader's assessment/understanding of the potential for a circular economy in Norway throughout the upcoming discussion.

Norway is a small, open economy (Norman & Orvedal, 2010). Yet, the country possesses significant amounts of natural resources which have made it one of the richest countries in the world (Røvik, Thorsnæs, & Thuesen, 2016). Fossil fuel (oil and natural gas) is Norway's largest industry and export, while fishery/fish products and metals are the second and third largest export, respectively (SSB, 2014). Ninety-nine percent of Norway's power generation comes from hydropower (i.e. renewable energy) (Røvik, Thorsnæs, & Thuesen, 2016).

In terms of regulatory efforts facilitating a sustainable economy, Norwegian authorities have shown ability to act. For instance, in 1983, the law of pollution and waste entered into force (Forurensningsloven), imposing sustainable pollution- and waste handling on companies. Nevertheless, there is still a lot of potential for Norwegian firms to utilize residual waste streams and raw materials (NHO, 2016). To address this potential, in 2015, the government appointed an expert committee to propose a national strategy to promote "green competitiveness" towards 2030 and the low-emission-society in 2050 (Regjeringen, 2015). A study conducted in connection to this, estimates that a transition to a circular economy in Norway can create 40.000 new jobs, reduce the carbon emissions by approximately seven percent and improve the trade balance by two percent (Wijkman & Skånberg, 2016)[2].

[2] For the interested reader, we refer to the expert commitee's web site (http://www.gronnkonkurransekraft.no/) and the Club of Rome's publications (http://www.clubofrome.org/a-new-club-of-rome-study-on-the-circular-economy-and-benefits-for-society/).

2.4 Research on Circular Economy and Collaboration

So far in the literature review, we have elaborated on collaboration as a strategic measure for competitive advantages, as well the concept of circular economy. In the final subsection of the literature review, the focus is on collaboration in a circular economy. We incorporate several studies and reports that tackle various themes related to how a circular economy can best be attained. As such, the latter part of the literature review aims on providing the reader with an extensive insight into how and why collaboration is emphasized as imperative in a circular economy. We end the subsection by summarizing barriers, enablers and lack thereof (cf. section *2.4.1).*

On the subject of cross-chain and cross-sector collaboration as enabler of the circular economy, EMF (2012) highlights four main factors:

4. Enabling factors to improve cross-cycle and cross-sector performance (see below):
Cross-cycle and cross-sector collaboration facilitating factors
E.g. joint infrastructure management and product development
Favorable investment climate
Availability of financing and risk management tools
Rules of the game to quickly reach scale
E.g. regulations through taxation and tariffs
Education
Raising awareness about circular economy and its implcations, as well as incorporating circular concepts in education curricula

Table 9 (excerpt from table 4): Enabling factors that improve cross-cycle and cross-sector performance (EMF, 2012).

The European Commission (Vanner et al., 2014) share EMF's (2012) view, noting that the relationship between actors in the value chain is important in realizing the potential of the circular economy. In a study of opportunities for a circular economy in the Netherlands, TNO (Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013) assesses several product categories and waste streams, in order to map enablers, barriers and the potential for the Dutch economy to become increasingly circular. TNO (Bastein et al., 2013) claims that businesses are collaborating across supply chains on an increasing level to "generate industrial symbiosis – by reusing waste, energy, water and material streams, for example – in an economically responsible way" (p. 5). TNO argues that frontrunners in the circular economy should receive permanent and true advantages. For instance, the government can act as a value chain manager through removing regulatory obstacles and bringing together parties in the value chain (Bastein et al., 2013). This supports EMF's (2012) claim that regulations can enable a more rapid transition. In support of this, the Confederation of Norwegian Enterprise (NHO) does not

consider the existing economic and legal framework conditions sufficiently enticing (NHO, 2016). For the private sectors to transform to circular models, profitability is an absolute necessity. NHO (2016) sees the need for economic frameworks that create predictability and incentives to invest in bio economic business – from research to commercialization. Here, public grants programs and less bureaucracy are given a good portion of the responsibility. The lack of venture capital is a key economic challenge according to NHO (2016).

Following on the discussion of barriers to and drivers of a circular economy, the European Commission (Vanner et al., 2014) propose policy standpoints to address barriers. Firstly, support through investment and development programs in the development of skills, awareness and investments, and improving cross-cycle and cross-sector performance, should be encouraged. In a more general perspective, the European Commission (Vanner et al., 2014) highlights factors that can hinder the realization of the circular economy. Motivation of players throughout the value chain is necessary to realize the opportunities of a circular economy. Both the players' capabilities in the value chain and their relationships, can limit realization of value. Lack of trust, absence of complementarity, dissimilarity of culture and goals, and lack of ability to coordinate collaboration, are all factors that may impede motivation, thereby influencing capacity to innovate, and eventually deter players from cross-chain collaboration.

(NHO, 2016) focuses on collaboration as an important enabler of the bio economy in Norway, arguing that a circular bio economy will only be achieved through exchange of competence and technology between sectors (NHO, 2016).

NHO (2016) identify four comparative advantages in Norway (see Table 10):

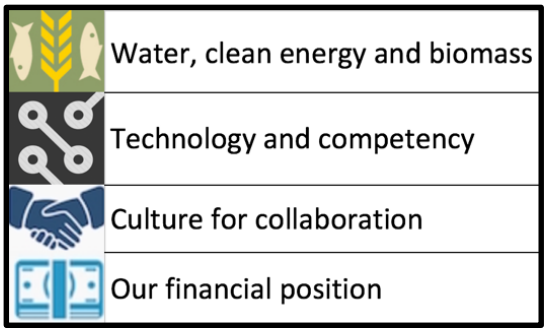

Table 10: Comparative advantages in Norway. *The table lists the four comparative advantages in Norway, identified by NHO (2016).*

NHO (2016) propose that, for instance, a value chain based on collaboration between agriculture, marine industries and the processing industry - all connected to hydropower - would be both economically and environmentally sustainable. Further, knowledge sharing should be increased between the research and educational sector and the industries, in order to increase the relevance and utility of research and education (NHO, 2016). NHO (2016) provides four principles as the fundament for how to achieve the goal of better exploitation and reuse of raw materials, which should be seen in relevance to Norway's comparative advantages, as well as the research on the circular economy discussed so far (EMF, 2012; Bastein et al., 2013; Vanner et al., 2014):

1. Basic need for food needs to come first.
2. A circular economy is fundamental.
3. Biomass should be used where it has the greatest value (cf. the principal of cascading).
4. The development of a bio economy in Norway depends on that it maintains and further develops existing activities within agriculture, forestry, fishing, aquaculture and manufacturing.

TNO notes that…

> …*another precondition for the successful application of biorefining is the creation of integrated bioconversion chains. These chains should cut across the agricultural, energy, chemical, pharmaceutical and agro-food sectors so that they all work together to generate high-quality products, while the waste streams can be used to produce materials, bulk chemicals and energy. These achievements, together with the development of biorefining technology, will contribute to the circular economy in the long term.* (Bastein et al., 2013, p. 63)

To further extend on the importance of involvement from governmental bodies, TNO found that the government, in order to take concrete steps towards a circular system, should create strong ties with various sectors and focus on the bio economy (Bastein et al., 2013). Through their research, TNO underlines the importance of having a facilitator that is not solely market based.

According to EMF (2012) there is a good chance for circularity to go mainstream by 2025. However, transformational efforts from the government are necessary, for instance through funding stimuli to lessen some of the risks associated with innovative, green businesses (EMF, 2012).

Several of the barriers highlighted by the European Commission (Vanner et al., 2014) can only be overcome through intervention by public and governmental forces. Dyer and Singh's (1998) framework emphasizes the benefits of co-investments and including players with complementarities. However, the European Commission's (Vanner et al., 2014) study stresses that policy support is important to attract more circular business.

NHO (2016) point to the importance of a governmental force that provides economic incentives and pave the way for an economically feasible bio economy. Reducing risk in the establishment and start-up phase is important in creating new value chains – in the bio-case, through bio-refining pilots. Risk-reducing actions can be interference decree, tax relief or contracts that secure demand (NHO, 2016). In order for the bio economy to be successful, there is a need for synergies between sectors and each link in the value chain. However, it is proposed as necessary that the business sector itself need to look past barriers and initiate collaborations between sectors.

Sempels (2014) devotes his chapter in the book *A New Dynamic: effective business in a circular* economy (Lovins & Braungart, 2014) to discuss business model innovation and collaboration as business strategy in a circular economy. Innovative advances are anticipated as a key element in securing circular transformation, and can for instance allow for more efficient collaboration and knowledge sharing, and increased use of renewable energy (EMF, 2015).

As also discussed by Lacy et al. (2014), business model innovation is a necessary step towards circular business, but as industry incumbents need to redefine the organizations' business model, implementing the principles of the circular economy might be harder than for new entrants (Sempels, 2014). Christensen (1997) mentions that incumbents often fail in their attempt to innovate, and it is thereby usually new entrants that bring the disruptive innovation. However, a driver for business model innovation among incumbents is harsh competitive conditions; if the survival of an incumbent is threatened by tough competition, the incumbent may be forced to renew its business model (Sempels, 2014).

"A circular economy by nature relies more heavily on intangible resources and tends to reduce tangible ones" (Sempels, 2013, p. 152). For business to move towards a circular economy, it needs to evaluate distribution channels and customer relationship management. "The organization of the co-creation and the management of the network of actors become an important activity that should not be minimized" (Sempels, 2013, p. 152). Moreover, the need for additional resources and activities (e.g. research and development, manufacturing, IT

development, marketing, sales) often entails the need for additional partners. As such, it is important to know that the complementary gains of productivity relate directly to the quality of the collaborative partnership.

Sempels (2013) points out difficulties for incumbents in adjusting to new business models and how complementary resources are imperative in the development of collaborative networks.

Seeing that a large part of Norwegian businesses are SMBs (Ministry of Trade, Industry and Fisheries, 2012), the following quote, retrieved from TNO (2013), highlights a challenge concerning innovation and circular business models in Norway:

> *Most entrepreneurs focus on themselves, on their own company. This is evident in the practice of collective sustainable development of industrial estates, for example, and closed-loop recycling projects in the construction sector. As a result, many entrepreneurs ignore opportunities for innovation in the chain and fail to cash in on the value of waste streams.* (Bastein et al., 2013, p. 70)

In relation to the discussion on policy standpoints, the European Commission (Vanner et al., 2014) proposes industrial symbiosis as a strategy for circular economy, in order to be better situated in optimizing the product life-cycle. Industrial clusters can be generated through innovative business models, and should be in focus as clusters better reflect the objectives of circular economy (NHO, 2016). Clusters create synergies between businesses for economies of scale, as a result of sharing services, utilities, and byproduct. The European Commission (Vanner et al., 2014) claims that industry clusters are particularly important in the need for innovation (in products, organizational structure, knowledge, or value chain).

In relevance to the objectives of our study, it will be important to assess how our sampled businesses' collaborative aspects relate to the preceding discussion. Many of the barriers and enablers concerning innovation, technology, government, clusters, and Norway's comparative advantages, coincide with the objectives of our study.

However, the research highlighted so far, has not had explicit focus on firms that operate after the circular economy concept. Jordens' (2015) research focus on how to build a collaborative advantage within a circular economy, through assessing interorganizational resources and capabilities of circular value chains[3].

[3] For an alternative take on circular value chain management, we refer to Leising (2016). She examines circular supply chains in the built environment.

The main findings in Jordens' (2015) research comprise insight into factors important for boundary conditions, technology enhancing operational resources, and managerial capabilities. "Organizational boundaries" embrace many of the underlying themes in the Relational View: joint identity (compatibility), commitment and opportunism (safeguards and knowledge sharing), and transparency. In addition, Jordens (2015) includes the focus on collective collaboration structure, and customer satisfaction.

Likewise, much of the findings in "operational resources" are covered through the discussion on relation-specific assets and knowledge sharing. The opportunity in partnerships to generate and finance innovation is imperative for a transition to circular economy, and is a competitive advantage that can be attained through increasing relation-specific assets and encouraging knowledge sharing.

"Managerial capabilities" comprise four factors that are important for how management ensures resource utilization: collaboration, coordination, integration and stabilization. Jordens (2015) asserts that collaboration occurs when there is reciprocity between the players, and that they can identify the benefits of working together (relational rents). In addition, stabilization refers to the players' ability to utilize shared knowledge and attain new.

Jordens' (2015) research is of a great benefit to our study in its focus on value chain collaboration, as a large part of the identified factors occur in Dyer and Singh's (1998) framework. Since Jordens (2015) has identified and indirectly confirmed many of the factors that Dyer and Singh's (1998) framework encompass, we see the Relational View as particularly appropriate in assessing the competitive advantage that can be attained through a circular economy.

A main critique to Jordens' (2015) framework is the view that businesses must manage entire product value cycles. This view is valuable insight into how firms and industries need to be restructured in the future, but we believe that there are several incremental steps that need to be taken before we see businesses fully incorporate value cycle perspectives, as proposed by Jordens (2015). Moreover, the birds-eye view that Jordens' (2015) research conclude on, neglects in depth analysis on firm and industry level. As such we see that our study will contribute through assessment of competitive advantages stemming from collaboration, in a circular economy. This will in turn be a valuable exploration of circular economy today, and

how Norway can shift towards a circular economy with the technologies and resources we have today, in mind.

Jordens (2015) make a valid point in that "companies that can identify and capture their synergies with other companies in partnerships are more future proof. In this process, circular value chains will emerge" (p. 59). In line with Dyer and Singh (1998), collaboration can stand as a great competitive advantage through leveraging on complementary resources.

2.4.1 Summary of Literature Review of Research on Circular Economy and Collaboration

The preceding literature review is meant to show the reader that circular economy and collaboration are subjects that often co-occur, even in different contexts. However, we discovered that none of the reviewed studies have investigated the enabler that is collaboration, and looked solely on how circular businesses values collaboration in a strategic perspective.

The technology-, financial-, knowledge- and material sharing that is needed for the proposed circular cycles to work, demands an approach vastly different from how today's business work. Therefore, we identified the need for analyzing enabling and impeding factors of a circular economy from a more strategic perspective. Thereby, collaboration is assessed as a source for competitive advantage. After assessing studies and reports that either criticize, base their research on, or take inspiration from the Relational View, as well as reviewing research on the circular economy, we believe that the Relational View is appropriate to the case of circular economy. The framework is widely recognized, it is applicable to various forms of collaboration, and it is flexible towards new contexts. As such, the many parallels between the principles of circular economy and the proposals of the Relational View highlighted above, testify that our choice of theoretical framework as basis for the analysis is appropriate. In Table 11-13 we have categorized the reviewed circular economy literature's views in accordance with the determinants and factors that are discussed in the Relational View. In chapter 5, we will discuss how the identified factors in the literature review fit with our findings.

Table 11: Enablers of circular economy. *The table summarizes factors that are referred to as enablers of a circular economy in the literature.*

Enabler	**Themes**	**Source**
Relation-specific assets	Joint product development, joint collection systems, competence and technology sharing, industrial symbiosis.	EMF (2012), NHO (2016), TNO (Bastein et al., 2013), European Commission (Vanner et al., 2014)
Knowledge-sharing routines	Reciprocity, transparency, information sharing	Jordens (2015), EMF (2012), NHO (2016)
Complementary resources and capabilities	Multiplication, technological advances, complementarity.	Jordens (2015), EMF (2012), Sempels (2013),
Effective governance	Informal mechanisms.	Jordens (2015)

Tabell 12: Lack of enablers of a circular economy. *The table summarizes factors that are referred to as lack of enablers of a circular economy in the literature.*

Lack of Enablers	**Themes**	**Source**
Lack of relation-specific assets	Inability to specialize assets.	EMF (2012)
Lack of knowledge-sharing routines	Lack of incentives from regulators.	EMF (2012), European Commission (Vanner et al., 2014)
Lack of complementary resources and capabilities	Absence of complementarities.	European Commission (Vanner et al., 2014)
Lack of effective governance	Non-alignment of power, Lack of trust, Dissimilarity of culture and goals.	European Commission (Vanner et al., 2014)

Table 13: Barriers of circular economy. *The table summarizes factors that are referred to as barriers to a circular economy in the literature.*

Barriers	**Themes**	**Source**
Incentives	Motivation of players, SMEs too narrow-minded.	European Commission (Vanner et al., 2014), TNO (Bastein et al., 2013)
Complementary resources and capabilities	Players' capabilities.	European Commission (Vanner et al., 2014)
Effective Governance	Firm legislation, economic framework, public support systems, coordinate collaboration.	EMF (2012), NHO (2016), TNO (Bastein et al., 2013), European Commission (Vanner et al., 2014)
Interfirm transactions	New business model.	Semples (2013), TNO (Bastein et al., 2013).

3 Method

This chapter first explains the choice of research design (cf. section 3.1), before it elaborates on the research strategy (cf. section 3.2), data collection techniques (cf. section 3.3.1) and analysis procedures (cf. section 3.3.2), and time horizon (cf. section 3.4). The section concludes with an evaluation of the credibility of our findings given the chosen method (cf. section 3.5). As mentioned in the literature review, Walker et al.'s (2013) *study has been particularly helpful with regards to methodological choices.*

3.1 Research Design

As mentioned initially, scientific research on the circular economy phenomenon is still at an early stage (Murray, Skene, & Haynes, 2015), and it needs to be further explored. For that reason, we opt an exploratory research design (Saunders, Lewis, & Thornhill, 2012). An exploratory study can be a valuable way of finding out "what is happening; to seek new insights; to ask questions and to assess phenomena in a new light" (Robson, 2002, p. 59). As reflected in our research question and objectives, this is exactly what we wish to achieve with our thesis (cf. section 1.3).

The greatest advantage of an exploratory research design is the flexibility (Saunders, Lewis, & Thornhill, 2012). The Ellen McArthur Foundation considers a global transition to circular economy as an inevitable outcome, and a transition that has merely begun (EMF, 2012). For that reason, we can expect changes to occur during the course of our study and an exploratory research design will enable us to adapt to these changes.

On the other hand, exploration does not always result in new insights (Saunders, Lewis, & Thornhill, 2012), although one could argue that that is a discovery of its own. Nevertheless, this is a risk we carry with our choice of research design. Also, the exploratory design limits our possibilities to infer anything about causal relationships, for which an explanatory design would be better suited (Saunders, Lewis, & Thornhill, 2012).

3.2 Research Strategy

Thus far in this chapter, we have explained *what* we want to do with our study. The following concerns *how* we proceed with our study. The research strategy is a general plan for how we tend to go about answering our research question (Saunders, Lewis, & Thornhill, 2012).

For our study we have chosen a multiple and holistic case study (Yin, 2003). We find this appropriate since the purpose of our study is to provide "an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" (Robson, 2002, p. 178), namely collaboration in circular businesses. A case study allows us to gain a rich understanding of collaborations in circular business and the processes

being enacted (Morris & Wood, 1991; Olsen, 2015). Supporting this, Dyer and Singh (1998) specify that the Relational View "focuses on dyad/network routines and *processes* [emphasis added] as an important unit of analysis for understanding competitive advantage" (p. 661).

Since there is little existing literature on circular business models in the Norwegian economy, we were forced to look to actual cases of circular business models in order to get deep insights into collaborations in circular business (cf. section 3.3.1). Furthermore, as the Relational View reflects, collaboration can take many forms and occur in different contexts. Therefore, we needed multiple cases in order to examine whether or not the constructs of the Relational View hold for circular collaborations.

As mentioned above, we chose a multiple case study as opposed to a single case study. There are mainly two reasons for this. Primarily, using multiple cases allowed us to establish whether findings from the first case occur in other cases as well. In other words, a multiple case study can reveal whether our findings can be generalized (Saunders, Lewis, & Thornhill, 2012). We will elaborate on this in the section about validity (cf. section 3.5.2). Secondly, there are not many cases of circular collaborations in the Norwegian economy. Hence, sampling almost all circular collaborations in the Norwegian economy, we were able to assess whether there are other conditions, apart from the propositions of the Relation View, that have had significant impact on circular collaborations in Norway.

Furthermore, we opt for a holistic approach to our multiple case study. This concerns the unit of analysis (Yin, 2003). As mentioned in the introductory chapter, our main unit of analysis is the business unit (i.e. registered legal entity) within the collaboration that is directly involved in circular processes and/or routines on an operational level. As noted in the literature review, Dyer and Singh (1998) use two firms as unit of analysis. Yet, they specify that the theory applies to multiple firms as well. This underpins our choice of a holistic approach.

Coherent with the limitations of our research design, a case study limits our possibilities to infer anything about causal relationships, for which an experiment strategy would be better suited (Saunders, Lewis, & Thornhill, 2012). Furthermore, a holistic case study strategy limits our possibilities to examine internal processes within each case (Yin, 2003), although this is not the intention of our study.

3.3 Methodology

We opt a multi-method qualitative study. This means that we use several data collection techniques, and associated data analysis procedures, that are restricted to qualitative data (Tashakkori & Teddlie, 2003). There are several reasons for this. First, the exploratory nature of our study implies the need for rich and deep information in order to answer our research question. Qualitative data is predominantly associated with such rich data (Saunders, Lewis, & Thornhill, 2012). Second, the Relational View rests on abstract constructs such as *relations* and *knowledge (sharing)*. Saunders, Lewis and Thornhill (2012) argue that qualitative data collection techniques are good means of identifying and measuring abstract phenomena. Third, a qualitative method is compatible with our choice of research strategy (Saunders, Lewis, & Thornhill, 2012).

Furthermore, in our search for relevant cases, we discovered that several of the circular collaborations were in their early stages of maturing. For that reason, they were not able to provide us with relevant and solid quantitative data. This limits our ability to make quantitative analyses. Finally, choice of method will affect the results one obtains (Saunders, Lewis, & Thornhill, 2012). This is often referred to as the "methods effect"; different methods will likely lead to different results. However, it is impossible to ascertain the nature of that effect. Therefore, it makes sense to use different methods to mitigate the method effect (cf. 3.5.3).

3.3.1 Data Collection Techniques

For the data collection, we chose to use semi-structured interviews coupled with a concise online survey. Semi-structured interviews can be regarded as a middle ground between in-depth interviews and structured interviews (Saunders, Lewis, & Thornhill, 2012). Since the Relation View has finite propositions and we needed rich and deep information, we considered semi-structured interviews as a technique that fulfilled our purpose. The flexibility that semi-structured interviews provide, proved useful as the context of the circular collaborations varied with each case. This reflects the compatibility with the chosen case study strategy.

Concerning sampling technique, seeing that the size of the population (i.e. circular collaborations in the Norwegian economy) was unknown to us, we had to choose a non-probabilistic sampling technique. We employed the so-called "snowball sampling technique" (Saunders, Lewis, & Thornhill, 2012). This entails that "subsequent respondents are obtained from information provided by initial respondents" (p. 601). The initial respondents were suggested from our supervisor, Lars Jacob Tynes Pedersen, who was already familiar with a

few cases of circular collaborations in the Norwegian economy. The success of our sampling technique manifested itself as subjects eventually referred to cases we had already contacted.

Saunders, Lewis and Thornhill (2012) argue that one of the three principal ways of conducting exploratory research is to interview "experts" on the subject. For that reason, we targeted the person in each firm that is responsible for strategic collaborations and/or partner relations. Not once did we encounter a negative response to our inquiry for an interview, and we were able to interview all the subjects we identified and contacted, with the exception of three firms. These three firms did not have the resources to participate in an interview at the moment and apologized for the rejection. We successfully interviewed 15 subjects. The majority of the interviews, 12 out of 15, were carried out over a one-hour-long phone interview. Three interviews were carried out face to face at the interviewee's offices. All the interviews followed an interview guide we had prepared in advance (see Appendix B). The interview guide was designed on the basis of the sources and sub-processes associated with relational rents, in accordance with the Relational View, and consisted of open and probing questions related to these.

Initially, we wanted to interview all the entities in the circular collaborations that we identified. This would likely provide us a more complete picture of the circular collaborations. However, due to our limited time (cf. section 3.4) and resources, we realized that this was not feasible. For that reason, we chose to construct an online questionnaire in Qualtrics (see Appendix C). This was largely based on the same interview guide that we used for the interviews. To facilitate a high response rate, we made the questionnaire concise (Saunders, Lewis, & Thornhill, 2012). The questionnaire exclusively consisted of multiple choice questions with different variations of Likert-scales and a few options to complement with text if desired. The pilot tests showed an average completion time of just 6.5 minutes, which we considered positively. The questionnaire was distributed to both the interviewees and their partners in the respective circular collaborations through email. To further enhance the response rate, we kindly asked the interviewees to forward the questionnaire to a selection of partners whom they considered central in their circular collaboration. Each group of respondents (i.e. interviewee and partners) received a unique link in order to discriminate the two groups.

Apart from our limited time and resources, we had several reasons to use a questionnaire for data collection in addition to interviews. Most importantly, for the sake of triangulation (cf. section 3.5.3), it can be beneficial to use several methods of data collection (Saunders, Lewis, & Thornhill, 2012). Furthermore, the data from the questionnaire could aid us in confirming

our interpretation of the data from the interviews. This improves the credibility of our findings (cf. section 3.5).

3.3.2 Data Analysis Procedures

Data analysis concern the process of sorting, structuring and assigning meaning to the collected data (Saunders, Lewis, & Thornhill, 2012). This subsection explains which procedures we chose to analyze the qualitative data (i.e. data from interviews and questionnaire).

As mentioned earlier, qualitative data collection usually provides large amounts of data. Therefore, the process of analyzing qualitative data can be quite time consuming. The key to analyzing qualitative data is *conceptualization* (Saunders, Lewis, & Thornhill, 2012), which involves assigning meaning to the data to make it more tangible.

Considering that we managed to conduct 15 interviews – each approximately one hour long – we initially had an overwhelming amount of information to transcribe. After a careful consideration of what our analysis would require, and a consultation with our supervisor, we concluded that semantics were not imperative to our study. This enabled us to both transcribe, summarize and unitize our data in one step. The data was unitized into three-, four- or five-item Likert-scales, depending on the variance in responses, for easier reference (e.g., none-small-moderate-large extent). The categorization was devised from the four sources of relational rents and the associated sub-processes (Dyer & Singh, 1998). Before we proceeded with the search for relationships, we sent a draft of our transcription to the respective interviewees for verification (Walker et al., 2013). In the process of identifying relationships, a new category emerged different from those provided by the Relational View. This is elaborated on in section 4.6.

Questionnaires have the benefit of allowing you to codify the input prior to data collection. As mentioned before, we designed the questionnaire according to the Relatoinal View's determinants (i.e. sources of relational rents and the associated sub-processes). Furthermore, as the data from the survey was intended to supplement the interviews, the level of precision did not need to exceed that of the interviews. The questionnaire included only categorical questions ranked on Likert-scales. Consequently, the output was ordinal data. This enables us to infer comparable statistics (Saunders, Lewis, & Thornhill, 2012).

3.4 Time Horizon

In the beginning of a research project, it is important to consider the appropriate time horizon for the research design (Saunders, Lewis, & Thornhill, 2012). We chose a cross-sectional study, which aims at giving a snapshot at a particular time. This is common for master theses because most academic research projects are necessarily time constrained (Saunders, Lewis, & Thornhill, 2012), as is the case for our study. In addition, most circular collaborations in Norway are still in the early phases, as mentioned before. Indeed, it would be interesting to study the changes and development of these, which longitudinal studies are particularly useful for. However, as the Ellen McArthur Foundation (2012) points out, the transition to a circular economy takes time. Such a study would simply not be feasible for a master thesis.

3.5 The Credibility of Our Findings

The overarching goal of most academic studies is to provide new insights into a relevant field by answering the research question(s) in the best possible way. However, the answers and new insights are only as good as the credibility of one's findings (Saunders, Lewis, & Thornhill, 2012). As we progress with the study, it is inevitable for us to develop an affection for the data collected. This can give ground to subjective biases with regards to the assimilation of data and the subsequent analysis. Scientific methodology is a way of preventing subjective biases from affecting the research outcome (Rogers, 1961) . A good research design is key to obtaining relevant data as well as ensuring the credibility of your findings (Saunders, Lewis, & Thornhill, 2012). The following subsections assess the credibility of our findings with regards to reliability, validity and triangulation.

3.5.1 Reliability and Threats to Reliability

Reliability concerns whether our data collection techniques or analysis procedures will yield consistent results or not (Saunders, Lewis, & Thornhill, 2012). To assess the reliability of our study, we ask ourselves three questions posed by Easterby-Smith et al. (2008, p. 109):

1. Will the measures yield the same results on other occasions?
2. Will similar observations be reached by other observers?
3. Is there transparency in how sense was made from the raw data?

The answers to these questions are linked with the four threats to reliability identified by Robson (2002). These are *subject or participant error*, *subject or participant bias*, *observer error* and *observer bias*, and will be discussed below.

Subject or participant error concerns whether the data was collected in a peculiar context (Saunders, Lewis, & Thornhill, 2012). For instance, a subject who has recently experienced an unexpected abruption of a collaboration is likely to express a more negative perspective on collaborative relations than what the subject might express under normal circumstances. In our case there are particularly three factors we want to shed light on. First, our research is a cross-sectional case study and circular economies are continuously evolving. This will only provide a snapshot of circular collaborations in their real-life settings. Second, circular economy has increasingly gained attention – mainly positive – in research, media and from politicians. This might have affected some subjects' optimism about their circular collaboration. Third, a few subjects had recently experienced conflicts related to intellectual property with other parties. All of these are likely to have threatened the reliability of our findings with regards to subject or participant error.

Subject or participant bias concerns whether the subjects answer the questions in a certain way due to the context in which the interview is being carried out (Saunders, Lewis, & Thornhill, 2012). The typical example of a subject bias are employees answering what they think that their boss would expect them to answer. We experienced hesitation from a few subjects when we asked for their permission to audio record the interviews, but this seemed to ease as soon as we begun the interview. To mitigate this threat, we offered the subjects anonymity (Saunders, Lewis, & Thornhill, 2012), although we mostly interviewed executives and they are less likely to fear employment insecurity than subordinate employees. Therefore, we assume that the reliability of our findings was not considerably threatened by the subject or participant bias.

Observer error concerns the degree to which different researchers use different tactics/styles to collect data (Saunders, Lewis, & Thornhill, 2012). A fitting example to our case would be if the researchers asked the same question differently depending on who asked the question. We conducted all the interviews together which enabled us to correct each other in case of a divergent question framing. More importantly, we used a comprehensive interview guide with open questions and well-defined probing questions. The latter is a supported by Saunders, Lewis and Thornhill (2012) as a good method to lessen this threat to reliability.

Observer bias concerns the degree to which different researchers interpret the same data divergently. According to Saunders, Lewis and Thornhill (2012), observer bias is the greatest threat to reliability because it is a consequence of the inevitable subjectivity of people. To reduce this threat, we took two particular measures. If we found the subject's answer confusing, we asked affirmative questions such as "So, what you're saying is… Do we understand you

correctly?". This proved effective in several cases. In addition, we conducted the conceptualization of the three first interviews separately. Then we compared the outcomes to see if we had the same understanding of the subjects' answers and a compliant categorization. We achieved a high degree of compliance. This last method was inspired from Walker et al. (2013). Finally, after the transcribing of each interview, we sent the draft to the respective subjects for verification. This is a form of triangulation (cf. section 3.5.3) (Saunders, Lewis, & Thornhill, 2012; Walker et al., 2013).

Due to the subjective nature of several of the threats mentioned above, one can never achieve absolute reliability (Saunders, Lewis, & Thornhill, 2012). All we can do is reduce the chance of our findings being wrong. The study by Jordens (2015) supports the reliability of our findings. Jordens discovered that the interviewed value chain managers unprovoked mentioned many of the same factors that the Relational View includes. Based on the discussion of the four threats above, we conclude that the reliability of our findings is high.

3.5.2 Validity and Threats to Validity

It is common to distinguish between two types of validity: internal validity and external validity (Saunders, Lewis, & Thornhill, 2012). Internal validity concerns whether our findings really are what they appear to be. Threats to internal validity include *history*, *testing*, *instrumentation*, *mortality* and *maturation* (Robson, 2002). External validity (sometimes referred to as generalizability) concerns the degree to which our research findings are generalizable (Saunders, Lewis, & Thornhill, 2012): that is, whether our findings are applicable to other research settings (e.g., another organization or industry). Threats to external validity are mainly related to choices regarding the research design. To assess the validity of our findings we will discuss the threats to validity in the following.

Internal validity is likely to be weakened when a historical event has significant impact on current behavior and/or response (Saunders, Lewis, & Thornhill, 2012). This threat to validity is closely related to subject or participant error's threat to reliability. Especially the two latter factors mentioned under subject or participant error (cf. increased positive media and political attention, and the few cases of conflicts related to intellectual property) manifest themselves as threats to internal validity.

If subjects feel that they are being tested during the data collection, and think that the results of the research may reciprocate in some unfavorable way, their responses can be biased (Saunders, Lewis, & Thornhill, 2012). This is similar to subject or participant bias, and the same tactics to avoid threat to reliability apply to the testing threat to validity. In other words, we offered anonymity to all participants although we mainly interviewed executives. In addition, we made it clear to the subjects that our intention was to interview them as representatives for their business and the circular collaboration, rather than them personally.

Instrumentation as a threat to validity can occur if subjects are given new instructions between two batches of data collection (Saunders, Lewis, & Thornhill, 2012). For instance, if a company decides to intensify their corporate social responsibility efforts between a first batch of interviews and a second batch, this is likely to affect the results (provided the study is related to the matter). In our case, instrumentation could occur in the time slot between interview and completion of the survey. To minimize the chance of this happening, we distributed the surveys to the interviewed subjects shortly after the interview took place – at the latest three days after the interview. This had potentially two positive effects. First, it reduces the threat of instrumentation to validity. Second, subjects are likelier to provide consistent answers since they have the interview and the topic fresh in mind.

Mortality refers to the rate of participants dropping out of the study (Saunders, Lewis, & Thornhill, 2012). None of the interviewees decided to terminate the interview before we were done. However, the mortality rate for the questionnaire was unfortunately higher than we had hoped for (47%) (see Appendix C). This is likely to affect the validity of findings stemming from the questionnaire. It is worth noting that we did not experience companies starting the survey and then dropping out. In other words, the mortality above reflects the ratio of the 15 interviewed cases that did not take survey at all (7/15).

Maturation concerns the maturation of participants, e.g. learning/developing new knowledge (Saunders, Lewis, & Thornhill, 2012), and is as such conditioned on the time horizon of the study. Since we are conducting a cross-sectional study, we do not consider maturation as a threat to the internal validity of our findings.

External validity – the generalizability of one's findings – is of particular concern for case studies (Saunders, Lewis, & Thornhill, 2012). External validity requires a precise identification of the population in order to select a representative sample (Olsen, 2015). It would be difficult for us to ascertain the size of the population at a given time. Furthermore, as mentioned under

section 3.2, a case study is “an empirical investigation of a *particular contemporary* [emphasis added] phenomenon within its real life context using multiple sources of evidence” (Robson, 2002, p. 178). The goal of our study is not to deduce generalizable findings, but to give a richer and deeper understanding of circular collaborations. Based on the same arguments as for our choice of research strategy (i.e. case study), we do not expect the findings of our study to be generalizable to other research contexts. Albeit, our findings can provide insight and be relevant to the understanding of similar research problems in equivalent contexts.

3.5.3 Triangulation

“Triangulation refers to the use of different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you” (Saunders, Lewis, & Thornhill, 2012, p. 146). By this definition, triangulation has a positive effect on both the reliability and the validity of our findings. We have sought to triangulate our data collection in three ways. First, we chose to conduct a multiple case study as opposed to a single case study. Second, we sent the transcription of the interviews to the respective interviewees for verification. Finally, we triangulated the qualitative data from the interviews with qualitative data from the survey.

3.5.4 Conclusion

The research design and choice of data collection techniques and analysis procedures play a crucial role to the credibility of our findings (Saunders, Lewis, & Thornhill, 2012). Although we expect the reliability of our findings to be somewhat impaired by subject or participant error, we believe that our preventive measures with respect to the other threats to reliability result in a high degree of reliability of our findings. The same argument applies to the threat of historical events to internal validity. Furthermore, as our study is not intended to result in generalizable findings, we do not consider external validity as a relevant threat to the credibility of our findings. Nevertheless, we believe that the relatively high number of cases and appropriate method will result in insights that can be relevant to the understanding of similar research problems in equivalent contexts. Finally, we argue that the three-folded triangulation of our data collection supports the conclusion that the credibility of our findings is high.

4 Findings from Data Collection and Analysis

Chapter 4 presents the findings from our study. For a brief introduction of the cases, see Appendix A. First, we provide a categorization of the cases (cf. section 4.1). Second, we account for the governance characteristics of the companies (cf. section 4.2). Third, we highlight the companies' investments in relation-specific assets (cf. section 4.3). Forth, we outline the companies' knowledge-sharing routines (cf. section 4.4). Fifth, we present complementarities that reside in the circular collaborations (cf. section 4.5). Finally, we highlight the companies' view on the role of the government and academia in a transition to a circular economy (cf. section 4.6).

The purpose of this chapter is to give the reader a clear overview of the data that constitute the basis for the discussion of our findings in chapter 5. As such, throughout this chapter, we will put emphasis on the most noteworthy findings, be it instances with great variation, similarities or disparities. The aggregate findings from the interviews are presented in Appendix B.

From the survey, we received eight responses from interviewed companies and two responses from partnering companies. The latter is not sufficient to infer any significant statistics, and are therefore excluded from the thesis. The eight responses from interviewed companies corresponded to a large extent with our interpretation of the data from the interviews, and are synthesized in Appendix C.

The following chapters are quite comprehensive. For the sake of clarity, we have included an illustration of the components that constitute the foundation of our thesis, and how they interrelate throughout the rest of the thesis (see Figure 9).

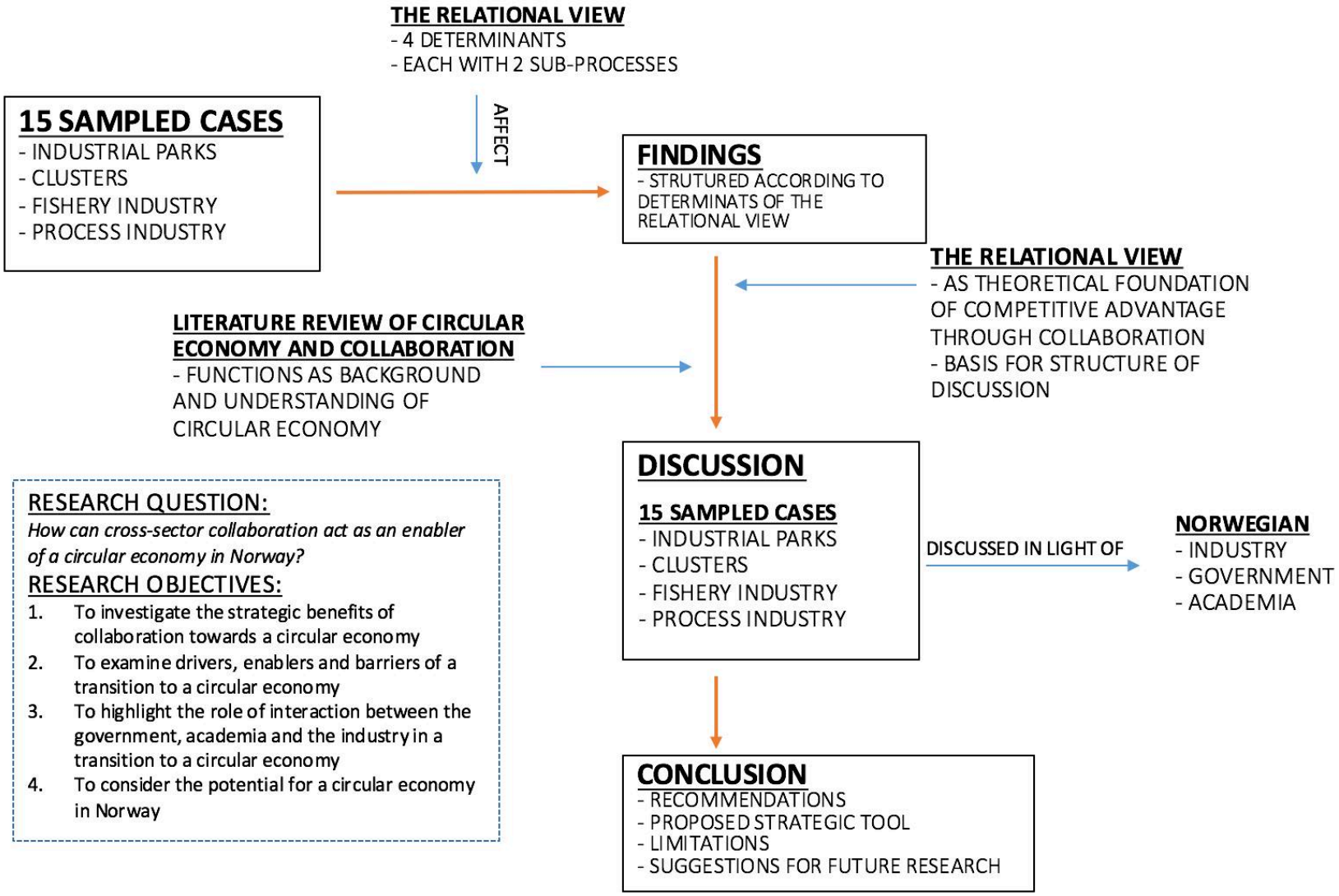

Figure 9: Roadmap of chapter 4, 5 and 6. *The figure illustrates the structure of the remaining parts of the thesis, and how the components interrelate throughout the thesis. The orange lines represent the structure of the chapters, while the blue lines represent supporting elements.*

4.1 Categorization of Cases

In the following, we will categorize the companies into two categories. As seen from the description of the various cases in Appendix A, both sector and where they fit in the value chain differs across companies. What they all have in common is that they can be linked to the circular economy. Nevertheless, this varies to some extent. We identify Biomega, CO2BIO, Hordafor, Hofseth BioCare, Foods of Norway, Aqua Bio Technology, Nutrimar, ReSiTec, BIR and Anonymous Company as *circular companies* (see Figure 10). Our claim is based on that the ten companies' input and product composition is solely based on what can loosely be termed as *waste* – meaning that these are resources that, up until now, would not have been used otherwise. For the companies mentioned, this model has become economically sustainable, except for CO2BIO and Foods of Norway who are in a too early stage to determine the economic outcome of their projects.

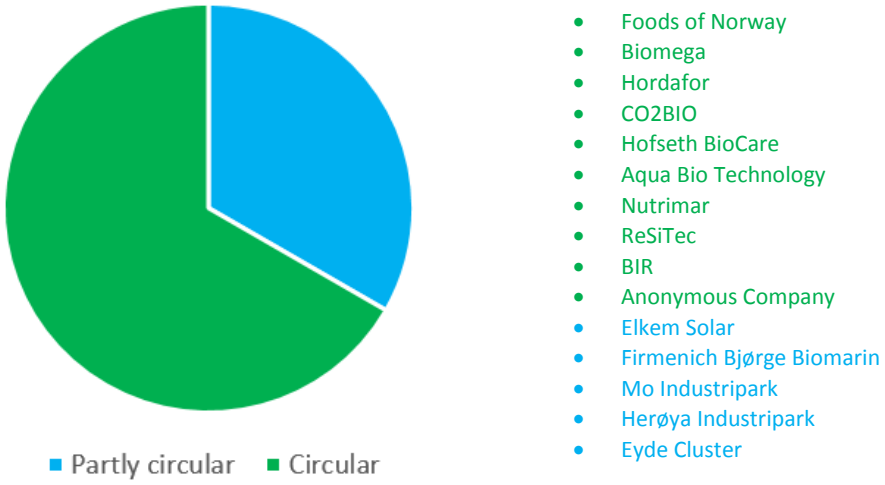

***Figure 10*: Categorization of companies.** *Ratio of circular versus partly circular companies.*

Elkem Solar, Mo Industripark, Herøya Industripark, Eyde Cluster and Firmenich Bjørge Biomarin, have all incorporated circular aspects into parts of their business. Mo Industripark, Herøya Industripark and Eyde Cluster are cases where an explicit circular model is hard to define as they act more as hosts or an administrative body for their members. We have focused on the hosts and cluster administration's goal of making their members and the interaction between them, more circular, rather than the member businesses themselves. As such, it is their views and strategies that will be reflected in our thesis. We determine them as *partly circular*, as they have coordinated residual streams (amongst other things) to be used as input, and have thereby created an additional cascade of the resources. However, many of their goals and strategies are still in an early phase, and they have all a long way to go before their potential is fully leveraged.

Firmenich Bjørge Biomarin and Elkem Solar are companies that only have projects going that are circular as of now. During the interviews we have focused on these projects and collaboration related to these. The projects are *circular* in the same way as the ten companies identified above, but, nevertheless only projects, and Firmenich Bjørge Biomarin and Elkem Solar are thereby categorized as *partly circular* as well.

4.2 Governance

In this subsection, our findings related to governance are presented. The first part encompasses tailoring of governance and what types of governance mechanisms that are most prominent. Second, the companies' perceptions of economic implications of governance mechanisms are accounted for. The subsection concludes with a brief summary (cf. section 4.2.1).

For most of the interviewed companies, the governance of their collaborations is to a large extent tailored according to the characteristics of the respective partners. However, for Foods of Norway, Nutrimar, ReSiTec and Eyde Cluster, the governance structured is conditioned on a project-to-project basis.

CO2BIO reported that it has a high degree of tailored governance because most partners are involved in the different decision-making bodies of the project. Elkem Solar operates with framework agreements with academia, which allow academia to move in and out of transactions without jeopardizing intellectual property. With smaller companies, they have confidentiality agreements as a basis followed by technology collaboration agreements when relevant. Eyde Cluster distinguishes between core companies (i.e., process firms) and technology vendors. Anonymous Company has mainly three different agreements according to the type of customer.

Firmenich Bjørge Biomarin reported that the governance of their collaborations is not particularly tailored to the characteristics of their partners: "As a responsible global company, we have clearly defined internal guidelines for what types of agreements we can enter into" said Thomson (2016). They mainly use standardized contracts. Therefore, it is difficult to push through a proposed amendment. Also Herøya Industripark operates with standard contracts between itself and member companies that regulate behavior and operations with respect to environment and the local community.

There are also interesting differences in which parts are decisive with regards to governance. For BIR it is simply the government through orders. Foods of Norway and Eyde Cluster are conditioned by their status as Center for Research-based Innovation and Norwegian Center of Expertise (NCE) respectively. CO2BIO and Nutrimar highlighted how the type of funding a project receives determines the governance. CO2BIO was initially leading the governance of

the collaboration until University of Bergen demanded knowledge creation, and Innovation Norway requested formalization of intellectual property rights in order to fund the project. Herøya Industripark said its role as host makes them central in the governance, while Mo Industripark said the process firms are principal. Elkem Solar is a large player who initially possesses the intellectual property. Therefore, it needs to lead the governance in order to secure its intellectual property. In Anonymous Company's case, who is principal depends on the customer.

All the interviewed cases reported that they employ contracts as the basis for the governance of their collaborations. However, 14 out of 15 cases also reported that they enforce the agreements between themselves. Firmenich Bjørge Biomarin is conditioned by the clear guidelines passed down from its parent company, Firmenich. As such, Firmenich can be considered the third-party enforcer. Aqua Bio Technology is currently in a twist resulting from a contractual disagreement with a client. This has resulted in a lawsuit, which underpins the third-party safeguard.

Foods of Norway also uses contracts, but the project is so big that it commits the involved partners considerably. In Eyde Cluster, the contracts formalize responsibilities and intellectual property rights. Yet, trust is also of significant importance as many of the people involved know each other professionally. Biomega and Hordafor, who operate with short duration on their contracts, rely on trust and reciprocity to retain customers and suppliers. Hordafor, Hofseth BioCare and ReSiTec highlighted an additional form of formal safeguard, namely financial hostages. They have invested in relation-specific assets with some partners, which commit the parties to the collaborations. In Mo Industripark and Herøya Industripark's case, they are talking about such large sums that it is crucial to have formal contracts as basis. Yet, Mo Industripark said the parties enforce the contracts themselves and Herøya Industripark is actively trying to increase the level of informal safeguards by hosting social and professional gatherings for park members.

The companies differ in their perception of whether their governance mechanisms reduce costs or increase revenue (i.e., creates value) for the respective collaborations. Hjelde at Biomega emphasized that trust is cheaper than alternative safeguards: "It is more expensive to acquire a new customer than to retain an old one" (Hjelde, 2016). Elkem Solar highlighted that clear contracts reduce the monitoring costs. Hofseth BioCare and Hordafor's governance does not reduce costs, but increase value by securing supply of raw materials. Herøya Industripark does not see any noteworthy effect, yet argued its governance has value for the members of the park

because it gives Herøya Industripark an overview of each member's needs, which enables the host to coordinate the satisfaction of these more efficiently. ReSiTec acknowledged that informal safeguards are more cost efficient: "Our collaborations are to a large extent built on relations, where many of our partners are acquaintances from the industry" said a company representative (Halvorsen & Moen, 2016). Firmenich Bjørge Biomarin admitted that their governance is not cost efficient; the contracts impede collaboration because they are legally comprehensive and demanding. Both CO2BIO and Foods of Norway reported that it is too early to say anything about the economic effects of their governance mechanisms.

4.2.1 Summary of findings

The majority of the cases tailor the governance of their collaborations according to the characteristics of the partners. In some cases, it depends on a project-to-project basis, some tailor the governance according to the type of customer, while others tailor the governance according to whether it is a governmental, academic or industry partner. Which part is principal in the choice of governance varies across the interviewed cases. Most of the cases employ either formal or a combination of formal and informal self-enforcing safeguards, where legal contracts are chief and form the basis in all cases. Most cases agree that their choice of governance creates value for them or the involved partners, either by reducing costs and/or by increasing revenues.

4.3 Relation-Specific Assets

In this subsection, our findings related to relation-specific investments are presented. The first part encompasses the extent to which the companies have invested in relation-specific assets and what type of relation-specific investments are most prominent. Second, an account for the companies' duration of safeguards is provided. Third, we present the companies' take on opportunism in their collaborations. Finally, the frequency and scope of resource transactions are accounted for. The subsection concludes with a brief summary (cf. section 4.3.1).

Except for Biomega, who has not made any relation-specific investments, all the interviewed companies have invested in relation-specific assets to at least some extent. All process industry companies reported they have invested in relation-specific assets to a large extent. The Anonymous Company mainly makes necessary investments itself, but tries to specialize the investments so that the partners become attached to each other (cf. formal safeguarding).

The distribution of investments between the three kinds of investments (i.e., human-asset specific, physical-asset specific, and site-specific assets) differs for each company. For the process industry companies, most operating investments have been made in site specific and physical assets, while the human specific asset investments are mainly related to R&D. In both Mo Industripark and Herøya Industripark, the member companies make their own investments, but the hosts have invested in infrastructure that enables investments in relation-specific assets between members. Gabor (2016) at Mo Industripark illustrated:

> *Mo Fjernvarme get a lot of their heat from smoke gas from Fesil Metall, through pipe lines. This is further used to heat water that is distributed to the city. The investment associated to the infrastructure for this to work, has been made by Mo Industripark AS and the local power company. The revenue goes to the district heating company, Mo Fjernvarme AS, owned by Helgeland Kraft and Mo Industripark AS.*

Herøya Industripark has also invested in a research center that members can pay to use. Elkem Solar has invested in a research center with Elkem Technologies. The former Nutrimar employee claimed that there is generally a low degree of human-asset investments in the fish farming industry.

For now, CO2BIO has exclusively invested in site-specific and physical assets to build the pilot plant, but it plans to invest in stationed researchers when the plant is completed. Apart from that, all the companies whose business is nutrients have invested considerably in human specific assets, mainly R&D, to keep up with the increased demand for innovation from both upstream and downstream players. Hofseth BioCare managed to get two suppliers to specialize their

processes according to Hofseth BioCare's needs in exchange for exclusivity. Hordafor invests in relation development with suppliers and customers so that it can better cater to their needs. BIR and more than 40 other municipalities co-invested in a biogas plant in Trønderlag. In the waste management industry, it is generally common to make co-investments in order to meet regulations from the government; smaller municipalities do not manage to fulfill the requirements themselves. Anonymous Company has started to invest more in human assets, primarily R&D, in order to keep up with competition.

Which collaborative party that has invested the most, also differs for each case. In Aqua Bio Technology's case, it is generally project based, but they are often more proactive than other involved parties. Firmenich Bjørge Biomarin mainly makes the investments itself. Interestingly, CO2BIO is 100% funded by governmental bodies (i.e., University of Bergen, Innovation Norway and The Norwegian Seafood Research Fund). CO2BIO's industry has not had a tradition for investing in R&D, as companies look to more practical experiences. In fact, for most of the companies in the nutrients business, governmental bodies, such as Innovation Norway and the Norwegian Research Council, have had a significant role. For Foods of Norway, Norwegian University of Life Sciences has made most of its investments in relation-specific assets, while the Norwegian Research Council has supported with pure financing. On the contrary, Herøya Industripark and Mo Industripark have had to make most of the investments themselves. Herøya Industripark even funded a project that aimed at identifying and highlighting the potential for leveraging residual streams in the park, but the members themselves rarely take such initiatives.

Regarding the duration of safeguards in the cases' most important relations, there are particularly four findings we wish to highlight. Consistently, the process industry companies have long durations (i.e., five years or more), with Herøya Industripark having some up to 70-80 years long. The reason for this is the heavy investments that this industry is characterized by and the associated long pay-back period. Second, Firmenich Bjørge Biomarin and Aqua Bio Technology generally also have long durations on their safeguards, in contrast to the other companies in the nutrients business. The difference is that Firmenich Bjørge Biomarin and Aqua Bio Technology's most important relations are with their customers, who are large global producers with strict supplier quality requirements and, consequently, high supplier replacement costs. Biomega and Hordafor, on the other hand, face volatile demand from customers and supply from suppliers. For that reason, the legal contracts are relatively short-term, yet they endeavor to build long-term relations. Fourth, CO2BIO and Foods of Norway

are projects that are financed by governmental grants and the duration of their relations are therefore conditioned by the respective grants' predetermined time horizon (i.e., 5-8 years).

In relation to opportunism, Biomega emphasized that it is hard to completely hedge against. Aqua Bio Technology highlighted the exclusivity and duration of agreements as preventive against opportunism. Adding to this, Hofseth BioCare mentioned that the symbiosis of mutual dependence mitigates opportunism. Even though largely based on trust and reciprocity, Eyde Cluster has a defined "code of conduct" and believes the knowledge-sharing process will become more formalized through Eyde Innovation Center. Foods of Norway reported that opportunism is accounted for in the contracts, albeit not necessarily through the duration of the contract.. Herøya Industripark explained how monopolies easily can occur for certain resources in an industrial park, and consequently price manipulation can be tempting. Informally, the host tries to encourage refrainment from monopolistic behavior through dialogue with relevant companies. Formally, the host opens the park for outside bidding on certain resources to increase competition in order to regulate prices. Firmenich Bjørge Biomarin has no real competitors in Norway, and argued that more competitors would benefit Firmenich Bjørge Biomarin as it would both increase awareness of and expand the market for its products.

Regarding the frequency of transactions, the majority of the companies expressed that they often exchange or share resources with their partners. Members of Eyde Cluster often exchange human resources since Eyde Cluster facilitates human mobility between the members. Foods of Norway reported that some projects take place at the industry partners' premises, where academia often can be involved. Hofseth BioCare collects residual raw materials daily from its suppliers, while human resources are exchanged more sporadically. Firmenich Bjørge Biomarin said that it would like to see more resource exchange in the industry generally.

Both Herøya Industripark and Mo Industripark admitted that there is too little resource exchange between the members of the parks, although they have seen an increase lately. Herøya Industripark explained that the infrastructure of the park is not optimized for reuse and sharing of residual streams. However, such an optimization is a costly process, which the member companies do not prioritize as long as they meet the requirements of both the park and the government. Herøya Industripark could have increased the rent in order to force a restructuring, but instead it focuses on providing "carrots". One measure Herøya Industripark has taken in this regard, is to prioritize potential new members that are able to leverage on existing residual streams and/or can contribute with resources that benefit existing members of the park. Without a restructuring, a price increase will inevitably become necessary because of resource scarcity.

Mo Industripark, on the other hand, said that there has never been a culture for sharing resources in the park. This makes it even harder to sell new ideas to the industrial companies. However, pilot studies initiated by academia and the government, have proved effective to get the industry on board because they provide solid calculations of expected return. Nevertheless, lack of involvement from the government has made this more the exception than a rule.

4.3.1 Summary of findings

All the companies have invested in relation-specific assets, except for Biomega and Anonymous Company. The process firms have invested most in site-specific and physical assets. Common for human-specific asset investments is that these are mainly related to R&D. For the companies in the nutrients business, state funding has had a significant role. Governmental bodies have benefitted the process firms too, but the firms have had to make most of the investments themselves. Foods of Norway and CO2BIO have received considerable funding from academia as well. The duration of safeguards varies greatly across the cases. The process firms have generally long durations. So does the companies that have exclusivity agreements. Cases where price on input/output is chief have short duration on formal safeguards, and longer duration on informal safeguards. None of the cases consider opportunism as a noteworthy threat to their collaborations. Still, most cases have some sort of mechanism that mitigates opportunism. The majority of the interviewed cases say they often share/exchange resources with their partners.

4.4 Knowledge-Sharing Routines

In this subsection, our findings related to knowledge sharing are presented. The first part encompasses the importance of knowledge sharing to the establishment of the companies, and the degree of knowledge sharing that occurs in their collaborations. Second, knowledge-sharing routines and position in network are accounted for. Third, the companies' perception of their ability to identify and leverage on novel knowledge is presented. Finally, the companies' perceptions of free-riding in their collaborations are accounted for. The subsection concludes with a brief summary (cf. section 4.4.1).

Most companies agreed that knowledge sharing has been important or very important for the establishment of their business. For CO2BIO it was crucial; their biggest financer (University of Bergen) demanded competence building in return for their investment. In Foods of Norway, all the partners have experience from working together on earlier occasions. Firmenich Bjørge Biomarin, on the other hand, was not dependent on knowledge sharing for its establishment. It was acquired by Firmenich for its access to quality raw materials and know-how related to the refinement, not as a result of existing knowledge sharing.

With the exception of Biomega and Hofseth BioCare, all the companies have experienced a medium or high degree of knowledge sharing in their collaborations thus far (cf. Appendix B). In this respect, BIR's case is particularly interesting. BIR AS is not subject to competition and is the parent company of the BIR group. As such, there are no negative consequences associated with knowledge sharing, so they share and exchange knowledge to a large extent. Elkem Solar, who are a part of an integrated value chain through Elkem and Bluestar, also exchanges a lot of information within the Elkem-umbrella. However, in the beginning, when the price of silicon was high, there was a lot of protectionism in the industry due to the race for becoming "first-to-market". As the price on silicon has dropped, players have opened more up. Furthermore, in Nutrimar's industry, characterized by many small firms with little resources for in-house R&D, the firms have relied on knowledge sharing in order to innovate and survive. Hofseth BioCare shares some knowledge with suppliers, but not vice versa, while Biomega operates in a somewhat closed environment.

With regards to knowledge-sharing routines, the interviewed companies are divided on whether they have clear routines or not. On one side, Eyde Cluster, Herøya Industripark, Elkem Solar and Mo Industripark have structured assemblies, forums and workshops. On the other hand, Foods of Norway, Biomega, CO2BIO and Anonymous Company have no clear knowledge-sharing routines. Foods of Norway and CO2BIO explained this by referring to the immaturity of the projects. Nevertheless, several of the companies participate in industry networks and the like, where regular knowledge sharing is required to sustain the membership.

When asked to describe their perceived position in the network with respect to access to valuable and novel information (i.e., information flow), all the companies reported that they perceive their position as good. Nevertheless, the explanations for the respective perceptions differ. Biomega attributed its good position to its membership in a particular industry network. This provides them with novel information early. Logically, Herøya Industripark and Mo Industripark attributed their good position to the role of their organization, namely host. Firmenich Bjørge Biomarin has its own internal project organization that deals with aspects outside its main operations and serves as a hub in its network.

Which parties contribute the most in knowledge sharing also differs quite a lot. Aqua Bio Technology explained how its position between the research community and producers entails a natural leading position in knowledge sharing. Nordvik (2016) at CO2BIO said: “our research will be industry driven, not research for the sake of research”. BIR argued that governmental parties lead the knowledge sharing because private players are too risk averse and protective.

In relation to the ability to identify valuable information latent in the collaborations, all the companies reported that their ability is either medium or high, with predominance of the latter (cf. Appendix B). Aqua Bio Technology has dedicated resources for identifying valuable novel information. CO2BIO highlighted the benefit of having several people with different roles across the parties involved with regards to identifying valuable information in the collaboration. Elkem Solar, on the other hand, being a large and specialized player, considers itself as the source for novel information in their network. ”There are other companies that see potential in our sidestreams, like Norsk Gjenvinning and Høst Verdien i Avfall. But we have to a large extent stood for the identification of markets ourselves” said Gløckner (2016) at Elkem Solar. Mo Industripark and Herøya Industripark reported that it is easier for them as hosts and coordinators to identify valuable information in the park than for the member enterprises individually.

When asked how the companies perceive their ability to leverage the identified information, the responses are more diverse. Hordafor emphasized its years of experience in the industry as key to identifying what information is relevant and valuable to its business. Østervold (2016) at Hordafor explained: “We have a lot of experience and different competence in-house, which makes us good at analyzing information”. Herøya Industripark highlighted how the history and culture of the industry impedes the members’ ability to leverage on valuable novel information: “many of the members are successful large enterprises that are content with the way things are, and don’t mind the value of leveraging on new information” (Himle, Bolstad, & Madsen, 2016).

Elkem Solar admitted it is not able to leverage all the knowledge it generates due to rigidity owing to its size. It relies on collaborations and acquirements of more flexible SMBs that are able to utilize Elkem Solar's knowledge. The smaller companies, e.g., Biomega, Aqua Bio Technology, Nutrimar and Firmenich, reported that it is crucial for them to have a strong ability to implement valuable information in order to grow.

Most of the companies do not consider free-riding a noteworthy problem. Nevertheless, some companies reported that they have deliberate mechanisms to prevent free-riding, while others have none. CO2BIO and Foods of Norway are examples of the latter, stating the project nature of their collaborations entails that all involved partners acknowledge the mutual benefit of being open. Biomega, Hordafor, Nutrimar, ReSiTec and Eyde Cluster said they rest on trust and reciprocity among partners to prevent free-riding. Elkem Solar highlighted that being a part of an integrated value chain serves as an incentive for openness and reciprocity for all parties in the value chain. Furthermore, their industry is dense; everybody knows each other, so a potential reputation as free-rider travels fast.

Aqua Bio Technology uses crystal clear confidentiality agreements to mitigate the fear of sharing/exchanging information. Mo Industripark said the members are assessed in terms of achievements, knowing that it will require openness and reciprocity. Although not a very big issue, Anonymous Company reported that there have been cases of entrepreneurs free-riding in order to establish a network and grow. Nevertheless, it has not had any such experiences with the more mature parties.

4.4.1 Summary of findings

All the companies have experienced at least some knowledge sharing in their collaborations thus far. The level of knowledge sharing seems to vary. Confidentiality and clarification of intellectual property rights can facilitate exchange of knowledge. Holding a coordinative position in the network can provide good information flow. Not all companies are able to leverage on valuable information latent in the collaborations, especially the largest corporations due to rigidness. The smaller companies are generally good at leveraging valuable information in their collaborations. Free-riding is not perceived as a widespread problem among any of the interviewed cases.

4.5 Complementary Resources and Capabilities

”Without our complementary resources we would not have succeeded as fast as we did” – Company representative at ReSiTec (Halvorsen & Moen, 2016).

> *In this subsection, our findings related to complementary resources and capabilities are presented. The first part encompasses the extent to which the companies perceive complementary resources as important and valuable. Second, their ability to identify and implement potential complementarities is accounted for. Finally, their perception of organizational complementarity is presented. The subsection concludes with a brief summary (cf. section 4.5.1).*

Even though complementary resources may be viewed as an implicit factor for circular business models, the companies differ in how they value complementarities and to what extent complementarity defines their networks. While none of the companies were identified as having zero complementary resources with their partners, only seven companies characterized their networks as having complementary skills and/or resources to a large extent (cf. Appendix B). Companies that reported a moderate to large extent of complementarities, find it enabling for achieving their strategically important goals. Anonymous Company claimed that complementarity was only descriptive of its partnerships to a small or moderate extent.

For the seven companies that reported a large extent of complementarities, various facilitating factors determine how the complementarities are leveraged. For Foods of Norway, the complementary resources come in terms of commercialization skills that the industry possesses, while Foods of Norway contributes with research competencies and resources. Conversely, Aqua Bio Technology said that it is a necessity that when it engages in new research projects, the output of the research can be commercialized. Hofseth BioCare characterized the link between it and its suppliers as imperative, as they provide input, and Hofseth BioCare possesses the resources and skills to make value out of something that otherwise would be waste. Since CO2BIO is still in its pilot face, the company value its complementary resources mainly as an interacting force necessary for creating the technology, doing the research and building the company.

Further, the two industrial park hosts see great potential value in the complementary skills and resources that reside within the member firms. However, through studying its potential, Herøya Industripark found that it does not leverage the potential. The process firms in the industry park, defined as large, independent and specialized within their field, are closed when it comes to sharing, so complementarity has been neglected. Mo Industripark on the other hand, is better at utilizing the resources of the firms in order to create synergies stemming from the waste and

skills in the industrial park. BIR values complementary resources as well, exemplifying with the case of BIR and BKK Varme, whom are completely complementary and mutually dependent.

A noteworthy case is that of Firmenich Bjørge Biomarin, who has in-house competencies and knowledge, making them less dependent on complementary partners. At the same time, their in-house resources enable them to better identify complementary resources that might be needed in their operations. Even though Firmenich Bjørge Biomarin possesses a significant amount of skills and resources in-house, project size may deem it necessary to include academic and clinical partners for the project to be conducted. Therefore, the degree to which Firmenich Bjørge Biomarin depends on and value complementarity in its network will vary.

The companies that reported a moderate extent of complementarities in their collaborations, all acknowledged the importance of complementarity in their networks. Nutrimar for instance, noted that circular concepts have not necessarily been important in its projects, so complementarity has not always been relevant. However, Nutrimar does indeed recognize the value in thinking more in line of complementarity. Eyde Cluster facilitates utilization of complementarities by linking competency (e.g., academic partners) with capital resources (e.g., test centers). Elkem Solar stated that there is more potential to utilize. Elkem Solar acknowledged that they have valuable competency in-house, but not always the capital or technology to capitalize on the opportunities. Thereby, they look for partners that possess the necessary resources. Elkem Solar highlighted that clusters could help in facilitating complementary collaborations. A company representative at ReSiTec substantiated the comments of Elkem Solar:

> *We possess technology and hire the competency and skills we need accordingly. We have used R&D-institutions' skills and knowledge for assistance in demanding projects, as well as for conducting simulations that we have not been able to do.* (Halvorsen & Moen, 2016).

As mentioned initially, Anonymous Company claimed that complementarity was only descriptive of its partnerships to a small or moderate extent. Anonymous Company explained that the lack of complementary resources comes as a result of immaturity, both regarding its own company as well as the industry as a whole. With the waste management sector being characterized by both privately- and municipality-owned actors, a main barrier for Anonymous Company has been public tenders, which make new collaborations hard to establish. As a result

of the current competitive situation in the industry, it can be hard also to identify complementary resources.

In regards to the most important complementary sources in the network, industry and academia are highlighted. Even though governmental actors like Innovation Norway and Enova have been of great importance in terms of funding, this is not considered to be a complementary resource. None of the interviewees mentioned the government, or its bodies, as provider of complementary resources.

The ability of the companies to identify complementary resources varies greatly. Six of the companies claimed that their ability is high. Mo Industripark noted that since it owns the factories and infrastructure, it is easy to gain information, but leveraging on the identified complementary resources is difficult. Nevertheless, Gabor (2016) at Mo Industripark commented:

> *The alternative for Glencore is to burn the CO-gas. Instead, they get paid for the gas as there are someone in immediate vicinity who are willing to pay for it. This is income for Glencore, and it is reduced costs for Celsa and SMA because it is a cheaper alternative. It is also environmentally friendly.*

Nutrimar and Anonymous Company said that the identification of complementary resources and skills is hard. As previously discussed, this comes as a result of competitive aspects for Anonymous Company. For Nutrimar, the reason is more ascribed to them not looking abroad.

On the subject of organizational complementarity, the companies reported both similarities and differences. Those who encounter organizational differences are either characterized as relatively small firms, or they operate on a multinational level. Among these, a reoccurring strategy to overcome dissimilarities is being flexible. Only Anonymous Company explicitly said that organizational differences are a barrier.

4.5.1 Summary of findings

The findings show that all companies value complementarities, but to a varying extent. Seven of the companies define their network relations as having a large extent of complementary resources and skills. Further, the findings show that the companies perceive their ability to identify complementary resources as relatively strong. Lastly, only a few companies reported that their collaborations are characterized by a high degree of organizational complementary. However, the lack of organizational complementarity was only in one case recognized as a barrier or a challenge.

4.6 The Role of the State and Academia

At the end of each interview, we asked the companies if they could provide any general reflections on the state's and academia's role in the transition to a circular economy. The reflections are presented in this subsection, starting with the role of the state. The section concludes with a brief summary (cf. section 4.6.1).

Several companies agreed that increased awareness among politicians about the benefits of a circular economy and a green economy is good. Yet, they would like to see more action. One company said that the state should have clearer and stricter requirements for the sustainability of businesses, and consequently monitor and sanction accordingly. Aqua Bio Technology, on the other hand, argued that there are a lot of "sticks" but not that many "carrots", suggesting incentives are more effective than orders. Hordafor supported this, stating that orders are unnecessary if the incentives are right – the creativity in its industry would induce a transformation. Nutrimar argued that a national transition to a circular economy needs to be approached top-down, suggesting the government needs to guide the transformation. Building on this, Firmenich Bjørge Biomarin emphasized that a true national transformation to a circular economy would require big multinationals to lead the way, and that the state is responsible for making foreign direct investments in Norway attractive for foreigners. Hofseth BioCare highlighted how the right rewarding scheme and/or incentives could encourage more "green start-ups". Finally, Mo Industripark pointed out a paradox: The government puts strict environmental requirements on the industry, but do not reward the good ones.

CO2BIO, Biomega, Nutrimar and ReSiTec emphasized their good experiences with financial support from governmental grants, such as Innovation Norway and the Norwegian Research Council. However, several companies reported that there is potential for improvement in the governmental grant programs. CO2BIO said it is difficult to get funding for basics, such as infrastructure, and that well-defined products and development phases are prioritized. Furthermore, CO2BIO argued the state should accept more risk in their investments and not focus too much on return on investment because it is difficult to estimate return on such investments due to the associated uncertainty, and the industry players are not at all interested in such investments. Biomega supported this, reporting it is easy to get funding for groundbreaking research when what we might need is incremental innovation. Biomega suggested that the state focuses on the easy way out. ReSiTec reported that there is a gap in governmental grants, in which support for commercialization or industrialization is overlooked.

Herøya Industripark highlighted that industrial parks have the advantage of sharing the establishment costs, but it takes a big player with a lot of capital to get the ball running. In this

connection, according to Herøya Industripark, the state has been too passive, and many industrial companies/parks feel left alone to develop the industry. Often, parks have to push the state rather than being offered pulls from the state. Mo Industripark supported this:

> *Celsa is amongst the world's greenest steel scrap smelter, which they should get paid to be. Here, the Norwegian government is absent in that they impose the industry strict environmental demands, at the same time as they are purchasing steel by price. This leads to the purchase of European and Chinese steel, whom have 8-15 times the amount of emissions as Celsa. This is a paradox in how we will succeed with the circular economy – the Norwegian government needs to make it economically feasible to produce green.* (Gabor, 2016).

Further, Mo Industripark argued that the state needs to support more pilot studies because these are easier to sell to industrial partners than mere ideas and hypotheses, as mentioned before (cf. section 4.3). The Norwegian government's expert committee on green competitiveness had a workshop at Mo Industripark with several major industry players, and they agreed on the value and potential of existing industrial clusters (e.g., optimize the utilization of residual streams and waste energy).

On the subject of academia, for most cases, academia has been a research partner (see Appendix C). For CO2BIO, however, it had a more crucial role. University of Bergen agreed to fund half the pilot plant if they could abstain from operations and rather focus on knowledge creation and exchange. Also Aqua Bio Technology highlighted the importance of academia to their business. Academia has provided and supported studies that Aqua Bio Technology has capitalized on later. Hordafor has used master's students to solve problems, yet emphasized researchers' lack of ability to convey research and research results. ReSiTec initially used academia for fundamental research and knowledge creation, but now that they are operative, they look to R&D-communities within the industry.

4.6.1 Summary of Findings

Most companies yearn more action from the state. The majority agreed that the right incentives would speed the transition to a circular economy. While some companies have benefited considerably from governmental funding, they agreed that there is still potential for improvement. These companies argued that the state should invest more in projects that are perceived as high-risk investments, but might define future business and possibly become benchmarks for sustainable value creation. The industrial parks feel left alone to develop the industry, even though they seem willing to go further than what is required by the government with respect to sustainability. Academia has been an important research partner for most interviewed companies, as they provide competence in clinical studies which in turn can justify commercialization of innovations. Academia has also funded Foods of Norway and CO2BIO.

5 Discussion of Findings

The previous chapter presented the findings from our study. In chapter 5 we assimilate the findings and emphasize our interpretation of the findings. This chapter is divided into two parts. The first part (cf. section 5.1) comprises the main discussion of the findings from chapter 4. It is structured according to the four determinants of the Relational View (Dyer & Singh, 1998), but with an open approach so that we can extend on interesting elements related to our research objectives (cf. Figure 9 above). For each of the four determinants, we end the discussion with a summary on identified enablers, barriers and drivers of collaboration, and a discussion of the findings in light of a circular economy in Norway. Part two (cf. section 5.2) concludes on the value of collaboration to the circular economy in relation to the circular business models presented in chapter 2, and discuss how these can be used to create, deliver and capture value.

5.1 Discussion of Determinants

5.1.1 Governance

In this subsection, we discuss our findings related to governance of collaborations. The first part is primarily structured so that we discuss the findings in light of theory coupled with discussion of the findings in a greater context (e.g. the Norwegian economy and circular economy). The second part (cf. section 5.1.1.1) accounts for factors that are discussed as enablers, barriers or drivers of firms' governance mechanisms, which are summarized in Table 14. Finally, we conclude on the discussion's importance to a circular economy in Norway (cf. section 5.1.1.2).

According to Dyer and Singh (1998), companies that tailor their governance according to the characteristics of their partners, are likelier to achieve a competitive advantage owing to governance mechanisms. Considering our cases are in collaboration with at least one partner (e.g. supplier and buyer), the ones that tailor the governance of their collaboration to a large extent are therefore likelier to obtain an economic advantage owing to lower transaction costs and enhanced efficiency (North, 1990; Williamson, The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting, 1985). The benefit of tailoring may increase proportionally with the number of partners in a collaboration, as it will inevitably require more customization of agreements when there are many partners versus few partners.

Our findings show that all cases employ formal contracts as a basis for the governance of their collaboration (e.g., Technical Cooperation Agreements). However, we found that governance beyond this was mainly tailored to the specific partners. Mathisen (2013) found that flexibility and continuous reevaluation of agreements to meet projects needs are important success factors (cf. Table 14). This emphasizes the value of tailoring governance, as it has potential to lead to a greater rate of success. In the following discussion, we will therefore focus on the underlying conditions that facilitate for tailoring of governance.

As seen in Figure 11, twelve out of fifteen firms reported that they tailor the governance of their collaborations to a moderate or large extent. Based on Bakke and Kjølvik (2011) it is reasonable to assume that our sample is not unique in the prevalence of tailoring governance mechanisms, as the study shows that the strategy of adjusting mechanisms to partner-specific characteristics and letting informal structures like trust govern, also occurs in other cases.

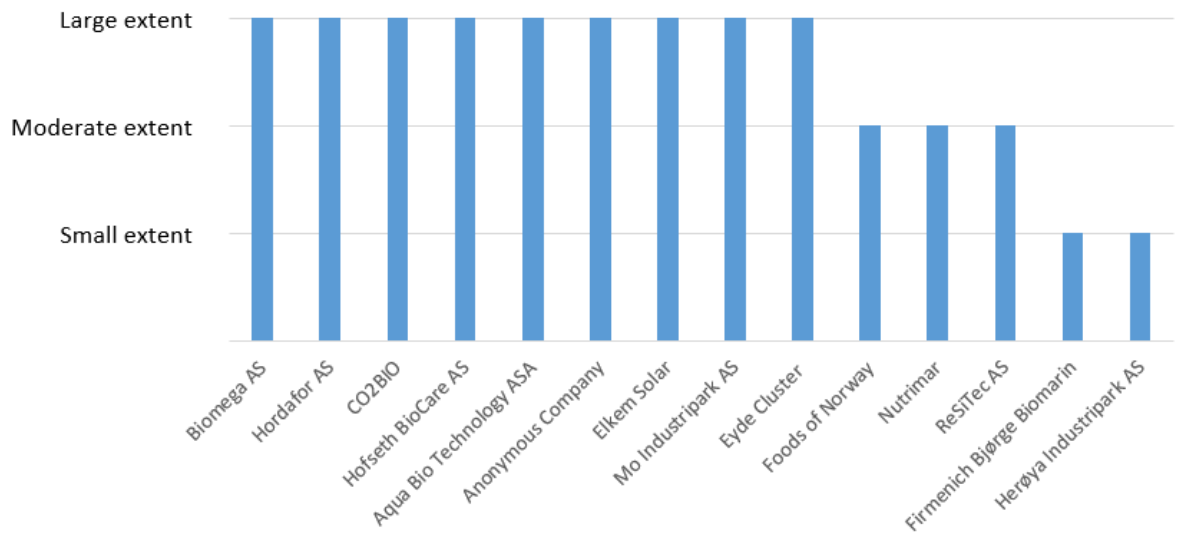

Figure 11: Tailoring of governance. *The figure shows to what extent the companies report they tailor the governance of their collaborations according to the characteristics of partners. Note: BIR is excluded because the topic was not relevant in their case.*

KPMG (2003) found that the most important mechanisms for public-private partnerships in Norway are goodwill, flexibility and a high level of trust, supporting the need for tailoring partnership structures. The study points to how the Norwegian public and private sector together have vast amounts of resources and skills to further develop industries and sectors. Seen in relation to the circular economy, it can be viewed as that public-private partnerships can be important in the transition to a more circular economy in Norway, and that these partnerships in large part should be based on trust, goodwill and flexibility. As mentioned in section 4.6, several companies referred to the idea of a top-down approach on a transition to a circular economy as an effective measure.

Fourteen out of fifteen cases also reported that they enforce the agreements between themselves – a sort of mixed self-enforcing mechanisms[4]. Poppo and Zenger (2002) emphasize that formal contracts, which include procedures for dealing with noncompliance and dispute resolution (Williamson, 1991), can encourage self-enforcement and trust because the parties know that a third-party (e.g., a court) will easily be able to settle any disputes or violations. However, they note that the effectiveness of formal contracts is likely to be altered by the level of confidence in the justice system. The Norwegian justice system ranks second in the world with respect to adherence to the rule of law (World Justice Project, 2015), and Enjolras, et al., (2012) highlight how Norwegians' trust in the justice system is exemplary from a global perspective. As such, the combination of formal contracts and trust can serve as an effective governance mechanism, not necessarily just for circular firms in Norway, but generally for firms collaborating in Norway.

Enjolras, et al., (2012) claim that the prevalence of trust among Norwegian industries comes as a result of governmental structures and public institutions facilitating favorable market conditions. Since Enjolras, et al.'s, (2012) results encompass a broad perspective of Norwegian business society and culture, it is reasonable to adopt the notion that trust is a mechanism that will be transferred to the governance of collaborations as well. This coincides with our findings, showing that trust is often used as a governance mechanism in order to increase tailoring and flexibility.

Andersen (2006) point to that flexibility and informal mechanisms can be profitable, and that informal mechanisms increase the flexibility of governance. As there is a high degree of trust in Norwegian public and private business sector (Enjolras et al., 2012), this can increase businesses' ability and willingness to adapt governance to partner-specific characteristics and objectives. Our interviews eliciting a medium to high degree of tailoring amongst most of the companies, are thus consistent with Enjolras et al.'s (2012) claim, and can prove to be profitable for the collaborations (Andersen, 2006). Governance mechanism may thereby increase the profits of firms transitioning to circular business models through close collaborative networks, making it more economically sustainable, entailing that trust, flexibility and openness are enabling factors of a circular economy transition (see Table 14). Increasing partners' ability to

[4] The theory is somewhat ambiguous as to whether this sort of governance qualifies as third-party, formal and/or informal self-enforcement. Nevertheless, Dyer and Singh (1998) refer to Borch's (1994) notion that many successful alliances in practice employ multiple governance mechanisms. For the sake of clarity, we have adapted this notion and chosen to categorize this sort of governance as a mixture with predominance of either one or the other.

engage in cost-efficient collaborations may provide for a more attractive starting point, as well as the continuation of the collaboration, thereby driving the circular economy partnerships (see Table 14). Firmenich Bjørge Biomarin support this notion, claiming that their low degree of tailoring is not cost-efficient.

The companies tailor the governance of their mechanisms for different reasons. For instance, Elkem Solar uses two very different safeguards towards academic partners and technology vendors, namely framework agreements and technology cooperation agreements, respectively. Jakobsen and Aarset (2002) found that firms perceive costs of buying R&D services as a barrier for engaging in relationships with academia. Seeing that such collaborations can be valuable in the transition to a circular economy, it is important to have governance mechanisms in place that facilitate for more collaboration between industry and academia. Firstly, effective governance can lower transaction costs if the partners are flexible, open and trustworthy in their enforcement of agreements. Our findings show that this is the case for the majority of the interviewed companies, and it appears to extend to other Norwegian industries as well (KPMG, 2003; Enjolras, et al., 2012; NHO, 2016). Such favorable governance mechanisms can affect the interactions between the collaborative parties, facilitating for increased awareness of each other's goals and needs.

Furthermore, in Jakobsen and Aarset's (2002) study, industry players noted that lack of awareness about the benefit academia could offer is a barrier for engaging collaborations. Likewise, academic researchers reported that industries' lack of insight into their potential as a contributor is a main barrier to establish relations between industry and academia. This supports the notion that informal governance should be enhanced in collaborations with academia. Additionally, the academic respondents proclaimed high costs of R&D-services as a barrier (Jakobsen & Aarset, 2002). The view of academia emphasizes the importance of informal governance structures that reduces transaction costs and promote relation-specific investments, knowledge sharing and utilization of complementarities (see Table 14).

Informal mechanisms are also suggested as fruitful by Hagendoorn (2002). However, Hagendoorn (2002) suggests that short-term projects can increase the value of informal mechanism even further. In the case of circular economy, short-term projects may not be viable, seeing that short-term projects are likely to increase the relative cost of transactions due to lack of trust. This impedes cost-efficiency as a driving mechanism. Moreover, it is likely that such projects will miss out on the positive effects favorable governance mechanisms have on the

degree of investments, knowledge sharing and complementary resources, further obstructing the economic viability of collaborations.

Seeing that a larger part of our cases have focused on long-term agreements (i.e. more than 5 years), it can be the case that long-term agreements function as a facilitator for increased informal mechanisms, increasing R&D (Jakobsen & Aarset, 2002). Therefore, firms should focus on including several partners in their networks, and find innovative and value generating resources through the positives that informal, long-term contracts provide through investments, knowledge sharing and complementarities. In addition, flexible long-term agreements can be beneficial as they facilitate for more trust and openness, again providing for increased use of resources specific to the partnership.

In their study, Jakobsen and Aarset (2002) found that lack of capital is a barrier for innovation collaborations. Informal governance mechanisms can facilitate for relation-specific investments, stemming from, among other factors, increased motivation from trust, openness and insight. With a significant amount of our sample cases tailoring their collaborative agreements through informal agreements, their basis for initiating feasible research projects, both in terms of costs and outcome, can be seen as good. Extending on the previous notion that our cases can explain the situation for a larger part of the Norwegian industry (e.g.,. trust), we can then assess the basis in a large part of Norwegian industry as good in terms of conducting R&D-projects with academia.

Nevertheless, Aqua Bio Technology expressed the need for more favorable conditions for foreign direct investments, which can attract large multinationals that can pull a heavy load. Therefore, it might be necessary for more expensive short-term projects to push forward incremental steps in the transition. As the circular economy is proposed to comprise an upheaval of today's industry (EMF, 2012; NHO, 2016), both governmental investments and large companies with sufficient capital (e.g., Firmenich and Bluestar) may resolve this. In this regard, governance mechanisms may be less important, at least less informal, as our findings show that heavy investments increase the need for formality of agreements.

Thus far, the discussion in this subsection has provided ample support for how informal mechanisms can enhance the value of collaboration and associated effects. Seeing that such informal governance is prevalent with our cases, it seems odd that several companies expressed that their governance mechanisms do not generate value for them, as seen from the aggregate results in Appendix B. This suggests that there are other factors that inhibit these firms from

realizing the apparent value that their governance should offer them. For instance, Anonymous Company argued that the competitive conditions deprive them of the potential rents stemming from what they consider effective governance. Will the lack of ability to enhance value through governance, also apply for the larger part of Norwegian industries? Carson, Madhok, Varamn and John (2003) claim that firms' absorptive capacity is a direct moderator of their ability to capitalize on the value of informal governance structures. Seeing that Anonymous Company explained their ability to utilize knowledge sharing to a small extent (cf. Appendix B and Figure 14), this can be another factor explaining their incapability of achieving profitable governance mechanism. If one compares our findings to a large part of Norwegian industries, in reference to the similarities discussed above, their ability to capitalize on governance may be suboptimal.

Since only a few companies perceive their mode of governance as value enhancing, it may be the case that several of the companies still have a way to go in order to fully benefit from the competitive advantages that reside in effective governance. For instance, the majority of the companies employ contracts as the basis for the governance of their collaborations. Although we find support for the combination of formal and informal governance (Poppo & Zenger, 2002; Enjolras, et al., 2012), we argue that if the firms move towards more cross-sector collaborations, which they are likely to do in a transition to a circular economy (EMF, 2012), we can expect that their networks will eventually become more diverse. In that case, alignment between transactions and governance can become more challenging with extensive use of contracts, as this will likely require a great deal of tailoring. For that reason, we argue that firms aiming at becoming circular will benefit from accustoming themselves with informal self-enforcing mechanisms as these provide more flexibility (KPMG, 2003; Enjolras, et al., 2012; Mathisen, 2013; NHO, 2016).

Although the theory acknowledges that it takes time to develop sufficient trust for informal self-enforcing mechanisms to be efficient (Dyer & Singh, 1998), it is reasonable to believe that firms with positive experience from informal self-enforcing mechanisms are more inclined to employ such mechanisms in subsequent collaborations (Poppo & Zenger, 2002). Through our interviews and survey, we found that experience had been important for many of the firms in their agreement structures (cf. Appendix C), supporting the claim that experience with collaborations can affect governance mechanisms of consecutive collaborations (Poppo & Zenger, 2002).

5.1.1.1 Identified Enablers, Barriers and Drivers

Table 14 shows which factors were most frequently discussed as enablers, barriers or drivers of firms' governance mechanisms. These are important for how firms can generate value through collaboration. Seeing that our interview focused on firms' collaborative aspects in relation to their circular operations, the identified factors are expected to be particularly important for collaborative networks in a circular economy. Especially important is to note how the other determinants can be drivers of effective governance in collaborations. Conversely, some of the identified drivers and enablers, can also be direct barriers if they are not cared for.

EFFECTIVE GOVERNANCE:		
Enablers of favorable mechanisms	**Barriers** to favorable mechnisms	**Drivers** of favorable mechanism
Trust	Low degree of trust	Cost-efficiency
Openness	Low degree of communication	Investments
Reciprocity	Low degree of reciprocity	Complementarities
Duration	Lack of willingness to adapt to partner-specific charctersitcs	Regulation
Flexibility	Opportunism	Knowledge sharing
Experience	Complexity	
Protection of IP	Competition	
↳ COLLABORATION ↲		

Table 14: Effective governance – enablers, barriers and drivers. *The table lists enablers, barriers and drivers of effective governance, as identified through the discussion in this subsection.*

5.1.1.2 Importance to a Circular Economy in Norway

How can firms in Norway opting to become circular affect their collaborations in helping them do se? The preceding discussion has shown that through informal mechanism, firms can create a more beneficial position in regards to how they utilize resources and knowledge that resides within their network. As our 15 cases have focused a great deal on having informal mechanisms that facilitates for tailoring agreements to specific partners, they are proposed to have a strategically beneficial basis. This can increase the relationship between partners, which in turn can result in more personal ties (Abrahamsen, 2013). Eventually, tailored governance can enhance specialization within the network, enhancing resource efficiency. This can in turn

speed the transition to a circular economy in Norway and reward the proactive companies with early-adapter returns (EMF, 2012).

As discussed above, it may be that tailoring of governance is not unique for our sampled cases, but rather somewhat common for many Norwegian companies and industries (Bakke & Kjølvik, 2011). Since this is proposed to be a cost-efficient and/or profitable measure, there is reason to believe that a great part of Norwegian firms have the necessary governance mechanisms in place to be economically sustainable in transforming towards becoming more circular.

Informal governance mechanisms in collaborative networks can have a direct effect on the circular economy as it facilitates for more interfirm interaction through tailoring, creating a base for increased amounts of knowledge sharing, investments and complementary resources. Consequently, governance mechanism can create a basis for the success of the subsequent determinants, which further will affect the firms' and networks' circular economy success. Additionally, flexibility in governance mechanisms is important to ensure that the firm is able to utilize collaborative partners' resources and skills. In a circular economy, with focus on cross-sector collaborations, firms will necessarily encounter partners with varying goals and characteristics. Emphasizing flexible governance mechanisms can therefore be a strategic benefit to a circular economy in Norway.

However, our findings lead to the discussion on complexity and competition as barriers to leverage the economic potential of effective governance mechanisms. Even though firms utilize informal factors to tailor and govern agreements, we found that economic value from mode of governance was not necessarily the outcome. As such, in order to further answer how firms can enhance the economical sustainability of their circular collaborations, discussion on the other three determinants is necessary.

5.1.2 Relation-Specific Assets

In this subsection, we discuss our findings related to relation-specific investments in light of relevant theory, but extend on this as we incorporate characteristics of Norwegian industry. First, we discuss the firms' degree of relation-specific investments and assess this in relation to types of asset specificity (cf. Figure 12). Second, we examine the connection between asset specificity and market characteristics. Third, relation-specific investments are assessed in light of network properties. Then, we account for co-investments. Finally, the government's role as a funder is elaborated on. Section 5.1.2.1 accounts for factors that are discussed as enablers, drivers and barriers relation-specific investments (see Table 15 for summary). Lastly, we discuss our findings' importance to a circular economy in Norway (cf. section 5.1.2.2).

Dyer and Singh (1998) propose that the more the alliance partners invest in relation-specific assets, the greater the potential for relational rents will be. Seeing that 14 of the 15 interviewed cases have invested in relation-specific assets to at least some extent, our findings are positive as the results can entail that also a larger part of Norwegian firms have conducted relation-specific investments, in reference to the previous discussion on Norwegian industry's similarities and favorable governance mechanisms (KPMG, 2003; Bakke & Kjølvik, 2011; Enjolras, et al., 2012; World Justice Project, 2015). Investments increases the competitive value of collaborations (Dyer & Singh, 1998), and the results can be assessed as proving that the Norwegian industry has an adequate starting point for becoming more circular through collaborations. However, we cannot conclude on this, as our sample size is both small and spread across different industries and sectors.

Nevertheless, through the assessment of studies conducted on Norwegian industries, we have found support for the assumption that our findings are not explicit, atypical or extraordinary. Jakobsen og Aarset's (2002) study focused on innovation and collaboration in the marine and seafood sector, and how the sector value relational investments and network partners as important for R&D. Veseth (2009) studied how increased investments between collaborating parties can have a positive effect on the relation between the parties and increase innovative capabilities. Midttun and Ørjasæter (2012) studied how investments from the government and/or the industry can trigger an innovation multiplier-effect through supplier networks, and through suppliers' networks' network. Fitjar and Rodríguez-Pose (2014) conducted a survey on 1 604 Norway-located companies and found that trust is an important predicator for choice of collaborative partners and that investments in R&D drives local collaboration.

In the discussion concerning mode of governance (cf. section 5.1), we saw that governance can affect the degree of investments conducted in a partnership. Fitjar and Rodríguez-Pose (2014) found that trust is a crucial factor that affects the dynamics of the partnership – degree of trust being influenced by choice of partner – and the amount and type of investments. Therefore, we find it reasonable to claim that the generally high level of investments come, in part, as a result of the favorable governance conditions in Norway.

However, it is notable that other factors affect the degree of investments as well. Even though investments in collaborative networks are proposed important for how economically sustainable the partnership is, the need for investments in resources specific to the network, might vary between firms and industries.

Firstly, as we have found no noteworthy correlation between type of investment and degree of investment in our results (see Figure 12 below), we see it necessary to further assess the reason behind the choice of type of partner-specific investments (human-specific-, site-specific-, and physical assets). More specifically: whether these choices are common for the Norwegian industry, and whether this can determine the possibility for economical sustainable networks through investments.

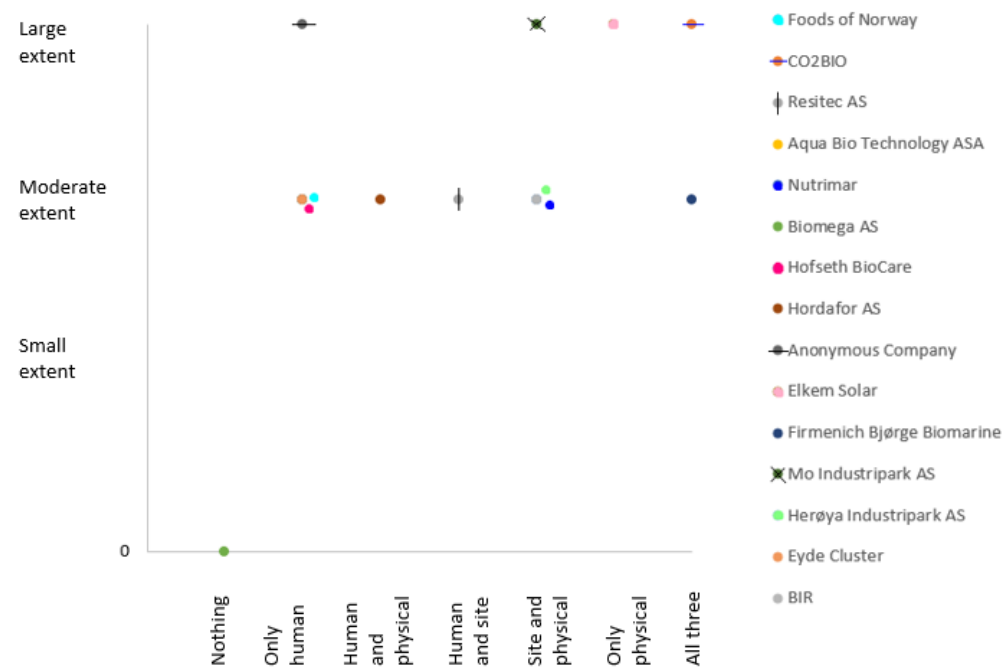

Figure 12: Correlation between extents of relation-specific investments and type of asset specificity. *The figure shows that there is no apparent relationship between extents of relation-specific investments and combinations of asset specificity*[5].

The degree of investment could be reflected in the duration of agreements, but our results show no correlation between duration and degree of investments. The only cases that can be highlighted are Biomega and Hordafor who has short-term contracts (i.e., less than one year), and reported having conducted none and some relation-specific asset investments, respectively. The duration is explained through trust, and Biomega has not experienced the need to invest in relation-specific assets. However, Hordafor reported having conducted some resource-specific investments, as well as having a great focus on competence development, entailing that considerable investments have been made. As such, we cannot conclude on the claim that duration of agreements has a significant effect on neither type of investment, nor the amount of investments. In reference to the discussed degree of trust, this is positive, as it can prove that trust, rather than heavy contractual agreements, is the facilitator for investments.

Both the industrial park hosts noted that the large physical- and site-specific investments, vital for an industrial park, make it necessary for them to employ long-term contracts. These investments, however, are not necessarily directly associated with the parks' circular activities,

[5] Eisenhardt (1989) suggests that cross-case comparison can better illustrate relationships. Selecting categories or dimensions, and then look for within-group similarities coupled with intergroup differences, is a proposed tactic. In our work, we have analyzed our findings from the Aggregate Results (cf. Appendix B) across dimensions, and coupled them with factors like firm size, revenue and turnover. In this paper, we have chosen to highlight those most salient to our discussion.

and we can therefore not conclude that the duration of their agreements come as a result of investments necessary for the circular activities in the industrial park. Conversely, the circular activities can be possible as a direct effect of the duration, as this makes it possible to experiment and research on how the companies in the park can use each other's residual waste to their benefit.

It can be argued that human-asset investments are imperative for every company (Ballow, Burgman, & Molnar, 2004), but only 10 out of 15 companies mentioned that they had conducted a significant amount of human-asset investments specific to the partnership. This can be explained by the degree of mutual dependence on and resource division between their partners. Some of the companies that have invested in relation-specific human assets, have done so for the purpose of R&D (e.g. Aqua Bio Technology, Hofeseth BioCare, Foods of Norway, and Eyde Cluster). This has mainly taken the form of a joint research center or collaboration with academia. As such, they are connected through the purpose of R&D-progress and future projects, rather than the need to educate workers for the sake of the collaboration. Except for Anonymous Company, the result can prove that partners connected through research goals, can engage in human-asset investments in the partnership.

To extend on this, in Jakobsen and Aaset's (2002) report, the industry respondents said that academia and research institutions play a negligible role. This does not coincide with our findings (see Appendix B), which can elicit an industry that has established closer relations with such institutions the last 14 years. This assumption can also be elicited from how the respondents in Jakobsen and Aaset's (2002) study claimed that R&D-relationships were mostly based on technology and equipment. Seeing that our results show a significant amount of human-asset investment, it can be the case that increased relations with academia and research partners, also increases the investments in human assets. One explanation for this can be that a circular economy demands increased knowledge of each partners' abilities, resources and goals, in order to specialize production. Additionally, this can point to that the equipment and technology needed to operate circular business models, have either been conducted independent of the collaborative networks, or that it is already-existing. The last notion can be important as it entails a basis for a more rapid transition to circular operations. Through the preceding discussion on Norway's comparative advantages (NHO, 2016), and how technology transfer from the petroleum industry (enerWE, 2015) can be utilized in the context of bio economy, it might be the case that a large part of physical-asset investments needed to operate circular bio economic processes, are already conducted.

In continuation of the discussion on bio economy investments, the seafood industry is said to be highly adaptive to innovation (Iversen, Brustad, & Jahnsen, 2010; NHO, 2016). However, Iversen, Brustad and Jahnsen's (2010) report suggests that the industry should have more specified strategies to target development of the industry. Our results can therefore entail that cases of collaborative networks, with a high technology absorptive capacity, should focus on becoming more circular in order to utilize innovation for a specific purpose. The strategic effect of targeted investments for circular economy development can thereby be important not solely for the focal firm and its collaborative network, but also for the transformation of the industry as a whole. Facilitating for more innovation through human-asset investments in the seafood industry is perhaps an initially reasonable focus area in order for the industry to transition towards circularity.

Through our interviews, we found few examples of companies that were explicitly supplier- or customer-driven. Nonetheless, it can prove insightful to assess whether single-entity focused investments make a difference to how the firms invest in partnership-specific assets. One argument can be that such focused investments create stronger bonds between the focal firm and the entity in focus. This in turn can enable specific investments that are even more tailored to suppliers or customers. Aqua Bio Technology for instance, makes human-asset specific investments with their customers (e.g., producers/wholesalers) in order to conduct clinical research to develop its products. For their products, specifically, this is essential, as consumers' needs and desires affect their customers' demand. Conversely, for companies like Biomega, Hordafor and Nutrimar, the products are not market driven to the same extent, making the view of the customer less crucial to the product characteristics. This can entail a difference in degree of investments for firms who have products directed at markets where consumer demands change rapidly, and firms who rather engage in circular economy with the aim to increase effectiveness and/or "greenness" of production.

The further discussion extends on types of relation-specific investments in relation to market characteristics.

Table 15 summarizes identified enablers, drivers and barriers to relation-specific investments in present section. Some companies might find it necessary to comply with governmental regulations, and others might find value in waste streams not previously used in value creating production, independent of governmental encouragement. It may be the case that how firms' products need to comply with market characteristics can have an effect on how firms allocate their investments, and whether they find it necessary to invest in assets specific for the

collaboration. By extension, studies of circular economy (EMF, 2012; Lacy, Keeble, & McNamara, 2014) claim that as the consequences of persevering the linear economy become more intrusive to consumers, their preferences will pivot in favor of those brands who can document positive social and environmental effects, suggesting that investment efforts will likely pivot accordingly. A study ordered by World Wide Fund for Nature (WWF, 2016) underpins that this behavior is already present among Norwegian consumers.

Hofseth BioCare's network-investment strategy is supplier driven. The business model could facilitate for controlled investments and close dialogue, but as the results shows, they have conducted some human-specific investments, and have a low degree of knowledge sharing (see Appendix B). Hofseth BioCare answered that they see value in having a small network of only two suppliers. An explanation is that the suppliers have conducted production-adaptation investments. This increases the interdependence between the involved parties, as well as creating an exclusive symbiosis that substantiates the trust for each other. Hofseth BioCare uses this as a selling point, referring to increased quality in its products. This accords with Dyer and Singh's (1998) notion that physical-asset specialization has proved to allow for product differentiation and may increase the product quality (Clark & Fujimoto, 1991; Nishiguchi, 1994).

It can be reasoned that focal firms with large networks do not experience the same commitment and interdependence, making it necessary to enhance ties to increase effectiveness of the collaborative network (Capaldo, 2007). One such strategy is increased investments (Dyer & Singh, 1998). Moreover, larger networks can increase the possibility of spillover-effects through, for instance, knowledge- and competence sharing, which can enhance the benefits of the circular economy (Uzzi, 1996; Norwegian Innovation Clusters, 2015). This is a concrete argument for why collaboration in networks can be imperative for the development of the circular economy.

One example of a large and systemic network is Eyde Cluster. There is increasing support in clusters' role of transforming and renewing Norwegian industry (Norwegian Innovation Clusters, 2015). Increased degree of clusters (and networks) may increase the network effects between firms and industries (Veseth, 2009; Innovation Norway, 2015). When these clusters focus on circular projects, the positive spillover-effects can elicit more circular projects and businesses (Fitjar & Rodríguez-Pose, 2014). Cluster members provide resources (e.g., human and/or physical). These can either be direct or indirect investments (e.g., that a company opens its knowledge base, or that it actively participates in projects). Increased involvement and

dependence of the cluster structure and its members may increase the likelihood of investments, affecting the outcome of cluster projects and goals, as well as the possible spillover-effects. In turn, this might be beneficial for the attractiveness of becoming more circular, seeing that the more firms invest in circular economy projects and concepts, the more economically sustainable circular companies can become.

Industrial parks, like Mo Industripark and Herøya Industripark, have increased spillover-effects through their geographical proximity. The circular business models of these parks are in great part based on residual waste streams, implying that location proximity can positively influence the circular economy without the need of project-specific investments. This is peculiar seen in relation to the Relational View (Dyer & Singh, 1998), as it is not the investments that bind the companies together, but rather the duration of agreements as a consequence of being situated in an industry park.

Only a few firms say they have conducted co-investments (namely Aqua Bio Technology, ReSiTec and Elkem Solar). Seeing that co-investments can increase mutual dependence (Dyer & Singh, 1998), our cases might signify a lower degree of competitive advantage than optimal. We base this argument on four possible explanations. First, the governance mechanisms that are in large part based on trust can entail that additional investments are not needed to further cultivate dependence. Second, with a significant proportion of the interviewees claiming that they have received at least some funding support from the government, large additional investments might not be necessary for the collaboration. Third, engaging in co-investments might demand costly agreements and contracts. Finally, the absence of co-investments may indicate that ownership is still prevalent among companies.

Nonetheless, co-investment is an important source of competitive advantage, and long-term agreements can facilitate for better-coordinated co-investments (Kogan & Tapiero, 2009). As such, firms who withstand from co-investments with their collaborative partners miss out on long-term competitive advantages (Kogan & Tapiero, 2009), which would make the collaborations increasingly sustainable in an economic sense. Therefore, it can be the case that the sampled companies could attain added value through increased co-investments.

Based on the argumentation so far, a relatively high degree of human-asset and physical-asset investments may be typical for collaborative networks in Norway, also beyond those interviewed in this thesis. Why? On one hand, favorable governance that is significant in firms and industries nationwide can explain the degree of investments. On the other hand, factors

determining the focal firms' type and degree of investment specific to the collaboration can be attributed to other factors than trust, for instance the size of network, the product-to-market focus, R&D-focus, as well as firm size. We have found support for variance in focal firms' focus on these factors through our interviews, as well as for other industries (Jakobsen & Aarset, 2002; Veseth, 2009; Fitjar & Rodríguez-Pose, 2014). On this assumption, both variances and similarities can further be ascribed to the general Norwegian corporate culture consisting of many SMB's, a high level of trust, and involvement of academia and government (Enjolras, et al., 2012; Ministry of Trade, Industry and Fisheries, 2012).

The government's role has thus far been assessed to a small degree. Midttun and Ørjasæter's (2012) study refers to Maynard Keynes' (1936) theory on the government's potential in transitioning economies. Further, Midttun and Ørjasæter (2012) assessed how governmental interaction can trigger innovation in not only a focal firm's networks, but also its innumerable associations to other networks and networks' networks – a multiplier effect. Additionally, the authors claim that with the right incentives and resources, firms can unite through collaboration, and overcome the urge for competition (Midttun & Ørjasæter, 2012). As the Norwegian government's role was by several interviewees described as being absent and too weak in the transition towards the circular economy (cf. chapter 4), it can be important to discuss both why, and whether it should administer in a more significant role.

Eight of the interviewees claimed that governmental bodies (e.g. Innovation Norway, the Norwegian Research Council and Enova) constituted a significant role for investments specific for the network (cf. Appendix B). In CO2BIO's case, governmental institutions have made all the investments. The argument for *why* is largely based on the industry's risk aversion towards R&D-projects. Even though the case of CO2BIO is rare, our sample shows that governmental institutions as funders are rather common. Is this solely based on industry risk aversion, or is our sample a deceptive case relative to the Norwegian industry as a whole? Following Midttun and Ørjasæter's (2012) argument, some amount of governmental investments should increase private sector willingness to invest. This can prove to be correct also in our case, seeing that most of the interviewed companies referring to governmental investments also note that the government has solely engaged in the companies and/or projects as funders. As such, it may be that governmental funding works in accordance to Midttun and Ørjasæter (2012), in that it signifies a solid foundation, but that the industry has to build product value and commercialization itself.

A challenge with the Norwegian economy consisting of a large amount of SMBs (Ministry of Trade, Industry and Fisheries, 2012), is the difficulty of connecting available capital with SMBs (Isachsen, 2002). In his article, Isachsen (2002) explains this by information asymmetry, claiming that the SMBs usually know more about the projects than the potential investors. Isachsen (2002) supports the notion that the Norwegian government's focus on SMBs has mainly been to fund the start-up phase up until commercialization. As such, we can assume that our cases are not merely an exception, but rather the rule. Norman, Reve and Roland (2001) argue in their book that Norwegian ventures have had a significantly higher return than Oslo stock exchange, signifying that venture capital can be valuable. On the other side, Mazzucato (2013) argues that in order for "industry revolutions" to happen (i.e. long-run innovation led growth), more governmental intervention and risk taking is needed. In the case of the circular economy, this can be a valuable argument, as it is clear that for whole industries and nations to become circular, major investments, transitions and regulations are needed (EMF, 2012; Bastein, et al., 2013). With rising insecurity towards the oil industry as a driver of the national and world economy in the future (Innovation Norway, 2016; Olafsen, et al., 2012; The Economist, 2016; El-Katiri, 2016), both the need for investments in new technology and ideas, as well as increased risk taking, also from the government's side, may be a resort (Mazzucato, 2013).

Based on the argumentation above, we can assume that governmental bodies are important in large parts of the Norwegian industry, but that they inhabit the role of a funder. In order to drive forward and expand the circular economy in Norway, it can be essential that governments increase investments in more risk-associated projects and industries. This accords with the subjective views of our interviewees (cf. chapter 4).

5.1.2.1 Identified Enablers, Barriers and Drivers

Table 15 shows which factors were most frequently discussed as enablers, barriers or drivers of firms' relation-specific investments. These are important for how firms can generate value through collaboration. Seeing that our interview focused on firms' collaborative aspects in relation to their circular operations, the identified factors are expected to be especially important for collaborative networks in a circular economy. Especially important is to note how the other determinants can be drivers of the circular economy (e.g., government and co-investments). Collaboration with SMBs, preferably through informal governance mechanisms, can enhance investments. Short-term contracts might impede investments, as beneficial mechanisms like trust, infrastructure, and exclusivity often develop over time.

RELATION-SPECIFIC INVESTMENTS:		
Enablers of favorable mechanisms	**Barriers** to favorable mechnisms	**Drivers** of favorable mechanism
Informal governance mechanisms	Regulations	Complementarities
Strong network relations	Market demand	Market demand for green products
Collaboration with SMBs	Consumer knowledge	Market driven R&D
Duration of agreements	Perceived value of investments	Government
Knowledge-sharing	Opportunism	Co-investments
Infrastructure	Duration	
Exclusivity	Formality	
Network	Lack of co-investments	
Cluster		
COLLABORATION		

Table 15: Relation-specific investments – enablers, barriers and drivers. *The table lists enablers, barriers and drivers of relation-specific investments, identified through the discussion in this subsection.*

5.1.2.2 Importance for a Circular Economy

The discussion on resource-specific investments has proved that collaboration can be valuable for firms willing to invest in various forms of resources to enhance the capabilities that resides within the network. This is important for the transition to a circular economy since it is proposed to demand significant amounts of investments from firms, industries and government. Norway's corporate culture is beneficial in facilitating for investments across firms and networks. Investments in human assets, such as R&D, can further catalyze the transition, while physical capital investments are imperative to meet technology demands. In order to meet the infrastructure demands, increased site-specific investments are likely required.

Further, on the assumption that the transition to a circular economy is demanding in terms of investments, a more risk-inclined investment strategy will be necessary, and that the Norwegian government can preferably play a salient role in this. As such, it is proposed that governmental investments pave the way for private capital that are averse to investing in research projects. Nevertheless, we expect that market demand will drive the need for investments further, as awareness of and demand for greener products arise.

Lastly, collaboration is proposed to increase both amount and value of investments, through better-coordinated projects, and a more liberal sharing of resources. In turn, this will be advantageous for the transition to circular business, and is proposed to create an economically sustainable position.

5.1.3 Knowledge-sharing Routines

In this subsection, we will discuss our findings on knowledge sharing in light of relevant theory and juxtapose the most prominent factors with Norwegian industry characteristics. First, we discuss the degree of knowledge sharing among firms. Second, we account for firms' ability to identify relevant information and absorptive capacity. Then we discuss how firms' position in their networks can enhance the former. Finally, we highlight firms' perception of free-riding in their collaborations. When appropriate, we use scatter plots to illustrate and discuss our findings in a new perspective (cf. Figure 13 and Figure 14). Section 5.1.3.1 summarize discussed enablers, drivers and barriers to knowledge sharing for circular firms and Norwegian industries. Lastly, we discuss our findings' importance to the circular economy in Norway (see section 5.1.3.2).

According to Dyer and Singh (1998), the companies that are effective in sharing knowledge are likelier to outperform competitors who are not. Nine cases reported that they experience a lot of knowledge sharing in their collaborations. As such, some of the interviewed cases still have a way to go in order to fully enjoy the competitive advantages associated with knowledge sharing. Furthermore, it appears that deliberate knowledge-sharing routines have a positive impact on the degree of knowledge sharing as the majority of firms that reported that they have knowledge-sharing routines also reported that they experience a high degree of knowledge sharing (see Figure 13). This confirms Dyer and Singh's (1998) proposal of inter-firm knowledge-sharing routines facilitating knowledge sharing.

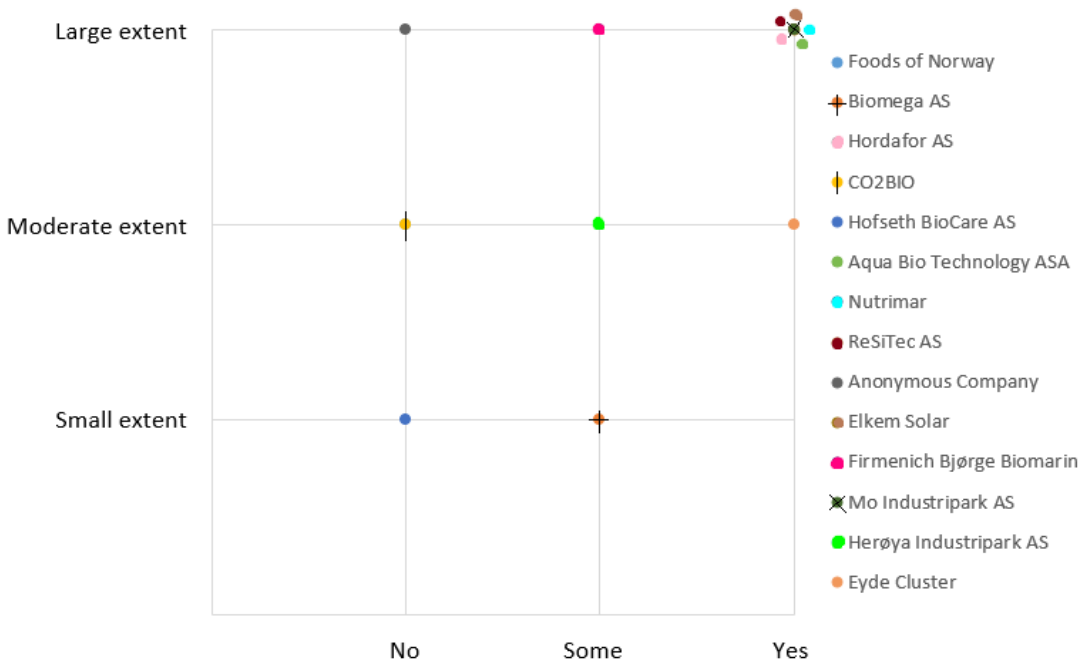

Figure 13: Correlation between having knowledge-sharing routines and the extent of knowledge sharing*. The figure shows that the companies that have deliberate knowledge-sharing routines experience a large extent of knowledge sharing in their collaborations.*

From the findings in chapter 4, we see that the cases with the highest degree of knowledge sharing in their collaborations are the ones that either have been in alliances over a longer time, are not prone to considerable competition and/or are incorporated in the value chain of a parent company. In other words, the level of knowledge sharing and exchange seems to vary with the age/maturity of the collaboration, the intensity of competition, and how integrated the collaborative partners are in the value chain. If we recall the assumption about trust developing over time, could it be that companies share more knowledge with partners the more they trust each other? If a company is prone to fierce competition, it can be that the marginal cost of experiencing opportunisms related to knowledge sharing is higher than if there is no competition (e.g., BIR's case), provided the competitors are able to assimilate and apply the knowledge commercially. Consequently, if one's suppliers and buyers are incorporated in a common value chain under the same parent company (e.g., Elkem Solar and Elkem) – in other words, working for the same bottom line – the associated risk of sharing knowledge with suppliers and buyers is probably small (if existing at all) because the suppliers/buyers have no incentives to behave opportunistic.

The findings above can also reflect first-mover advantages, assuming a transition to a circular economy is inevitable, which we have pointed out is the opinion of many scholars (cf. chapter 2). It is conceivable that the firms with the longest experience in a market (i.e., the first movers) are prone to accumulate more knowledge and experience than new entrants, and that being a first mover per definition entails low levels of initial competition (EMF, 2012). Awareness about these dynamics is therefore likely to encourage more new entrants into niche markets that have yet to be discovered with novel circular business models (EMF, 2012; Lacy & Rutqvist, 2015).

With 13 of 15 cases experiencing a medium or higher degree of knowledge sharing (cf. Appendix B), it is interesting to examine whether this is unique for our sample or if there are alternative explanations, especially since Norwegians have long had a profound reluctance to sharing knowledge (Reve T. , 2009).

Traditionally, industrial companies have not shared knowledge with one another (Reve T. , 2009). For the marine and seafood sector, Jakobsen and Aarst (2002) found that knowledge sharing is not very important for firms' R&D-processes, where the average importance score was around 20%. This does not coincide with our findings (cf. Appendix B). In the subsequent discussion, we will discuss how our findings might, nonetheless, be representative for the future of knowledge sharing in cross-sector collaboration in Norway.

It may be surprising to observe a high level of knowledge sharing from the interviewed industrial companies, considering Reve's (2009) notion above regarding tradition. However, the tradition appears to be fading. For instance, the establishment of NCEs (in particular Eyde Cluster in this case), manifest itself as a step towards a new era characterized by cooperation among Norwegian industrial companies. Two of NCE's overarching objectives are increased innovation and access to tailored competence (Norwegian Centres of Expertise, n/d). In 2014, the NCE-companies triggered or rectified 268 innovation projects and 220 projects related to knowledge development (Norwegian Centres of Expertise, n/d). Among the latter, an industrial cluster in Kongsberg, in cooperation with two academic institutions, initiated a four-year project to increase awareness about the benefits of knowledge sharing, which thus far has proved effective for knowledge sharing among the member companies (Løvhaug, 2014). The interviewed industrial firms all confirm that there is an increasing level of knowledge sharing among industrial firms.

In relation to circular economy, this is a positive trend since knowledge sharing is proposed as essential for the circular economy to evolve (EMF, 2012; NHO, 2016). Increased knowledge about and awareness of, as well as experience with, circular economy, might in turn attract more players, and evolve network collaboration. Eventually, willingness to invest in circular economy related firms and/or projects can be positively affected. These benefits come directly as a result of collaboration, proving collaborations' value for the circular economy.

A thorough analysis of the historic, current (i.e., year 2010-2012) and future (i.e., in year 2050) value creation stemming from sea related activities (Olafsen, Winther, Olsen, & Skjermo, 2012) can possibly help explain if the circular marine nutrients firms' relatively high level of knowledge sharing is unique for these firms. Keeping in mind that the marine nutrients industry is a relatively young industry (Reve T. , 2009), the industry used to be characterized by small players in an immature industry with a reluctance towards sharing knowledge. These have now grown to become part of a modern industry (Øverland, 2010). Further, Olafsen et al. (2012) emphasize how the increase in aquaculture will subsequently increase demand for marine nutrients for fish feed, and that resource scarcity will force the emergence of innovative and sustainable production methods. Olafsen et al. (2012) claim that the innovation will be driven by producers' demand, and executed by suppliers, and that collaboration and knowledge sharing between the suppliers is inevitable in the development of the fishery sector as a whole. As such, what we might be observing are the early movers of this development, and that more players (if not all) will eventually have high levels of knowledge sharing.

In order to extend on the future of knowledge sharing, we continue on the importance of clusters. The dispersion of NCEs across industries entails that we can expect this trend to expand to other industries in Norway. The aforementioned overarching goal of NCEs is to increase knowledge sharing (Norwegian Centres of Expertise, n/d). To become a member of an NCE, a firm must have solidified its position in the national market with potential for growth in international markets (Norwegian Centres of Expertise, n/d). This entails that big firms can be expected to lead the way in the development of their respective industry through knowledge sharing, which is a favorable trend with respect to a transition to a circular economy (cf. discussion of large firms pulling the load, see section 5.1.1).

Furthermore, a well-coordinated and well-structured overarching system for competence development, which NCE can be regarded as, is likelier to pick up on and allocate spillover knowledge more efficiently, than if the knowledge sharing occurred occasionally. As such, enhanced communication between NCEs can address the issue highlighted by Elkem Solar: That identification of circular business opportunities is challenging without cross-sector communication. Such a coordinative system and communication is exceptional for Norway (Reve T. , 2009), which underpins the potential for a quicker transition to a circular economy in Norway compared to other countries.

Regarding the focal firm's position in its network, Dyer and Singh (1998) argue that a firm's ability to innovate is a product of its network because learning often occurs between firms. As such, a good position in the network with respect to information flow is a good starting point for knowledge sharing. All the interviewed companies perceive their position in their respective networks as good with respect to access to novel knowledge (cf. Appendix B). This might explain why all the companies perceive their ability to identify valuable information latent in their networks as good (i.e., medium or high).

In extension to circular economy, there are two things we would like to highlight concerning positioning in networks. First, a position in a network is assessed from a focal firm's perspective and is thus necessarily subjective. Second, an effective network takes time to develop (Capaldo, 2007; Powell & Grodal, Network of Innovators, 2005; De Man, Duysters, & Saebi, 2010). As such, it is not likely that new circular firms are able to establish an effective network in the beginning. An exception to this could be a traditional firm that undertake a transformation and is able to transfer and leverage its existing network in the process. To this, Burt (1992) adds that with regards to access to information it is not always a matter of owning the information,

as much as knowing who to ask. In this connection, awareness of NCEs and NCE's efforts can play a particularly notable role in the transition to a circular economy (Reve T. , 2009).

Interestingly, on the subject of absorptive capacity, the smaller companies reported that they are better at exploiting available relevant information compared to the larger enterprises (see Figure 14). The absorptive capacity of a recipient is key to capitalize on shared knowledge (Dyer & Singh, 1998). These companies argue they rely on innovation in order to remain competitive in their business, and that it is crucial for them to absorb as much relevant information as possible.

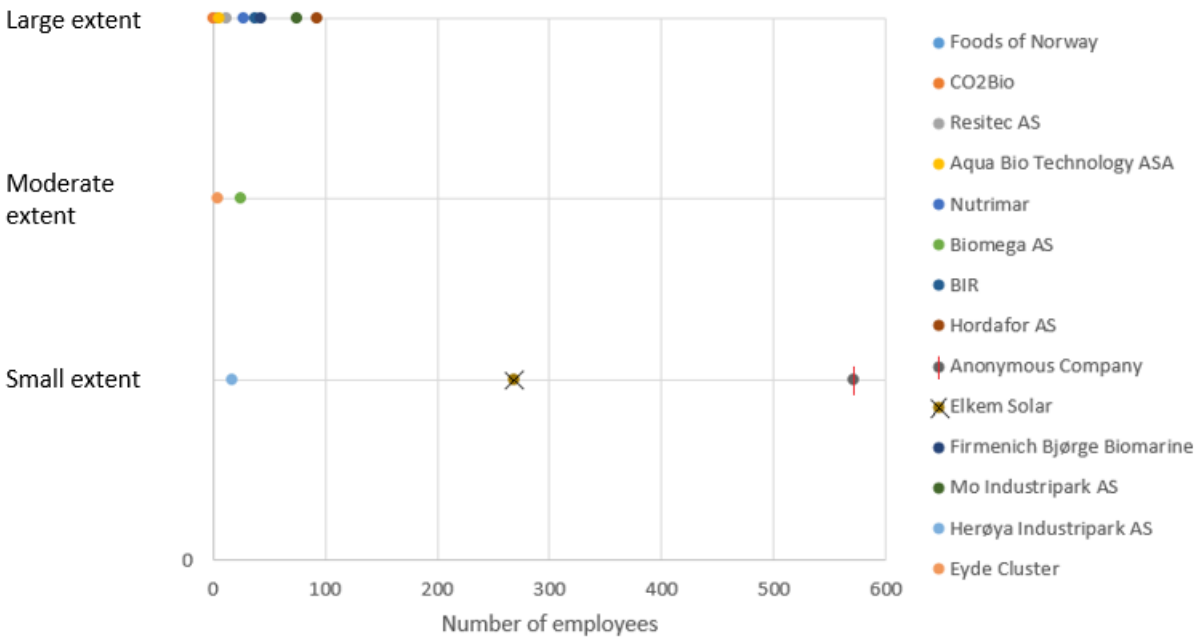

Figure 14: Correlation between size of company and expressed absorptive capacity. *The figure shows that smaller companies (expressed in number of employees) are better at leveraging knowledge that resides in their networks.*

However, a recent study (Iversen, Brustad, & Jahnsen, 2010) makes us question this finding for the fish feed companies. Although the fishery industry as a whole is deemed good at adopting new technology and streamline, it found that the smaller players' innovations do not result in satisfactory margin increases because the innovation process occurs outside the firms. That way, the knowledge that constitutes the basis for the innovation remains with the external party (e.g., academia or research institutions) and is not as market-oriented, which the authors argue increases margins, as if it was developed in cooperation with e.g. customers. Consequently, lower margins further inhibit the small players from performing innovation in-house. As such, we can question the actual absorptive capacity of the respective firms, and argue that firms should more actively participate in the innovation processes in order to build competencies and

knowledge based on *their* resources, which facilitates greater absorption (Iversen, Brustad, & Jahnsen, 2010).

Regarding free-riding, none of the interviewed companies considered this a significant issue, which we consider a noteworthy finding. A study of more than 200 Norwegian companies (Silkoset, 2013) showed that different levels of knowledge sharing had opposing effects on mitigating free-riding. Personal relations, trust, and common understanding and interpretation of information between partners had a positive effect on mitigating free-riding. However, collaborations with a high degree of formal interaction turned out to evoke free-riding (cf. discussion of governance in section 5.1.1). The rationale behind this is that formal interactions entail collective activities, and the more collective activities the more options there are to free-ride. This can indicate that our sampled firms, although they all employ formal contracts (cf. section 4.4), rely on trust and common understanding of information in their knowledge sharing since they do not experience free-riding.

For the transition to a circular economy, the arguments above infer that companies should make a transition stepwise. This way, they will less likely be subject to massive collective activities. However, as the principles of circular economy emphasize (EMF, 2012), collective efforts are vital to a transition to a circular economy. Therefore, companies should endeavor to establish allocation of responsibilities in the initial phase of a potential collaboration, e.g., by employing thorough formal contracts, and focus on nurturing trust in the collaboration. As we know from the discussion of governance in Norway, formal contracts appear to be effective against opportunism and facilitate relational governance, which in turn affects trust and willingness to further engage in value-creation initiatives – in this case, knowledge sharing.

5.1.3.1 Identified Enablers, Barriers and Drivers

Table 16 shows which factors were most frequently discussed as enablers, barriers or drivers of firms' knowledge-sharing routines. These are imperative for how firms can generate value through collaboration. Seeing that our interviews focused on firms' collaborative aspects in relation to their circular operations, the identified factors are expected to be particularly important for collaborative networks in a circular economy. Especially notable is how networks, clusters and complementarities can drive knowledge sharing, and that firms' governance mechanisms can enable favorable knowledge-sharing routines. Barriers might not always be destructive to the collaboration, but rather a hindrance to leverage on partners' valuable know-how.

KNOWLEDGE SHARING:		
Enablers of favorable mechanisms	**Barriers** to favorable mechnisms	**Drivers** of favorable mechanism
Informal governance mechanisms	Low degree of trust	Network
Routines	Low degree of communication	Institutionalized knowledge-base/-center (NCE)
Collaboration in clusters	Low degree of reciprocity	Complementarities
Duration of agreements	Inability to implement information	
Clear formal contracts	Free-riding	
Institutionalized knowledge-base/-center (NCE)	Lack of routines and complex networks	
Ability to convey research results	Destructive habits	
Protection of IP		
↳ COLLABORATION ↵		

Table 16: Knowledge sharing – enablers, barriers and drivers. *The table lists enablers, barriers and drivers of knowledge sharing, identified through the discussion in this subsection.*

5.1.3.2 Importance to a Circular Economy in Norway

After analyzing the findings on knowledge sharing, we have discovered some implications for how firms can transition to a circular economy in Norway. It is seemingly evident that more structured knowledge-development networks, like that of the NCEs, can be valuable for firms' ability and motivation to share knowledge. As such, collaboration may be valuable for the degree of knowledge sharing, thereby eliciting the assumption that collaboration can be valuable to a circular economy in Norway. Assessing our results in comparison to studies on Norwegian industry, showed that firms' absorptive capacity could be increased. This strengthens the notion of knowledge sharing through collaboration as crucial for innovation processes and competency building – both factors being essential for the transition to a Norwegian circular economy.

Additionally, knowledge sharing in collaborative networks can create a first-mover advantage, seeing that innovation and learning occurs between firms. Assuming that the circular economy will be increasingly prevalent in the future, a first-mover advantage can create significant value, and help secure a valuable network position. Consequently, an economically sustainable advantage for firms operating in a circular economy can be achieved through participating in collaborative networks where knowledge sharing is emphasized. Finally, being privileged with

a systemic knowledge-development network such as NCE, it could be that better communication between these could lead to discovery of more circular opportunities in Norwegian industry.

5.1.4 Complementary Resources and Capabilities

In this subsection, our findings related to complementary resources and capabilities will be discussed in light of relevant theory. In addition, we draw on industry characteristics that can explain how firms exceeding our sample can relate to our findings. First, a general remark on complementary resources is presented. Second, complementary resources from academia are accounted for. Third, firms' ability to identify complementarities is discussed. Then follows a thorough discussion of organizational complementarity. Finally, we account for Norway's comparative advantages in relation to complementarities. In section 5.1.4.1, we summarize the discussion on enablers, drivers and barriers (see Table 17). Lastly, we end this subsection with a discussion of our findings' importance for the circular economy (cf. section 5.1.4.2).

Dyer and Singh (1998) refer to complementary resources as resources that are more valuable when combined than separate, that cannot be easily purchased elsewhere and that they are indivisible. We wish to clarify that we will emphasize complementary resources as those that are more valuable in the network than if they would have been kept with a focal firm. For instance, Biomega's enzyme technology, Hordafor's logistic network, and Hofseth BioCare's technology, are all examples of resources that may not easily be found elsewhere on the market.

Not surprisingly, most of the interviewed cases reported that they have at least a medium degree of complementary resources in their collaborations (see Figure 15). This seems reasonable since a prerequisite for our sampling was that cases should have some degree of circularity in processes or operations, which necessarily entails complementarities (EMF, 2012). Nevertheless, the interviews proved that complementarity is a salient factor in addition to the implicitness that is inhibit in circular economy processes. Complementarity can be found in shared machinery and infrastructure, and as physical products, but also notable, complementary resources can come as know-how and skills.

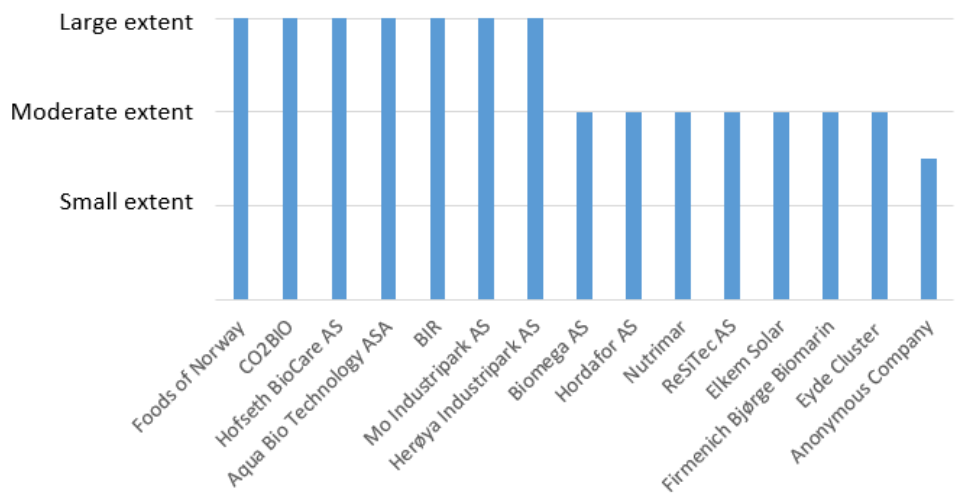

Figure 15: Complementary resources. *The figure shows the reported extent of complementary resources in the companies' collaborations.*

Several interviews proved that academia provide essential complementary resources (e.g. research competencies and funding). In our case, this outcome is often used in combination with firms' commercialization competencies, and/or as a mean to generate knowledge of how virgin input can be replaced with residual materials. It is worth mentioning that, as discussed previously, a lot of research is conducted in-house, meaning that R&D relevant for the focal firm can also come from industry partners whom have such capabilities within their firm. Nine of the companies refer to the industry as an important source of complementary resources in the network (cf. Appendix B). One such example is the industry parks (Mo Industripark and Herøya Industripark), and how the hosts conduct research to analyze the possibilities for exploitation of complementary resources between the member firms.

The medium-high degree of complementary resources in the collaborations (cf. Figure 16) is considered as a noteworthy finding. First, according to Dyer and Singh (1998), these firms are likely to experience competitive advantages stemming from complementarities through making the resources valuable, rare and inimitable. Second, it is reasonable to assume that this supports our previous assumptions that Norwegian corporate culture provide for a marketplace characterized by trust and mutuality. Third, our discussion has shown that collaboration directly affect the benefits of investments and knowledge sharing. This reinforces the already advantageous governance conditions.

A predominance of companies reported a medium to high ability in identifying complementary firms and resources (cf. Appendix B). Although the four determinants are mutually dependent on each other, complementary resources and skills might be the most tangible beneficial outcome of collaboration networks. Complementarity can increase the benefits of both knowledge sharing and investments by posing a clear motive to collaborate. Herøya Industripark and Mo Industripark, for instance, will experience an increased value of the investments in infrastructure, research, human assets, and facilitation for knowledge sharing, since the utilization of residual waste comes as a direct result of such investments. More importantly, this value comes as a consequence of focus on circular economy facilitation. One inference can thus be that complementarity can arise as a consequence of relation-specific investments and/or knowledge sharing in collaborative networks, seeing that shared resources can highlight potential for complementarity.

However, it is noteworthy that complementary resources and skills can be identified pre-collaboration as well, seeing that both the industry parks and firms like Foods of Norway reported that they, to at least some extent, assess potential partners on their complementary resources and skills. Complementary fit is necessarily a prerequisite in order to develop a circular model, but a partner can be anticipated to be increasingly valuable if it can contribute with more than input only. Further, leveraging on the complementarities can improve the rarity and inimitability of the relation-specific resources as well, underlining the importance of assessing the complementary resources and skills the potential partner brings to the network. Even though our sample consists of firms with circular models (cf. discussion in section 5.2), at least to some extent, it is not implicit that identifying complementary partners is easier for them, than for firms with explicit linear models.

Once potential partners with relevant complementarities have been identified, Dyer and Singh (1998) argue organizational complementarity is a prerequisite to leverage the complementarities. Since the majority of the interviewed companies reported that they are able to leverage complementarities within their collaboration, we would expect the companies to report at least some degree of organizational complementarity with their partners. However, we found that only a few cases experience a high degree of organizational complementarity, while the rest spoke of little organizational complementarity between them and their partners (cf. section 4.4). For instance, CO2BIO said that the industry partners (i.e., fish farmers) do not have a culture for innovating through basic research and are thus reluctant to contribute financially to the research of University of Bergen in the project. Therefore, we cannot conclude

that complementarity in processes, culture and organization is generally imperative for our sample.

As Dyer and Singh (1998) emphasize that relational rents can only be attained if the partners organizationally compatible, our results may prove that many of the interviewed firms have potential in enhancing their complementary resources specific to the collaboration. More so, this can assumingly mean that there is potential for improvements in their complementary resources related to the circular economy process. Hordafor explained that parts of their network were slow in communicating results, slowing down the process, which can suggest that process and/or system complementarity could be improved.

Many of the firms that replied that their collaborations had a low degree of organizational complementarity explained this through them being small and flexible (e.g., Biomega, Aqua Bio Technology, and Hordafor). As such, this could also apply to a vast amount of Norwegian firms, seeing that is a substantial amount of SMBs in Norway (Ministry of Trade, Industry and Fisheries, 2012). Moreover, Norwegian corporate culture (i.e., trust and reciprocity), can further explain the ability to be organizationally flexible and adaptable (Thune & Ravnaas, 2015; Larsen & Teigen, 2009). This elicits the thought that if a considerable amount of Norwegian firms are flexible and adaptable, they might also be more compatible than what they care to admit in our interviews. Another possible explanation could be that the companies have not had sufficient volume of interactions to develop organizational complementarity, but, as mentioned in section 4.3, the majority of the companies reported that they interact frequently with their partners.

Previously, we discussed how clusters can both be seen as a rising trend and a solution to how best create networks for transforming the Norwegian industry to become more circular (Norwegian Innovation Clusters, 2015). On a futuristic note, this might increase networks' perceived organizational complementarity. Eyde Cluster and Herøya Industripark both claimed to have small differences in their networks and explained that the industries in which the firms operate in are relatively similar. However, this can indeed play as a counterargument as well, based on the conviction that cross-sector networks will be the trend in the future (EMF, 2012; Jordens, 2015; Norwegian Innovation Clusters, 2015).

Perhaps an even more notable argument is that because of the assumed organizational similarity across Norwegian corporate culture, engaging in cross-sector collaborations might be easier and more effective, seeing that organizational complementarity is not a hindrance. Successively, it may be that Norwegian social and corporate culture increases firms' ability to identify complementary resources and skills, induced by the view that organizational complementarity is not an aspect that firms have to consider before entering into collaborations. As such, increased amount of industry parks and clusters might not have a direct effect on organizational complementarity. Yet, it is important to keep in mind that the potential to leverage on complementary resources and skills in a network presumably correlates with communication and investments, which can be anticipated to increase in industry parks and clusters.

The ability to identify and leverage on complementary resources can both be a starting point for engaging in networks, as well as increasing economic sustainability of collaborative relations. Such aggregate effects and outcomes will most likely play a significant role in the argumentation for how Norwegian industry is structured in the future, and presumably how it will solve challenges with resource depletion, fluctuating resource prices and new technology. Elkem Solar provided a case in point: Elkem Solar possess substantial knowledge in-house. However, due to lack of capital and resources, they are unable to leverage on all this know-how by themselves. For that reason, they have dedicated people who search for so-called "technology enablers", i.e. SMBs that possess the technology to leverage on Elkem Solar's know-how. King, Covin and Hegarty (2003) discuss the interaction between small and large firms, claiming that they often inhibit complementary resources that can facilitate innovation success. Once identified, Elkem Solar either engages in collaboration with these technology enablers or acquire them if the proprietary know-how is particularly synergy sensitive. This can explain why Elkem Solar said the complementarities in their collaborations are crucial for Elkem Solar to achieve strategic goals. Nevertheless, Elkem Solar did express concern about the difficulty of identifying potential partners' complementarities, because they have experienced that complementarities can reside within firms/industries/sectors that are not intuitive to search in.

The notion that complementarities can be hard to identify because they may reside in counterintuitive industries, is interesting. The fact that it can be hard to identify complementarities, may also pose a competitive advantage for the companies that succeed in doing so (cf. Table 3). Further, it can be an argument for the increased engagement of

collaborative networks and innovation clusters, which can solve such barriers through knowledge sharing, providing insight as to where to look. As mentioned before, NCE is an example of how innovation through networks has come as a result of governmental initiation. Also, through the interviews we discovered that complementarities are essential for firms to reach their strategic goals, increase the sustainability of their economic operations, as well as importance, of retaining complementary resources within the network. This argument can be seen as reason for why all firms should collaborate to include complementary partners as a strategic element, reducing the barrier of connecting with other firms, and inducing the notion that most firms are probably seeking complementary collaborations. Lastly, as King, Covin and Hegarty (2003) argued, the combination of small and large firms can be beneficial for leveraging on relation-specific complementarities to prompt innovation. This claim can suggest a need for facilitation of dialogue and resource allocation directed specifically at collaboration between smaller and larger firms.

Additionally, an argument for increased importance of complementary resources in strategic models, is the amplified need for technology and innovation (Reve & Jakobsen, 2001; Haugland, 2004; Powell & Grodal, 2005). EMF (2012), TNO (Bastein, et al., 2013), Jordens (2015), among others, discuss the necessity of technology and innovation in a circular economy. Exponential technological advancement and globalization has made markets pivot faster than ever (Haugland, 2004). Firms need to adapt fast in order to remain competitive. However, based on our interviews, it seems as if few companies possess all competencies and resources necessary to drive innovation themselves. This can explain why complementarities are increasingly emphasized as objectives of strategic alliances, and why collaboration is imperative for the circular economy. This can increases with specialization.

In reference to NHO's (2016) report, it can be interesting to assess Norway's identified comparative advantages (e.g., agriculture, forestry, marine and maritime industry) in light of complementarity. NHO (2016) claims that the access to biomass resources can be a crucial factor in taking a leading role in the new bio economy. Norway can be considered as the 15th largest country in the world if we include the maritime zone (NHO, 2016). Only one percent of our total produced biomass is harvested from our oceans (NHO, 2016). Also in the forestry sector, Norway has large unexploited resources. Today, Norway stands for 0.1% of the world's total biomass outtake, entailing that even with a considerable increase, we would have market opportunities globally (NHO, 2016). NHO (2016) shows that moderately adjusted numbers

assume a fifty percent increase in demand by 2050 for biomass products like feed and bioenergy.

Complementarity creates a base for unique solutions and economical gains, and this can be utilized through taking advantage of a geographical area's comparative advantages (Cortright, 2006; Karlstad, 2011). Karlstad (2011) discuss how clusters can enhance complementarity and utilize comparative advantages. Based on the previous discussion, industry parks and/or clusters can gain economies of scale based on their complementary resources stemming from proximity, investments and knowledge-sharing networks. If we see this in relation to NHO's (2016) report, we can assume that a great part of Norway's future value creation from complementarities will spring from our comparative advantages, like forestry and marine sector. Focusing on this, we do not only utilize the bio economy, which can be environmentally sustainable, but a converging towards a bio economy would also entail leveraging on Norway's comparative advantage, which is in line with Cortright's (2006), Karlstad's (2011) and Norman and Orvedal's (2010) research. This might entail an economical sustainable situation as well. NHO (2016) also claim that a bio economy can only be achieved through cross-sector collaboration by utilizing interdisciplinary technology and knowledge. For Norway, being a relatively small economy (Norman & Orvedal, 2010), such a focus can presumably strengthen the economically sustainable position (NHO, 2016).

5.1.4.1 Identified Enablers, Barriers and Drivers

Table 17 show which factors were most frequently discussed as enablers, barriers or drivers of firms' complementary resources. These are salient for how firms can generate value through collaboration. Seeing that our interviews focused on firms' collaborative aspects in relation to their circular operations, the identified factors are expected to be particularly important for collaborative networks in a circular economy. Especially notable is how clusters, technology and innovation are driving factors. Barriers are imperative to overcome, as complementary resources and skills can be crucial to the effectiveness of the collaboration, and to what degree knowledge sharing and investments occur.

COMPLEMENTARY RESOURCES:		
Enablers of favorable mechanisms	**Barriers** to favorable mechnisms	**Drivers** of favorable mechanism
Informal governance mechanisms	Inability to identify	Cross-sectorial networks
Knowledge-sharing	Inability to implement	Clusters
Investments	Lack of technology	Technology
Duration of agreements	Lack of organizational complmentarity	Innovation
Clusters	Complexity	Strategic goals
Ability to identify firms and networks	Public tenders	New revenue streams
In-house competency	Lack of infrastructure	
Infrastructure		
Organizational complementarity		
↳ COLLABORATION ↵		

Table 17: Complementary resources – enablers, barriers and drivers. *The table lists enablers, barriers and drivers of leveraging complementary resources, identified through the discussion in this subsection.*

5.1.4.2 Importance to a Circular Economy in Norway

We have found that for the future of Norwegian industry, a greater focus on innovation and clusters can be beneficial for utilizing complementary resources that resides between firms, industries and sectors. In their 2001 report on how Norway should continue as a value-generating nation in the wake of the oil and gas industry, the authors highlight both the seafood and maritime sector, and industry clusters as important. Reve and Jakobsen (2001) claim that complementarity increases as a result of pressure to innovate, meaning that competition as a consequence of customer requirements induces the need to implement complementarities in production. In addition, it may be that governmental regulation increases the need to innovate. This may in turn have the same effect as customer demand, thereby increasing the need for complementarities. As a large part of our cases are within the seafood and maritime sector, Reve and Jakobsen's (2001) study, might be valuable. Innovation can be a huge benefit to the transition towards a circular economy. As complementarity may increase innovation, our firms and circular firms to come, should indeed focus on innovation through clusters. Additionally, the government should be central in pushing forward regulation that increases competition, increasing the need for complementarities, resulting in innovation. Bergman (2012) note the

external R&D can complement internal R&D and have a positive effect on sales of new products. As such, focusing on incorporating R&D-partners can enhance value of internal innovation. This strengthens Reve and Jakobsen's (2001) claim, and is an argument that may prove the benefits of operating in clusters and industrial parks as it can facilitate for increased utilization of external resources, and increased competitive advantage as competition for innovation increases.

Organizational complementarity is advantageous to fully exploit complementarities, and Norwegian corporate culture provides for mechanisms like trust and openness, which facilitate for less barriers for organizational complementarity. Further, firms' ability to identify complementary resources and networks can be enhanced through network participation, as well as investing in geographical proximity. Complementary resources are a necessity in circular business models. However, leveraging on complementarities is not a straightforward process. These findings provide for a beneficial basis for how Norway can transition towards becoming more circular, and which factors that should be in focus.

5.2 The Value of Collaboration

In this section, we discuss the value of cross-sector collaboration for a circular economy. Even though we will not be able to pin point the real value of collaboration, neither for the focal firm, the network, nor the circular economy in Norway, we would like to end chapter 5 by discussing how our findings propose an economically sustainable situation. To begin with, the following discussion will revolve around collaboration's impact on economically sustainable transitions. This will subsequently be discussed in relation to circular business models, and how such models can lead to increased value of collaboration.

A majority of the interviewed firms fulfill Dyer and Singh's (1998) propositions, entailing that they have a great potential for obtaining relational rents through their collaborative networks. As we have argued through our discussion, even though our selection is small, we can with some degree of certainty claim that our findings are illustrative for a proportion of Norwegian industries. Extending the discussion beyond the four determinants of the Relational View, showed how the circular economy in Norway can directly benefit from collaborative networks. As such, the potential for a Norwegian circular economy being economically sustainable, can be expected to be good.

In our review of existing literature (cf. chapter 2), we found research supporting the notion that the circular economy benefits greatly from collaboration between industries and sectors. Seeing that the potential for creating economically viable networks in Norway appears to be satisfactory, the potential for collaborative networks in a circular economy can also be expected to be valuable. Therefore, the economic and governance foundation in Norway seems beneficial for the circular economy.

Referring to the studies done on the value of the circular economy (Bastein, et al., 2013; Vanner, et al., 2014; EMF, 2015; Wijkman & Skånberg, 2016), we have seen estimates predicting significant economic gains in the EU, in Netherlands, Denmark and Norway as a direct cause of becoming more circular. Consequently, a circular economy can be assessed as the most valuable outcome of collaboration. Therefore, we can assume an increased economic effect of collaboration if used in a transition towards a circular economy. Thereby the value of collaboration is even greater, as it is deemed a substantial contributor to the value of a circular economy, and how a circular economy can be transitioned to. As such, we can assume the value of collaboration, yet to be quantified, is huge.

Economic viability is imperative for whether firms will enter into collaborative networks. Stressing the importance and value of collaboration, also for a single circular company, is a crucial starting point in how to continue expanding the circular economy in Norway.

Building on the initial discussion on the value of collaboration, we will elaborate on the benefits through assessment of circular business models. As mentioned in chapter 2, Accenture has studied more than 120 cases of firms that have successfully improved their resource productivity through innovation (Lacy, Keeble, & McNamara, 2014). From these studies they derived five underlying circular business models that together form a complete, closed and universal circular economy. Subsequently, we will place our cases in Accenture's symbiosis of circular business models. This will provide an indication of the lack of circular business models in the Norwegian circular economy, which in turn can serve as a solicitation to relevant incumbents and future start-ups in general. The following paragraphs assess and categorize each sampled company's[6] business models in light of the aforementioned circular business models (Lacy, Keeble, & McNamara, 2014). The categorization of cases is illustrated in Table 18 below.

[6] In addition, we have added some well-known companies to provide a better overall picture of the circular situation in Norway currently.

Foods of Norway and Eyde Cluster are primarily research project and competence center, respectively. As such, they do not fit any of the circular business models per se. However, they can be regarded as one of the five core capabilities for successful circular economies, namely innovation and product development, by developing and distributing valuable know-how that others can leverage on in their circular business model (Lacy, Keeble, & McNamara, 2014).

CO2BIO's first milestone is to utilize captured carbon dioxide from Statoil to produce omega-3-rich biomass based on algae, which can in turn be used for sustainable production of fish feed. As such, CO2BIO's circular business model can be regarded as a Resource Recovery model (Lacy, Keeble, & McNamara, 2014). Biomega, Hofseth BioCare, Nutrimar and Hordafor collect fresh, non-edible parts from fish slaughterhouses, which would otherwise go to waste, and produce high-value food grade products from all parts of the salmon (e.g. salmon meal and salmon oil). This model can also be regarded as a Resource Recovery model. Aqua Bio Technology's model is similar to the one just mentioned, except that Aqua Bio Technology collects residual hatching fluids from salmon hatcheries and refine the fluid sustainably into input in cosmetics production. Nevertheless, it is a Resource Recovery model. The same applies to Firmenich Bjørge Biomarin.

Elkem Solar produces solar grade silicon for the solar industry with a proprietary method that requires 25% of the energy compared to traditional methods and reduces the carbon footprint by 75%. This method comprises a five-step cleansing process of the silicon, which each produce valuable residual streams that other firms in their value chain utilize. One of these firms is ReSiTec, who recovers silicon from the sawdust, stemming from the cutting of wafers from silicon blocks, using much less energy than traditional silicon extraction while sustaining a high quality. The recovered silicon is then sold back to Elkem Solar, amongst others. As such, Elkem Solar has both a Circular Supplies and a Resource Recovery model, while ReSiTec has both a Resource Recovery and a Product Life Extension model.

Herøya Industripark and Mo Industripark primarily own the infrastructure that facilitates the utilization of residual streams among the member firms (e.g., pipes for reuse of cooling water and district heating), in addition to common research centers. The member firms pay to use these facilities. As such, they are indirectly circular to some degree by employing a Product as a Service (PaaS) model (Sempels, 2014; Tukker, 2015).

As mentioned before, BIR and Anonymous Company operate in the waste management industry. They collect waste from their "suppliers" (e.g., households, municipalities, firms etc.),

and either recycle the waste and sell it as input to customers, or use it for sustainable energy production. As such, BIR and Anonymous Company can be said to have both a Circular Supplies and a Resource Recovery model.

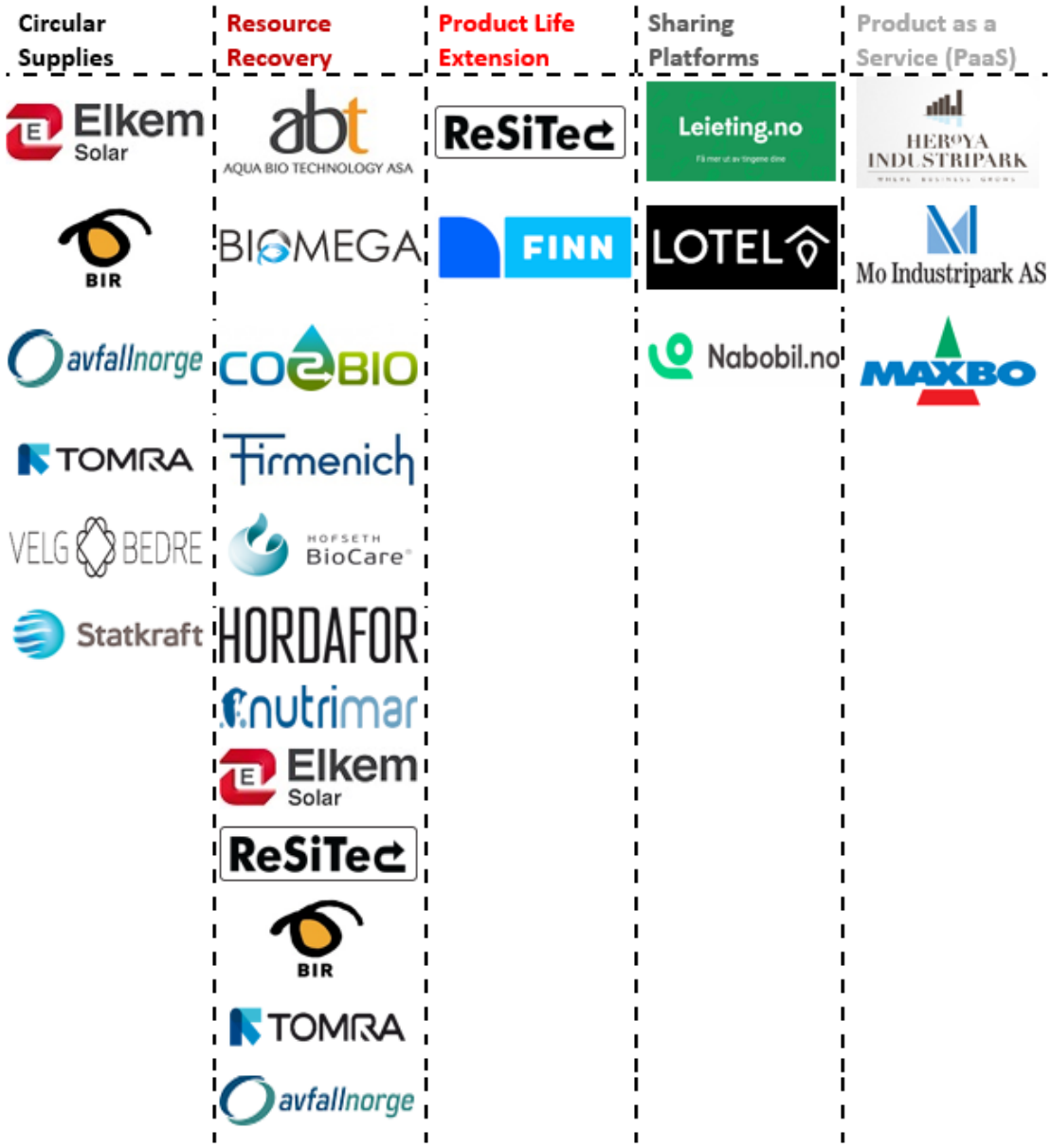

Table 18: Mapping of circular business models. *The table shows a categorization of the sampled companies', and a selection of other companies', business models according to the circular business models identified by Lacy, Keeble and McNamara (2014). Most of the sampled companies employ a Resource Recovery model.*

In Table 18 above, the interviewed companies are plotted according to the different circular business models. As we can see from the illustration, the sampled cases predominantly operate by a Resource Recovery model. That is not to say that the Norwegian economy is saturated with Resource Recovery models – quite the contrary. The mapping should be seen in conjunction with the industries represented. The industries above merely constitute a fraction of all industries in Norway.

Nevertheless, there is a predominance of Resource Recovery models in the fishery industry. These companies (e.g., Biomega, FBB, HBC, Hordafor and Nutrimar) have managed to transform an environmental problem, namely the disposal of fish waste, into a profitable and sustainable value chain. Today they pay for a residual raw material, which used to be called waste, and "upcycle" the product. In a sense, one could say they compete on who is the most sustainable; who can manage the most "waste" in the most efficient way and still earn profit. However, as mentioned earlier, the increase in aquaculture will increase the supply of residual raw materials as well as the demand for nutrients for fish feed (Olafsen, et al., 2012). Consequently, there will be room for new entrants and/or upscaling of incumbents' capacity. Another option is to look for alternative sources of residual raw materials to produce the demanded products, like CO2BIO will do with their pilot plant. Furthermore, it is conceivable that this industry will have considerable potential in reversed logistics as the industry grows. As far as we know, Hordafor and Nutrimar are the only ones with specialized solutions for this: offshore intermediate storages and collocation, respectively. Therefore, it may be the case that Resource Recovery models will both expand and become increasingly profitable as a result of a predicted increase in aquaculture industry. This perhaps, is substantiating for the value of collaboration.

Norway is in an exceptional position with regards to renewable energy due to its topography and climate, with hydropower constituting 99% of all power generation in Norway (Statkraft, n.d.). Velg Bedre is an exemplary Circular Supplies model: an online platform that connects social entrepreneurs with businesses, and helps companies with choosing sustainable procurement (Velg Bedre, n.d.; Havnes, 2015). The Circular Supplies model is particularly interesting in technical cycles of a circular economy. A common challenge that inhibits technical products from being reused, is their complex composition that complicates disassembling (EMF, 2012; Bastein, et al., 2013). Tomra has acclaimed its position as one of the world leaders in sorting within the waste and metal recycling industries. With their pioneering technology they are able to help customers optimize their sustainability and operational value. However, their job would be much easier if manufacturers designed for disassembly (Zussman, Kriwet, & Seliger, 1994). We argue that there is a lack of firms that specialize in designing products optimized for disassembly and recycling, and that these will become increasingly attractive partners for firms in other parts of the value chain as the circular economy thrives in Norway. The Circular Supplies model enable the possibility to leverage on natural resources through collaboration. Increased design for disassembly can be achieved as a

result of collaboration through knowledge sharing, shared investments and utilization of complementary resources for designing products for use throughout a value cycle. This will benefit several of the parties as resource efficiency increases. As such, collaboration can become increasingly valuable when Circular Supplies models are enhanced.

Finn.no experienced so much success with their Product Life Extension model in Norway, an online classifieds platform, that they copied the model to several other countries worldwide (Schibsted Media Group, n.d.). However, the platform focuses primarily on "customer-to-customer" and "business-to-customer". As Accenture (Lacy, Keeble, & McNamara, 2014) points out in their report, the Product Life Extension model could be particularly appropriate for capital-intensive industries (e.g., industrial equipment). For instance, one member of Herøya Industripark, Bilfinger Industrial Service, has specialized in maintenance and repair of the machinery present in the park. This is more convenient for the other members of the park, as they often rely on high run-time, than to have technicians from the producer of the equipment come over or, even worse, send the equipment to them every time a breakdown occurs. Such geographically focused specialization can be even more relevant if Norway chooses to pursue a cluster approach in the development of its economy, as discussed previously (EMF, 2012; Vanner, et al., 2014; Leising, 2016; NHO, 2016).

Sharing Platform models are increasingly gaining traction in the Norwegian economy (Havnes, 2015). LOTEL, Leieting.no and Nabobil.no are just a few of many sharing platforms that have thrived in Norway in recent years (Havnes, 2015; NHO, 2016; NHH, 2016). The common denominator for these is that they focus on a particular category of products or services (e.g., LOTEL on apartments, Leieting.no on household appliances and Nabobil.no on cars). It is safe to say that not all products or services have a sharing-platform-based substitute, and thus we argue that there is room for more sharing platforms in the Norwegian economy. Furthermore, there is nothing that suggests that existing solutions cannot be challenged by better value prepositions. Sharing Platform models have already been established as profitable and job creating (e.g., Airbnb and Uber). A notable facet of the model is that it enables value creation through exchange of resources between various entities, thus enriching the value perspective of cross-sector collaboration.

The case of MIP and Herøya can be said to be peculiar cases of PaaS models, in that their "product" is infrastructure. Nevertheless, it fits the description that the PaaS model is particularly attractive for companies whose products have a high cost of operation (Lacy, Keeble, & McNamara, 2014). Hence, several large building-materials vendors have

incorporated a PaaS model for special equipment (e.g., Maxbo, Bauhaus, Byggmaker) (Maxbo, n.d.; Bauhaus, n.d.; Byggmakker, n.d.). The PaaS model is a universal model that "can be applied to product flows in any part of the value chain" (Lacy, Keeble, & McNamara, 2014, p. 12). As such, it can be said that there is room for PaaS models in all the identified opportunities above. This potential mirrors the latent value of increased collaboration stemming from the possibilities of reducing relative costs of operation.

Thus far, we have discussed several business models and how collaboration can enhance these. The discussion has highlighted the opportunities circular business models can create. In extension of this, Jørgensen and Pedersen's (2015) model can aid us in explaining how these opportunities can translate to value creation, deliverance and capturing (see Figure 16).

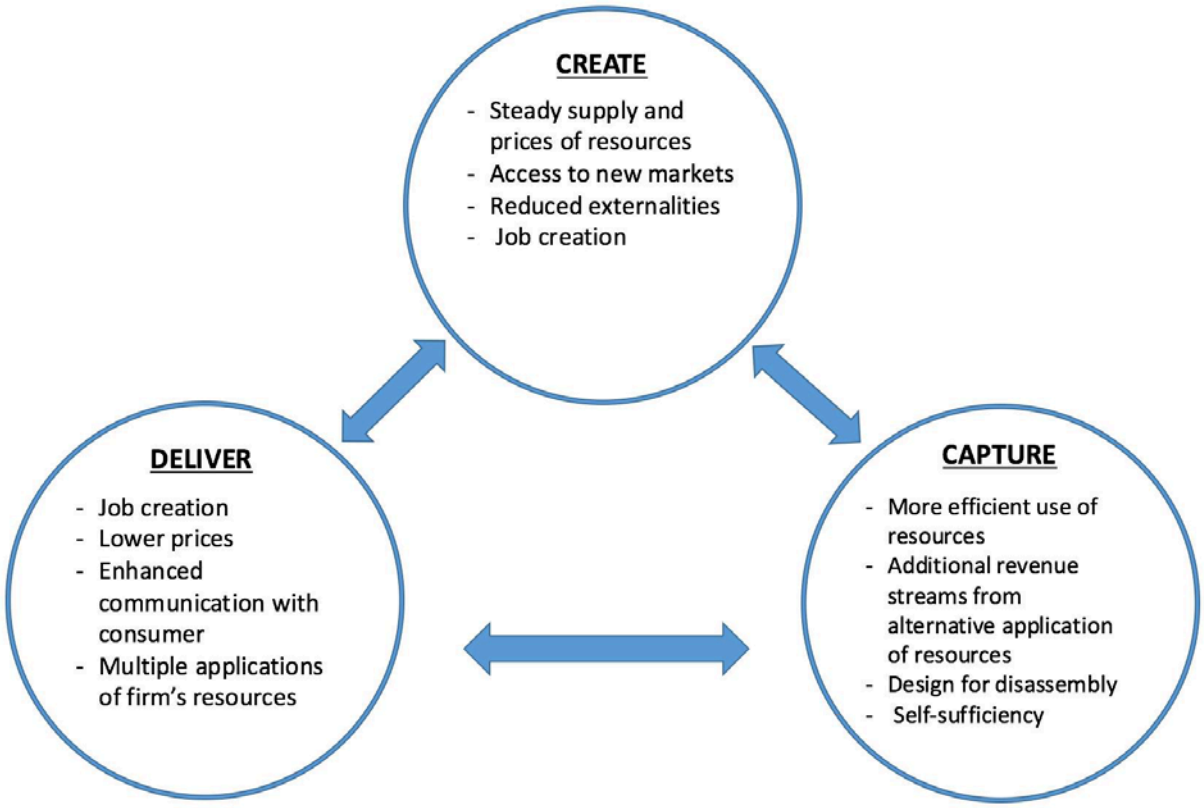

Figure 16: Circular business models and value. *The figure summarize how the different circular business models can translate business opportunities to value creation, deliverance and capturing (Jørgensen & Pedersen, 2015).*

5.2.3 Summary

Ideally, we would map the entire Norwegian economy, but the time horizon of this thesis and limited resources inhibit us from doing this. Thus, this analysis is subject to incomplete information, and the results should therefore be assessed accordingly. Albeit, the discussion in this chapter has shown that there is great potential for circular business models to thrive in the Norwegian economy, which also applies for the potential of obtaining value through cross-sector collaborations. This can likely be explained by the timeliness of circular economy and that it has not matured in Norway yet (Wijkman & Skånberg, 2016). As several studies point out (EMF, 2012; Bastein et al., 2013; EMF, 2015; Wijkman & Skånberg, 2015), this is the case for many countries, so it is conceivable that the findings above apply to other countries as well. Nevertheless, the discussion provides comprehensible examples of circular models represented by our sampled cases and complemented by examples of other circular models in different industries. This has further underlined the economic potential that resides in cross-sector collaboration through circular business models. We hope this will encourage more firms to seriously consider a transition to circular business models.

In 2015, Innovation Norway initiated a comprehensive project with over 3500 contributors across sectors and industries, NGOs and governmental bodies (Innovation Norway, 2016). The goal was to identify challenges and possibilities for the Norwegian economy, and to map the future development of the economy "from unique position through restructuring to a hopefully sustainable and vigorous new special position" (Innovation Norway, 2016, p. 3). Although the report has not been finalized, a status report identifies the following six opportunity areas, where Norway's resources are well-suited to accommodate the world's challenges: oceans, clean energy, bio economy, health and welfare, smart communities, and creative industry and tourism (Innovation Norway, 2016). They further provide ten recommendations for how Norway can leverage these opportunities, including focus on becoming world leading in sustainable solutions, clusters as restructuring accelerators and increased support from governmental bodies to ensure funding of entrepreneurs in the growth phase (Innovation Norway, 2016). As such, we expect that circular efforts within these six areas are likely to encounter more favorable conditions compared to other areas.

Nevertheless, the Norwegian economy has traditionally been characterized as a capital-intensive economy (Norman & Orvedal, 2010). The oil/gas and metals industry are still significant industries in Norway, as mentioned in section 2.3.4. Therefore, the Product Life Extension model could prove useful for companies in these industries in a transition to a circular economy. For the oil/gas industry, this could entail renting out specialized resources to other compatible industries (enerWE, 2015).

In the concluding chapter, we present a proposed conceptual strategic tool for how firms that consider a transition to circular business can leverage collaboration to optimize their circular business model.[7] The model is based on the data analysis and discussion, and serves as an implication of our findings.

[7] Accenture identifies five capabilities of successful circular leaders (Lacy, Keeble, & McNamara, 2014). We will not elaborate on this as the focus of this thesis is collaboration in circular economy, but for the interested reader, we refer to Lacy, Keeble and McNamara (2014) for more information.

6 Conclusion

This study was set out to explore the concept of circular economy and has identified several aspects of collaboration imperative to a transition to a circular economy in Norway, thus constituting a valuable contribution to the apparent knowledge-gap that we pointed out in the introduction. The overarching research question we initiated the study with was: *"How can cross-sector collaboration act as an enabler of the circular economy in Norway?"* We employed the Relational View as a theoretical basis to frame our approach to answering the research question. By incorporating research on circular economy and collaboration, and characteristics of Norwegian industry, we were able to discuss the findings from our sampled cases in a greater context. In turn, this enabled us to attain the four research objectives that were set to guide us in answering our research question. In the following, these will be accounted for.

The first research objective was "*to investigate the strategic benefits of collaboration towards a circular economy."* We find that through collaboration (i) companies are able to access resources that were previously out of reach, (ii) companies can increase their ability to innovate through enhanced knowledge sharing, and (iii) investments necessary to operate circular business models become more viable. Furthermore, we find that cross-sector collaboration is an important facet for how firms evolve their circular business models and generate value. In conclusion, we find that collaboration can be a door opener for companies seeking to become more circular and can reward them with competitive advantages.

The second research objective was "*to examine enablers, barriers and drivers of a transition to a circular economy."* In our literature review we have emphasized identified enablers, barriers and drivers of a transition to a circular economy (cf. Table 5, 6 and 7). On numerous occasions, the interviewed firms demonstrated, substantiated and added to these enablers, drivers and barriers (cf. Table 14, 15, 16 and 17). In conclusion, we find that cross-sector collaboration can enhance enablers and drivers, as well as mitigate non-institutional barriers.

The third research objective was "*to highlight the role of interaction between the government, academia and the industry in a transition to a circular economy."* We find that academia is predominantly a valuable R&D-partner because they provide complementary research competency, and in some cases they can provide funding of projects. However, the mutual value for industry and academia in collaboration could be further substantiated by closer interaction between the parties.

Concerning the government's role, we find that it is of great importance to a transition to circular economy. Many of the sampled companies have benefitted notably from governmental funding on their way to becoming circular. On the other hand, a transition to a circular economy in Norway could benefit from the government taking more risk in their investment by supporting research necessary for a transition (Mazzucato, 2013). Furthermore, government regulations that were initially considered as restrictions have paved the way for new circular business opportunities. However, we find consensus among the companies that a top-down approach from the government with increased "carrots" could accelerate a transition to a circular economy in Norway.

The final research objective was "*to consider the general potential for a circular economy in Norway.*" In this respect, three findings stand out. First, we find that prevalent trust among Norwegians and in Norwegian industry, which was underpinned by our cases, constitutes a solid foundation for collaborations to thrive. Second, despite being a notorious "oil nation", Norway has considerable potential in becoming more circular, especially in the bio cycle domain due to the rich natural resources that pose a comparative advantage (e.g., aquaculture and renewable energy). Third, Norwegian authorities have demonstrated efforts towards documenting and leveraging on this potential (e.g., the committee for green competitiveness). As such, we argue there is notable potential for a circular economy in Norway.

In attaining the four research objectives, we arrive at an answer to our research question. Cross-sector collaboration facilitates for a transition to a circular economy in Norway by (i) enabling streamlined interaction between Norwegian industry, academia and the government, thereby (ii) opening doors to new circular business opportunities through increased innovation, and (iii) enabling utilization of complementary resources and realization of comparative advantages.

In the following section of this chapter, we emphasize the implications of our study by way of a proposed strategy tool. We believe that this can aid firms and decision makers transition towards circular business, with the proviso that the tool is disputed both qualitatively and quantitatively, making it subject to further research. First, a brief introduction of the tool is presented. Second, we explain the "What? Why? How?" of the model. Third, we elaborate on the model and its components. Then, we provide recommendations for policy makers. Finally, we outline the limitations of our study and provide specific suggestions for further research.

6.1 Proposed Strategy Tool

The proposed model is a tool[8] meant to highlight salient strategic steps businesses should consider when making their business model more circular[9]. We base this model on the abovementioned conclusion that collaboration provides a strategic advantage, and can benefit a transformation to circular operations. Following these steps are beneficial not only in helping the firm become more circular in a strategic perspective, but it is also meant to ensure economic sustainability and a competitive advantage.

Even though we have illustrated the model as a five-step process, we emphasize that all steps are interlinked and affect each other, and revision should happen continuously to maintain a solid business strategy and -model, and to ensure that the circular economy sprocket keeps turning (see Figure 17 below).

6.1.1 Facilitating Determinants for a Circular Strategy – the "What? Why? How?"

The following is a detailed explanation of the relationships between the determinants in Figure 17, why firms should focus on each determinant, and how it can affect the firm and how it can be implemented.

6.1.1.1 Effective Governance

Agreements secure intellectual property, but can also create trust and reciprocity if conducted righteously (Poppo & Zenger, 2002). Such *informal* governance mechanisms are emphasized as a strategic source for competitive advantage (Dyer & Singh, 1998), and can further facilitate for a greater degree of knowledge sharing, investments and identification of complementary resources, which can push forward the transition to a circular economy. Increased informality in governance between the partners can increase the position as rare, valuable and inimitable (Dyer & Singh, 1998). We propose that industry incumbents should focus on agreements and structures that facilitates for increased trust and openness in their collaborations, as well as creating a notion of reciprocity. Being adaptive in relation to each partner's specific characteristics, is also an important feature for which governance mechanisms that should be employed (Dyer & Singh, 1998).

[8] This tool is based on 15 interviews with businesses operating in different sectors and with different business models, mapped in chapter 6. They are all, to various degree, operating after the principles of a circular economy. Additionally, the interviews were based on the Relational View, and the responses are thus implicitly framed thereafter. Therefore, we do not claim that this tool will be beneficial for all business and industry sectors. We do however, based on our findings, believe that incorporating the strategic elements of our proposed tool can be valuable in gaining perspectives on which strategic elements are important when transitioning towards a circular business model.

[9] Our model is mainly directed at industry incumbents looking to transition their business model to becoming more circular. Yet, new entrants can use our strategy tool as valuable input to key focus areas when making strategic decisions concerning collaboration and the circular economy.

6.1.1.2 Knowledge Sharing

Knowledge sharing within one's network is imperative. With solid governance mechanisms, knowledge sharing is proposed to increase, seeing that appropriate governance can enhance knowledge-sharing routines (Dyer & Singh, 1998). Knowledge sharing without routines nor governance mechanisms, can lead to inefficient networks, creating a competitive position easy to imitate (cf. Table 3). As the subject of circular economy is relatively new and with few experienced industry incumbents, sharing experience and know-how can be crucial for the pace in which the industry will transform.

Knowledge sharing can increase the focal firm's ability to identify potential complementary resources within and outside its network. We propose that firms should engage in networks, preferably clusters or industry parks (Innovation Norway, 2016), in order to leverage on its own potential as well as other firms' and sectors' resources. Additionally, engaging in clusters or industry parks is assumed to become increasingly prevalent in the future (Innovation Norway, 2016). Strengthening the firm's competitive advantage through knowledge sharing within the firm's network is therefore proposed as a sustainable competitive advantage.

With regards to research and development, firms should actively try to include relevant key personnel in the research so that the developed knowledge is assimilated and absorbed by employees, rather than remaining with a third party. Finally, firms can, and should, leverage Norway's impressive institutionalized competence bases (e.g., NCE) in order to avoid duplicate efforts.

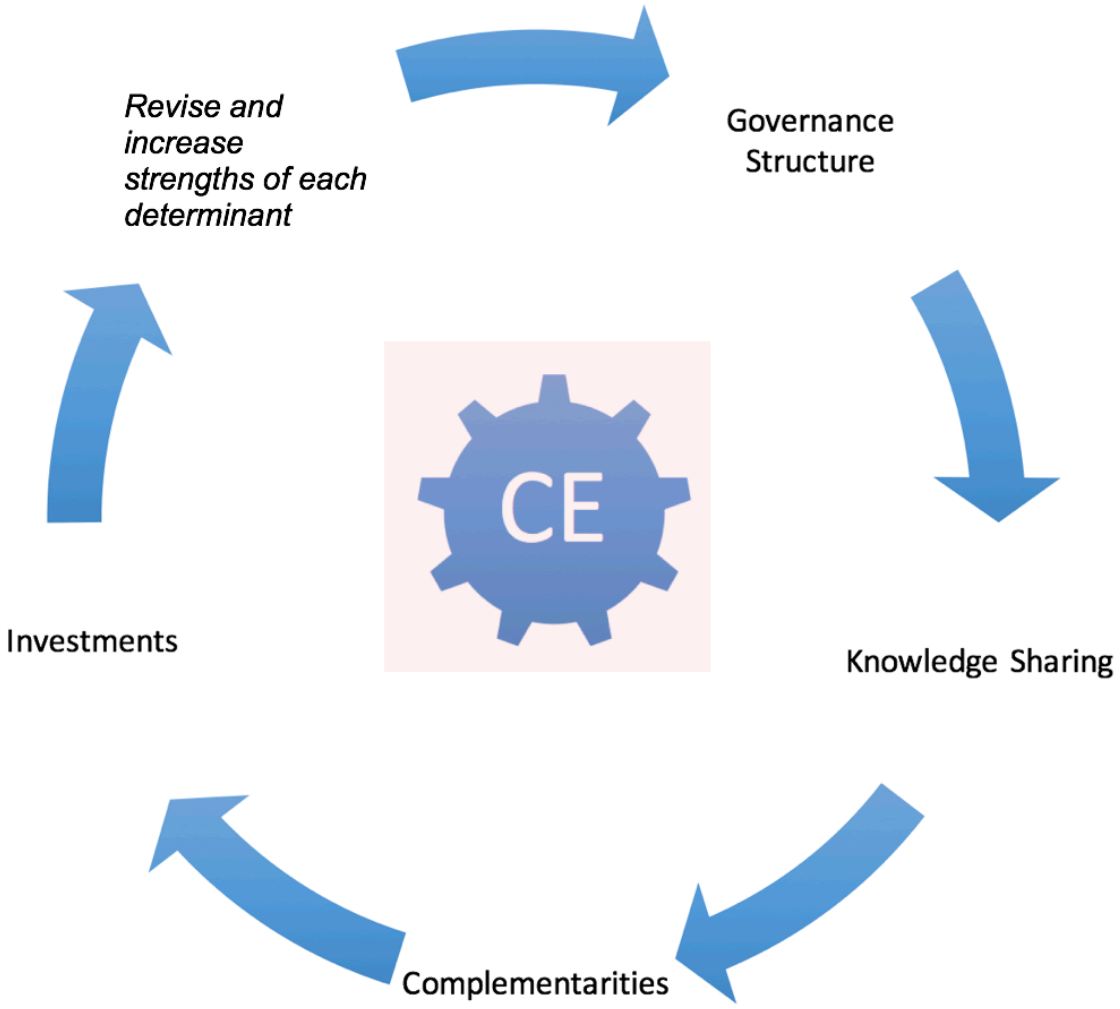

Figure 17: Proposed strategic tool. *The model constitutes a circular process encompassing five steps to consider as strategic input.*

6.1.1.3 Complementary Resources

As knowledge sharing increases, the possibility to leverage on the complementary skills and resources of the partnerships, is proposed to do so as well. If the focal firm engages in innovation clusters, it is likely that the firm's ability to become circular grows, because it can leverage the benefits clusters offer (e.g., lower transaction- and transportation costs, as well as easier access to complementary resources). Further, circular business models are assumed to find value outside their typical value chain, looking across industries, sectors and boarders to find input and uses of their residual streams that ensures economic sustainability. Increasing ability to identify complementarities, can extend both the focal firm's and the network's value from complementary resources, increasing potential to transform industry value cycles.

In order to increase the value of the networks' complementary resources and skills, as well as the ability to identify complementarities, we propose the following:

- Industry partners are proposed to be the most valuable player for direct complementary resources, while academia and governmental institutions are more facilitating partners. Including industry partners through participating in clusters or industry parks is assumed beneficial. A main focus should be directed at infrastructure management and/or product development (EMF, 2012).
- Organizational complementarity should not be neglected. Even though Norwegian corporate culture can be argued to elicit few differences in structure and culture, the value of organizational complementarity is important to strengthen the benefits of complementarity.
- Focusing on sectors that align with Norway's identified comparative advantages is proposed to be increasingly important through the focus on the bio economy.
- Look beyond existing networks, towards "counterintuitive" industries, to find new complementary value. This can create alternative revenue streams (EMF, 2012).
- Focus on complementary partners that increase the focal firm's and the network's innovative and technological capabilities.
- All partners in the firm's network should possess complementary resources and skills to optimize network efforts.

6.1.1.4 Relation-Specific Investments

Investments in technology, education, and equipment is necessary for a successful transition to a circular economy (EMF, 2012). When insight into current situation and future possibilities are mapped and elaborated on, the potential for making better long-term investments increases. Such insight can best be generated through networks and knowledge sharing (e.g., NCEs). Also, co-investments are a proposed strategy. Initial relation-specific investments in human assets are proposed to be important to secure competency development within the network. Through the previous steps, the focal firm should have developed an overview of which steps to take to further develop their circular business in the long term. Investments in physical and/or site-specific assets can be necessary in order to increase the circular competencies of the network, to increase value and to ensure sustainable competitive advantages. As a result, the circular potential of the network increases. Through investments, new possibilities can arise, and so can the complementary resources in the partnership.

The availability of financing and risk management tools is proposed as enabling factors (EMF, 2012). We propose that involvement from the government's side, will become increasingly imperative as a funder in driving the circular economy forward. Investments should in large part be done specific to the network in order to strengthen ties between partners and the partnerships' capabilities. Co-investments are not necessarily crucial, but long-term agreements can be valuable, as this allows for more experimentation and research on how firms can gain mutual value off of each other. For firms connected through research goals, a focus on human-asset specific investments is proposed valuable.

6.1.1.5 Revision

The model, as seen in Figure 17, is a circular process, leading back to *revision*. Revision should also initiate the cycle. A firm will have several ongoing processes within each determinant, and it is key to make sure that all steps are reviewed properly. It is assumed that changes within the determinants can occur unknowingly as well. Seeing that our model is a circle, it is implicit that alteration in one of the determinants will affect the other three (see subsequent elaboration on each step). Additionally, it can be necessary to skip one step in order to revise and implement another one.

As new entrants, industries and technologies will arise one after another, it is essential to be aware of possibilities to increase one's circular capacity. In order to increase the circularity of entire value cycles, revision and updates of your own cycle is necessary. This is proposed to be increasingly prevalent as both governmental and industry focus turns more towards the circular economy. Revising one's own, as well as the network's, collaborative capabilities will be increasingly important as technology and knowledge develop inside one's network, but also outside the network. Our model is a tool that can meet the needs of today's industry. Also, it is an illustration of what circular businesses today have valued as strategically notable measures in becoming circular.

6.1.2 The Model and its Components

We wish to emphasize that the model illustrated in Figure 17 should be viewed in relation to internal and external factors that go beyond that of the four determinants. The focal firm is predisposed to both internal and external effects that can affect the firm's capability and willingness to process necessary information to transition towards a circular business model (see Figure 18 below)[10].

6.1.2.1 Direct Effects

Direct effects comprise firm characteristics, network characteristics, economic, strategy, governmental support, and competition. These factors can all affect the success of the transition. Focal firm and network characteristics is assumed to affect the advantage and value of chosen circular economy strategy. Characteristics include, among others, business sector, focal firm and network size, network experience, technological or biological industry, collaborative agreements, and sustainability goals vs. firm capabilities. Economics: The R&D-investments necessary to implement a circular economy strategy is proposed to have an effect on both willingness and ability of the focal firm and/or network. Perceived economic viability is a necessity for all firms to conduct a project. Ability to see the value of transitioning to a circular model is therefore a prerequisite. This again is assumed to be affected by previous returns on investments, binding assets, previous experience with support from governmental bodies, and amount of liquid assets free to be used in new projects.

The strategic variable evolves around the current strategy, and whether severe changes are needed to reach a competitive position as a circular business. Further, the choice of strategy is proposed to have a large effect on the competitive advantage of the chosen strategy. In reference to our business model discussion in chapter 6, we highlighted the vastly different models and strategies of the interviewed firms, and it is clear that some strategies demand more investments and thought out positioning strategies.

[10] The direct and moderating effects are merely our propositions based on the findings of our study and the discussion of these. It is not our intention to infer causal relationships. Thus, further systematic (preferably quantitative) research of the model is required to validate our propositions.

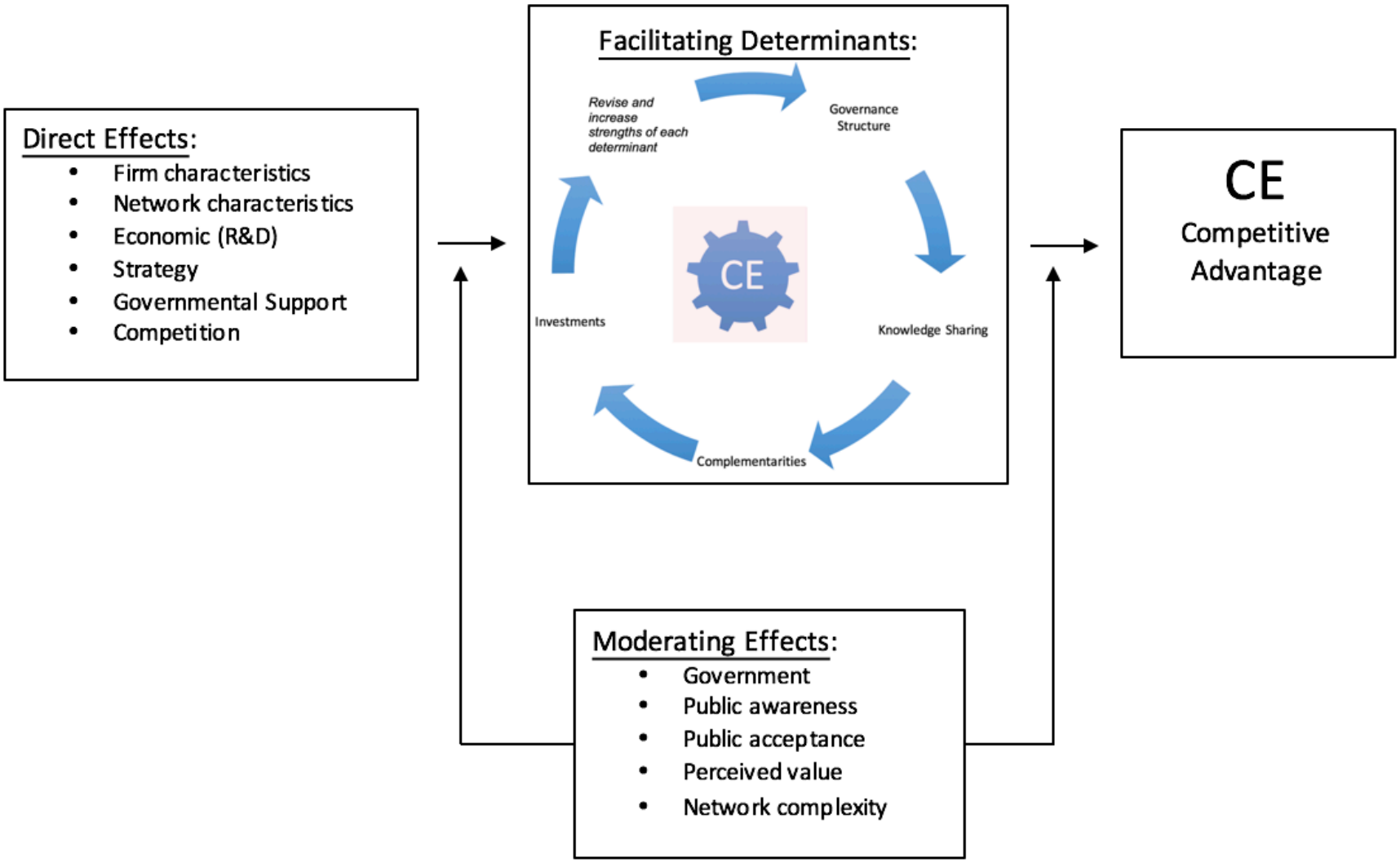

Figure 18: The model and its components. *The figure illustrates how internal and external effects affect the ability to implement circular strategic decision.*

Governmental support is essential. As discussed throughout our paper, we see the need for more involvement of the government in order to push the transition forward, seeing that a transition to circular industry is both costly and complex. EMF (2012) highlight changing the game to quickly reach scale through regulations. Additionally, investments in research projects too risky to attract private industry, like CO2BIO, is an example of how the government should take action to push forward a transition. Also, support for development of clusters and industry parks is key, and will directly affect how firms' networks are able to implement a successful transition. Lastly, the competitive landscape has a direct impact on firms' circular position through affecting firms' ability to make economically feasible transitions.

6.1.2.2 The Moderating Effect

As seen from Figure 18, both the *Direct Effects* and *Facilitating Effects* are moderated by several variables. Even though governmental bodies can directly affect firms' competitive advantage, it can also impede the transition and thereby also the competitive advantage. With fewer firms being able to transition, the network effects are assumed to be reduced. Additionally, initiating circular projects can be costly, and in a competitive market where consumers do not have a willingness to pay more for greener products, circular business strategy is not feasible without support from governmental bodies.

Further, government as a moderating variable can also have an effect on public awareness and acceptance. In reference to the notion on costs of operating circularly, educating consumers is key, as they are a driver of the value of being circular. With increased awareness and insight of the importance of the circular economy, comes increased willingness to pay. In the long run, this can increase the share of circular businesses, further increasing technology and effectives of production, and eventually reduce product prices.

The perceived value of the circular economy affects both producers and consumers. If there is a general acceptance of the circular economy as a concept, the market size is proposed to grow. In turn, this is assumed to increase the perceived value of producing circular products/services as a result of favorable market conditions, as well as improve perceived value of purchasing circular products. Such perceptions can arise from several instances, for example perceived environmental value (Gilg, Barr, & Ford, 2005; Griskevicius, Tybur, & Van den Bergh, 2010), or the thought of participating in a community (Sunstein & Ullmann-Margalit, 2000). Lastly, the complexity of the focal firm's network can moderate its ability to alter strategic motives and change its stages of production.

Moderating effects will also affect the outcome of how the facilitating determinants (Figure 18) functions in generating a sustainable competitive advantage as a circular business. Even though a firm is able to implement the proposed valuable mechanisms residing in each determinant, the market position might not prove to be valuable or viable because of moderators like customers' willingness to pay or market size, decreasing the impact the focal firm's strategy has.

Subsection 6.1 represents the implications of our study for businesses. The implications have been presented in the form of a proposed strategic tool to aid decision makers looking to transition to a circular business. The model encompasses five strategic determinants that together enhance a business' potential of becoming circular (cf. Figure 17). We have also highlighted internal and external factors that affect a companies' ability to implement strategic circular measures. One of the external factors is the government and its policies. As such, the following subsection encompass recommendations for policy makers.

6.1.3 Recommendations to Policy Makers

Since firms' operations are conditioned by laws and incentives set by officials, it is imperative that these are continuously evaluated on their alignment with the principles of the circular economy. Several of the interviewed companies yearn for more "carrots" rather than "sticks" from the government. They feel they are not being properly rewarded for their circular efforts, and some say firms are not being punished enough for disreputable behavior.

In relation to this, Christophe Pinck (2016) from Eyde Cluster introduced us to an interesting thought. He argued that "the biggest obstacle to a circular economy is how a state finance itself." Despite recommendations from think-tanks, international agencies and economists, taxes on natural resources are low and actually decreasing, while labor remains hefty taxed (Wijkman & Skånberg, 2016). This counteracts a transition to circular economy, because tax on labor inhibits remanufacturing and repair of products, while extraction of natural resources goes unsanctioned (Jordens, 2015). For a circular economy to be realized, renewable resources (e.g., labor, solar energy and hydropower) should be rewarded tax reliefs and non-renewable resources (e.g., oil, coal, gas and minerals) should have increased taxation. Hence, "point of an ecological tax reform is not to increase the overall tax burden, but turning the tax burden in a sustainable direction" (Orheim, 2001). Nevertheless, Norway has taken a step in the right direction as one of the parliamentary parties started negotiations with the government for "a green tax shift" in February 2016 (Giverholt, 2016).

In extension to this, EMF (2012) argues a fundamental behavioral change among consumers must occur in order for a circular economy to be fully realized. One way of incentivizing this is by reflecting the sustainability of products/services in their prices, for instance by reducing value-added tax on circular products/services. If circular products/services become cheaper than less sustainable products/services, it is likely that market demand will force through an accelerated transition to circular economy. However, this would require a sufficiently precise measure of circularity, which is yet to be developed, and transparency from vendors.

Lastly, although many of the companies have enjoyed the offers of government funding bodies, some argue that it is too difficult to receive funding for basic research and that this impedes the transition to a circular economy. As such, we recommend that the government revises the requirements and targeting of their funding to better facilitate for a transition to a circular economy, especially with regards to industry-oriented research, which Innovation Norway claim will accelerate the "green development" of Norway's economy (2015; 2016).

6.2 Limitations of our Study

The data collection is largely based on determinants of one theory, namely the Relational View. Although this is supported methodologically (Saunders, Lewis, & Thornhill, 2012), it may as well have limited our possibility to capture other factors associated with collaboration.

Considering we had limited time for each interview and the range of questions, we were not able to cover the interview guide entirely for all interviews. This inhibited us from digging deeper into affirmative answers in some interviews, which could have revealed new findings.

Furthermore, a few cases were in such an early phase of their collaboration that they were not able to provide us with answers to certain questions, which affected the comparative basis. This is likely to improve as circular businesses mature.

Except for two cases, all the interviews had to be carried out by telephone due to inconvenient distance. Although we believe we took measures, e.g. sent a preparatory letter outlining the purpose of our study and the interview process, this could have affected the responses from the interviewees, due to lack of physical interaction and inability to establish sufficient trust. Furthermore, we were not able to control the circumstances of the interview, so we cannot tell if the interviewee responded under disturbing conditions.

6.3 Suggestions for Further Research

This study has mainly focused on the strategic attributes of collaboration in the context of circular businesses. In the future, it would be interesting to further examine other strategic enablers, for instance in a comparative manner. This would also apply to circular business models; to examine actual success rate and/or efficiency of different circular business models.

As existing circular firms mature, it would be interesting to assess the effects of collaboration in circular businesses in economic-performance terms, both from a historical and future perspective – similar to that of a study done of the Netherlands (Bastein, et al., 2013). This could potentially provide financial incentives for decision makers to undergo a transition to circular economy.

Also, as collaboration entails interaction between at least two parties, and our sample comprise of the focal firms in circular collaborations, the findings might be skewed accordingly. A study of entire networks could correct for such skewedness, and maybe evaluate the relative importance of each partner to the total circularity of the collaboration more objectively.

The scope of this study is further limited to cases that have already underwent a transition to part- or complete circularity. A deductive approach in a study of our proposed strategic tool could prove interesting by either supporting/substantiating or debunking the tool. For instance, it would be interesting to examine whether internal or external barriers are most dominant in impeding a transition to circular business.

In the bigger picture, although we have acclaimed the benefits of cluster-orientation and geographic proximity to a circular economy, it would be interesting to examine how our findings would hold in a cross-national context. Incorporating a global perspective on the matter (e.g., the CABRISS project, see Appendix D), might speed the transition to a circular economy.

In more immediate future, research could be directed at debates that are relevant for industries today, for instance: the implications of more industrial parks, increased focus on the bio economy and how we can be less dependent on oil/gas. Finally, Norway has proclaimed great potential for bio economy, which arises the question of what can be done with existing technical cycles.

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Appendix A

Presentation of Cases

The cases are introduced in the same order as they were interviewed. One company availed itself of the opportunity to anonymity and is introduced accordingly.

Mo Industripark AS

Mo Industripark is an industrial park in Mo i Rana, which accommodates 108 companies as of June 2015. Mo Industripark AS is the hosting enterprise that owns the property and operates the park. Consequently, Mo Industripark owns the majority of the infrastructure in the park which enables the companies to leverage residual streams from one another. In addition, they are responsible for the admission and coordination of members of the park. According to Jan Gabor, Vice President Marketing at Mo Industripark, Mo Industripark's vision is to become the most sustainable industrial park in the world.

Foods of Norway

As of 2015, Foods of Norway is an official Norwegian Center for Research-based Innovation (SFI). Originating from Norwegian University of Life Sciences (NMBU), the consortium consists of nine academic and 15 industrial partners. The mission of Foods of Norway is to develop innovative and sustainable animal feed from natural resources that are not suitable for human consumption, including residual streams of raw materials.

Biomega AS

Biomega AS has successfully copied nature's processes in their patented enzyme processing technology. They collect fresh, non-edible parts from fish slaughterhouses (i.e. residual raw materials) along the west coast of Norway, and produce high-value food grade products from all parts of the salmon (e.g. salmon meal and salmon oil). All happens without adding any chemicals in the production line, while energy and water is reused several times out of environmental considerations.

CO2BIO AS

CO2BIO's purpose is to develop new and profitable business based on available captured CO2 at Mongstad. More specifically: the project's first milestone is to establish a national pilot plant for the production of omega-3-rich biomass based on algae. CO2BIO is also an innovation network consisting of actors from industry and research. The network is organized as a company where Marine Harvest, Lerøy Seafood, Salmon Group, Grieg Seafood, EWOS, Bergen Technology Transfer Office (BTO) and Nordhordaland Handverk- og Industrilag (NHIL) are shareholders.

Hordafor AS

The core business of Hordafor is the handling and processing of residual raw materials from fisheries and aquaculture. Hordafor was established in 1983 and are pioneers in their line of business. Hordafor's logistics are impressive, with specialized vessels and strategically placed intermediate storages for efficient collection of residual raw materials silage. Hordafor has a wide range of production lines along Norway's elongated coastline, from nutrition for animal feed to human applications and capelin roe.

Hofseth BioCare AS

Hofseth BioCare has managed to produce sustainable high-value ingredients for human applications (e.g. diet and exercising) through their unique and patented enzyme hydrolysis process. Like Biomega, Hofseth BioCare collects residual raw materials from fish slaughterhouses in Norway. The clever logistics and proximity to both suppliers and buyers enables Hofseth BioCare to sustain the high quality in the salmon – all the way from the sea, through their suppliers and to the end users.

Aqua Bio Technology ASA

Aqua Bio Technology is a Norwegian publicly listed company that specializes in marine active ingredients for the global personal care industry. Aqua Bio Technology has positioned itself between research communities and suppliers/producers of personal care products. As such, Aqua Bio Technology is active in the research, development and commercialization of sustainable marine active ingredients. Recently, Aqua Bio Technology partnered with British Zembra for the commercialization of biomasses from the production of olive oil.

ReSiTec AS

ReSiTec was established in 2012 and is wholly owned by Agder Energi Venture. They found a method to recover high-quality silicon from waste streams stemming from the production of solar panels. The production of silicon for solar panels is rather energy intensive and up to 40% of the pure silicon is lost as sawdust. ReSiTec is able to recover the silicon from the sawdust using much less energy than traditional silicon extraction while sustaining an approximate quality.

Herøya Industripark AS
Herøya Industripark AS is the hosting enterprise at Herøya Industripark, an industrial park that accommodates approximately 80 companies. Although Herøya Industripark does not operate by a particular circular model, it has a collaboration model that has enabled several of the member companies to leverage residual flows from one another. Herøya Industripark AS has set guidelines that apply to all members, which are intended to ensure that companies are prudently with regard to society and the environment, and that these companies can help to increase the overall value creation in the park.

Anonymous Company
This company is a considerable private actor in the waste management industry. They are committed to their strategy for sustainability, which entails a transformation to a more circular economy. The company has engaged in several projects that cohere with the principles of circular economy.

Elkem Solar
Elkem Solar is a subsidiary of Elkem, a global leader in sustainable production of silicon and carbon for industrial application, and account for Elkem's production of solar grade silicon for the solar industry. Elkem Solar has developed and industrialized a proprietary production method that requires 25% of the energy compared to traditional methods and reduces the carbon footprint by 75%. In 2011, Elkem had the whole value chain integrated under one parent company, after being acquired by Chinese Bluestar. This enabled them to look for circular opportunities both upstream and downstream. Elkem Solar is currently working on an even more energy efficient method for the production of solar grade silicon.

Eyde Cluster
The Eyde Cluster was established in 2007 as a cluster organization for Norwegian process industry enterprises. As such, Eyde Cluster's organizational structure differs a bit from our other cases. The core members of the cluster export approx. 90% of their production to the global market. Elkem Solar and ReSiTec are part of the cluster. In 2015, Eyde Cluster officially became an NCE, Norwegian Center for Expertise. Sustainability is an important part on their agenda.

BIR AS

BIR AS is the parent company in the BIR group, which is the municipal waste management company in the Bergen region. BIR AS, being a state-owned company, faces different conditions with regard to competition compared to the rest of our cases. For that reason, we treat the data coming from BIR AS accordingly in the subsequent analysis and discussion.

Firmenich Bjørge Biomarin AS

Firmenich Bjørge Biomarin AS is a small subsidiary of the fragrance and flavor giant Firmenich. Currently, Firmenich Bjørge Biomarin is leading a research project that aims at documenting the effects of peptides from fish proteins on health. They hope this will confirm their hypothesis that byproducts from fisheries can be used in the production of healthy functional food.

Nutrimar AS

Nutrimar is a Norwegian biomarine company that is directly coupled to InnovaMar, one of the biggest and most efficient salmon processing plants in the world. Nutrimar produces high quality oil, protein concentrate and meal from our uniquely fresh raw material.

Appendix B

Interview Guide

1. EFFECTIVE GOVERNANCE	
Preposition 1	*The greater the alliance partners' ability is to align transactions with governance structures in a discriminating (transaction cost minimizing and value maximizing) way, the greater the potential will be for relational rents.*
Q1a	To what extent is the governance of the partnership tailored to the attributes of each part in the collaboration?
Q1b	Does the chosen form of governance lower costs and/or generate value?
Q1c	In relation to governance of the partnership, do all the involved parties play a signifigant role? Who is most important? Why?
Preposition 1a	*The greater the alliance partners' ability is to employ self-enforcing safeguards (e.g., trust or hostages) rather than third-party safeguards (e.g., legal contracts), the greater the potential will be for relational rents, owing to (1) lower contracting costs, (2) lower monitoring costs, (3) lower adaptation costs, (4) lower recontracting costs and (5) super incentives for value-creation initiatives.*
Q1d (s)	What type of governance would you say that the partnership is mostly characterized by? (Self-enforcement or thrid-party enforcement?)
Preposition 1b	*The greater the alliance partners' ability is to employ **informal** self-enforcing safeguards (e.g. trust) rather than **formal** self-enforcing safeguards (e.g., financial hostages), the greater the potential will be for relational rents, owing to (1) lower marginal costs and (2) difficulty of imitation.*
Q1e (s)	What form of self-enforcement would you say that the argreements are mostly characterized by? (Formal vs. informal)
2. RELATION-SPECIFIC ASSETS	
Preposition 2	*The greater the alliance partners' investment is in relation-specific assets, the greater the potential will be for relational rents.*
Q2a	To what extent have the collaborating parties invested in resources/assets that are specific for the collaboration?
Q2b	What type of assets have the collaborating parties invested in: site specific, physical asset specifc or human asset specific?)
Q2c	In relation to collaboration and investments, would you say that all the involved parties play a significant role? Who is most important? Why?
Preposition 2a	*The greater the length of the safeguard is to protect against opportunism, the greater the potential will be to generate relational rents through relation-specific assets.*
Q2d (s)	How would you describe the duration of your most important agreements/relations?
Q2e (s)	To what extent do you experience that these agreements safeguard against opportunistic behavior?
Preposition 2b	*The greater the volume of exchange is between alliance partners, the greater the potential will be to generate relational rents through relation-specific assets.*
Q2f (s)	How often do you exchange resources between the partners in the collaboration?
Q2g (s)	To what extent is the process of resource exchange tailored to each party in the partnership?

3. KNOWLEDGE-SHARING ROUTINES	
Preposition 3	*The greater the alliance partners' investment is in interfirm knowledge-sharing routines, the greater the potential will be for relational rents.*
Q3a	How important has knowledge sharing been for the establishment of your firm/circular projects?
Q3b	To what extent has knowledge sharing occured in the partnership?
Q3c	Do you have any knowledge-sharing routines? Explain.
Q3d	How do you perceive your firm's position in the collaborative network in relevance to flow of information?
Q3e	How would you describe the role of the involved parties in relation to knowledge sharing?
Preposition 3a	*The greater the partner-specific absorptive capacity is, the greater the potential will be to generate relational rents through knowledge sharing.*
Q3f (s)	How would you describe your firm's ability to identify valuable knowledge in the network?
Q3g (s)	To what extent do you experience that your firm is able to leverage the valuable knowledge that is identified in the network?
Preposition 3b	*The greater the alignment of incentives by alliance partners is to encourage transparency and reciprocity and to discourage free riding, the greater the potential will be to generate relational rents through knowledge sharing.*
Q3h (s)	To what extent does the partnership have mechanisms that makes reciprocity and openness attractive (e.g. financial incentives)?
Q3i (s)	To what extent do you experience that free-riding is a problem in your network? Do you experience that the discussed mechanisms prevent free-riding?
4. COMPLEMENTARY RESOURCE ENDOWMENTS	
Preposition 4	*The greater the proportion is of synergy-sensitive resources ownded by alliance partners that, when combined, increase the degree to which the resources are valuable, rare, difficult to imitate, the greater the potential will be to generate relational rents.*
Q4a	To what extent do the partners have skills and/or resources that complement each other?
Q4b	How would you describe the partners' ability to utilize the complementary skill and/or resources that reside in the partnership?
Q4c	How do the complementary skills and/or resources affect your firm's ability to achieve its strategic important goals?
Q4d	How would you describe the role of the other involved parties in relation to complementary resources?
Preposition 4a	*The ability of firms to generate relational rents by combining complementary resources increases with the firm's (1) prior alliance experience, (2) investment in internal search and evaluation capability, and (3) ability to occupy an information-rich position in its social/economic networks.*
Q4e (s)	How would you descibe your firm's ability to find partners with complementary resources?
Preposition 4b	*The ability of alliance partners to generate relational rents from complementary strategic resources increases with the degree of compatability in their organizational systems, processes and cultures (organizational complementarity).*
Q4f (s)	How would you describe the partners' charcteristics in relation to organizational systems, processes and cultures?
5. THE ROLE OF THE GOVERNMENT AND ACADEMIA	
Q1	How would you describe the government's role in the transition to a circular economy so far?
Q2	What role do you believe that the government should adopt for the fututre transition to a circular economi?
Q3	What types of challenges do you wish to overcome through collaboration with academia?

Aggregate Results from Interviews

1. GOVERNANCE					
	Q1a	Q1b	Q1c	Q1d (s)	Q1e (s)
Circular Companies					
Foods of Norway	To some degree	–	Government and Academia	Self-enforcement	Mix
Biomega AS	To a large extent	To some degree	Yes	Self-enforcement	Mix
Hordafor AS	To a large extent	Yes	Academia	Self-enforcement	Mix
CO2BIO	To a large extent	Too early to say	Government and Academia	Self-enforcement	Mix
Hofseth BioCare AS	To a large extent	Yes	To a low extent	Self-enforcement	Mix
Aqua Bio Technology ASA	To a large extent	–	Yes	Self-enforcement	Mix
Nutrimar	To some degree	Yes	Project dependent	Self-enforcement	Mix
ReSiTec AS	To some degree	To some degree	Project dependent	Self-enforcement	Mix
BIR	–	Project dependent	Government	Self-enforcement	Mix
Anonymous Company	To a large extent	No	Industry	Self-enforcement	Mix
Partly Circular					
Elkem Solar	To a large extent	To some degree	To a low extent	Self-enforcement	Mix
Firmenich Bjørge Biomarin	To a small extent.	No	–	Third Party Enforcement	Formal
Mo Industripark AS	To a large extent	Yes	Yes	Self-enforcement	Mix
Herøya Industripark AS	To a small extent	No	No	Self-enforcement	Mix
Eyde Cluster	To a large extent	–	Government	Self-encforcement	Mix

2. Relation-Specific Assets

	Q2a	Q2b	Q2c	Q2d (s)	Q2e (s)	Q2f (s)	Q2g (s)
Circular Companies							
Foods of Norway	To some extent	Human-asset specific	Government and Academia	5-8 years	Not a problem	Often	To a large extent
Biomega AS	Nothing	Nothing	–	Less than one year	To some extent	Nothing	Nothing
Hordafor AS	To some extent	Phsyical-asset specific and Human-asset specific	–	Less than one year	Not relevant	Often	To a large extent
CO2BIO	To a large extent	All three	Government and Academia	5 years	To some extent	–	–
Hofseth BioCare AS	To some extent	Human-asset specific	Yes	Longterm	To a large extent	Often	To a large extent
Aqua Bio Technology ASA	To some extent	Human-asset specific	Varies	5 years	To a large extent	Often	To a large extent
Nutrimar	To some extent	Site-specific and Physical-asset specific	Yes	3-5 years	To a large extent	–	To a large extent
ReSiTec AS	To some extent	Human-asset specific and Site-specific	Yes	10 years	To a large extent	Often	To a large extent
BIR	To some extent	Site-specific and Physical-asset specific	–	–	–	–	–
Anonymous Company	To a large extent	Human-asset specific	No	3 years	Not a problem	–	To some extent
Partly Circular							
Elkem Solar	To a large extent	Physical-asset specific	Government	2-10 yeas	Not a problem	Often	To a large extent
Firmenich Bjørge Biomarin	To some extent	All three	Government	Over 10 years	Not a problem	Relatively often	To a large extent
Mo Industripark AS	To a large extent	Site-specific Physical-asset specific	Industry	Over 10 years	To a large extent	Relatively often	–
Herøya Industripark AS	To some extent	Site-specific and Physical-asset specific	Yes	Long term (up to 70-80 years)	To some extent	To a small extent	To a small extent
Eyde Cluster	To some extent	Human-asset specific	Varies	Project dependent	Not a problem	Often	To a large extent

3. Knowledge-Sharing Routines

	Q3a	Q3b	Q3c	Q3d	Q3e	Q3f (s)	Q3g (s)	Q3h (s)	Q3i (s)
Circular Companies									
Foods of Norway	Experience important	Medium	No	Good	Yes	High	High	Not necessary	Not a problem
Biomega AS	Very important	Low	Some	Good	No	High	Medium	None	Not a problem
Hordafor AS	–	High	Yes	–	–	High	High	Openness and trust	Not a problem
CO2BIO	Very important	Medium	No	Good	Industry and academia	Medium	High	–	–
Hofseth BioCare AS	Very important	Low	No	–	Academia	–	–	–	–
Aqua Bio Technology ASA	Very important	High	Yes	Good	Yes	High	High	Agreements and vested interest	–
Nutrimar	Important	High	Yes	Good	Project dependent	High	High	Reciprocity	Not a problem
ReSiTec AS	Important	High	Yes	Good	–	High	High	Openness and trust	Not a problem
BIR	–	High	–	–	Government	High	High	No competition and joint ownership	–
Anonymous Company	Important	High	No	Good	Industry and academia	Medium	Low	None	Some, regarding SMEs
Partly Circular									
Elkem Solar	Very important	High	Yes	Good	Industry and academia	High	Not alone	Knowledge	Not a problem
Firmenich Bjørge Biomarin	Not important	High	Some	Good	When necessary	High	High	Not necessary	–
Mo Industripark AS	Important	High	Yes	Good	Yes	Medium	High	High	Not a problem
Herøya Industripark AS	Very important	Mediem	Some	Good	Industry, academia and government	High for the host, low for the firms	Low	None	Not a problem
Eyde Cluster	Important	Medium	Yes	Good	Project dependent	High	Medium	Reciprocity	–

4. Complementary Resources and Capabilities

	Q4a	Q4b	Q4c	Q4d	Q4e (s)	Q4f (s)
Circular Companies						
Foods of Norway	High	Yes	Yes	Industry and academia	Medium	Some differences
Biomega AS	Medium	Medium	Medium	–	Medium	Big diffrences
Hordafor AS	Medium	Medium	Yes	Academia	–	Big diffrences
CO2BIO	High	Yes	Yes	Yes	High	Big differences
Hofseth BioCare AS	High	Yes	Yes	Industry	Medium	–
Aqua Bio Technology ASA	High	Yes	Yes	Yes	High	Big diffrences
Nutrimar	Medium	Yes	Yes	Project dependent	Medium-Low	Small differences
ReSiTec AS	Medium	Yes	Medium	Industry	Medium	Big differences
BIR	High	Yes	–	–	–	–
Anonymous Company	Medium-Low	To some degree	Yes	–	Low	Some differences
Partly Circular						
Elkem Solar	Medium	Yes	Yes	Industry	High	Small differences
Firmenich Bjørge Biomarin	Varies	Varies	Varies	Academia	High	Big diffrences
Mo Industripark AS	High	Yes	Yes	Industry	High	–
Herøya Industripark AS	High	Yes	No	Industry	Medium	Small differences
Eyde Cluster	Medium	Yes	Yes	Industry and Academia	High	Small differences

Appendix C
Survey from Qualtrics

Introduction

About the survey
This survey is made by Jon-Kristian Rydningen and Arber Zagragja, as a part of a master thesis at Norwegian School of Economics (NHH) about circular economy and collaboration. Our aim is to give you insight about which factors that are most important in circular collaborations in Norway. This study is one of the first of its kind, and your participation will be very helpful in generating knowledge about this.

The survey takes approximately 5-10 minutes to complete.

If you have any questions regarding the survey, please contact Jon-Kristian Rydningen or Arber Zagragja.

Do you want more information about our study and the survey?

Yes ○ No, proceed to the survey. ○

More information
This survey is part of the data collection for a master study at the NHH in spring 2016 and is thus subject to privacy policies of NSD (Norwegian center for research data). For more information, click here. The survey is sent to all companies who have been interviewed and selected partners of the respective companies.

The questions are related to the theory of Dyer and Singh (1998) - The Relational View - as well as data obtained from previous interviews. The questions will deal with four (4) overarching themes: the management of collaborative relationships, investments that are specific to partnerships, knowledge sharing between the partners, and complementary resources and capabilities. Through tests, it is estimated that the survey will take approximately 5-10 minutes to complete.

Consistently we will refer to "collaborations", and by this we mean all the key projects where you work with at least one other party. "Strategic alliances" refer to cooperation with the purpose to fulfill strategic objectives. "Cooperation" refers to the relationship between your company and your partners. Definitions beyond these are given in the help text of the relevant questions.

Why participate?
A similar study carried out by Walker et al. (2013) found that participating companies benefitted from the study because enablers and barriers were different for the different companies, and thus the participants were made aware of the opportunities/challenges they were not initially aware of. Finally, we hope that our study, including your participation, will inspire other enterprises to adapt to a circular model and ensure a more sustainable value creation in the future.

Governance of collaboration

The following questions will be about "governance" of cooperation agreements. With governance we mean the design and enforcement of the cooperation. Hereunder we distinguish between two main types: self-enforcement and third party. Self-enforcement refers to forms of governance which the partners have agreed on among themselves. Third party refers to forms of governance designed by an external party outside the collaboration (eg. a consultant, lawyer or accountant).

To what extent is the governance of cooperation adapted to the characteristics of the different parties in the collaboration?

Not at all | Small extent | Moderate extent | Large extent

Do you experience that the governance lowers costs and/or creates value for you?

Lowers cost | Creates value | Both | None

What type of governance will say that your cooperation is most influenced by?

Self-enforcement | Third party

What kind of selfenforcement will say that your agreements are most influenced by?

Formal (contract, ownership, co-investments or similar) | Informal (trust, reputation, goodwill or similar)

What do you feel you collaborative relationship is most rooted in?

Trust | Reputation | Godwill | Other:

To what extent do you emphasize that potential partners have had prior experience with similar alliances?

Not at all | Small extent | Moderate extent | Large extent

Relation-specific investments

The following questions will deal with relationshipspecific investments. This means different types of investments that are made specifically for the cooperative relationship. It may, for example. be common property, instrafruktur and/or construction, specially developed equipment and/or joint research and development.

To what extent have the partners invested in resources/assets that are specific to this collaboration?

Not at all	Small extent	Moderate extent	Large extent
○	○	○	○

What type of resources have you invested the most in? Rate the options from 1-3, where 1 corresponds to most and 3 equals least, by dragging up/down on the options below (top = 1, bottom = 3).

- Site specific (eg. property, construction and/or plant or similar)
- Physical asset specific (eg. machines, technological installations or similar)
- Human asset specific (eg. employees, skills development and/or joint research/development or similar)

How would you describe the time horizon of your collaborative relationship?

Less than 1 year	1-3 years	3-5 years	5-10 years	Longer than 10 years
○	○	○	○	○

Is the duration of the agreement connected to the desire to prevent the counterparty leveraging the collaboration for self-interest?

Yes	No	Don't know
○	○	○

To what extent has the collaborators deliberate mechanisms that prevents the counterparty leveraging the collaboration for self-interest?

Not at all	Small extent	Moderate extent	Large extent
○	○	○	○

How often do you share/exchange resources with other partners?

Never	Rarely	Often	All the time
○	○	○	○

To what extent is the sharing/exchange of resources tailored for your cooperation?

Not at all	Small extent	Moderate extent	Large extent
○	○	○	○

Knowledge sharing

The following questions will deal with the sharing of knowledge within the cooperative network.

How important has knowledge sharing been for the establishment of your company?

Not important | A bit important | Moderately important | Rather important | Very important | Don't know

How much knowledge sharing has occurred in the cooperation?

Nothing | Little | Moderate | A lot

With most of our partners we have clear procedures for knowledge sharing.

Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree

How do you perceive your company's position in the cooperative network for access to new knowledge?

Poor | Moderate | Good | Don't know

To what extent do you feel your company is able to *identify* valuable knowledge residing in the collaborative network?

Not at all | Small extent | Moderate extent | Large extent

To what extent do you feel your company is able to *leverage* valuable knowledge that comes from other parties to the knowledge sharing?

Not at all | Small extent | Moderate extent | Large extent

To what extent does the cooperation have mechanisms that make it attractive for the parties to be open and to show reciprocity (eg. incentives or rewards)?

Not at all | Small extent | Moderate extent | Large extent

Do you consider "free-riding" a problem in the cooperation? I.e. that parties in the collaboration participate without contributing appreciably.

Yes | No | Don't know

To what extent do you feel that the cooperative governance helps to prevent "free-riding"?

Not at all | Small extent | Moderate extent | Large extent

Complementary resource endowments

The following questions will deal with complementary resources and capabilities. With complementary resources/abilities we mean factors that complement each other, meaning that they are more valuable together than separately. For example, one party possesses technology and another party possessing research expertise.

To what extent do the parties have complementary abilities and/or resources?

Not at all	Small extent	Moderate extent	Large extent
○	○	○	○

The partnership allows the complementary resources to enable us to reach important strategic goals.

Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
○	○	○	○	○

To what extent do you have procedures/processes to find partners with complementary resources?

Not at all	Small extent	Moderate extent	Large extent
○	○	○	○

To what extent is the parties' cooperation compatible with respect to the following factors:

	Not at all	Small extent	Moderate extent	Large extent
Systems (eg. IT-structure or communication platforms).	○	○	○	○
Processes (eg..degree of bureaucracy).	○	○	○	○
Organizational culture (eg. attitude towards change, or entrepreneursnip).	○	○	○	○

About the state and academia

Finally, we will ask a few general question about the state's role in the development of circular economies.

What role do you feel that the Norwegian authorities have had in the development of circular economies?

- [ ] No significant role
- [ ] Regulator
- [ ] Driver
- [ ] Facilitator
- [ ] Barrier
- [ ] Resistor
- [ ] Other: _____
- [ ] No opinion about this.

What role does your business mean that Norwegian authorities should take in the future in the development of circular economies?

- [ ] Regulator
- [ ] Driver
- [ ] Facilitator
- [ ] Barrier
- [ ] Resistor
- [ ] Other: _____
- [ ] No opinion about this.

If you want to elaborate, you can take advantage of the field below.

Is academia a part of your collaborative network?

- ( ) Yes
- ( ) No

What types of challenges do you wish to overcome through collaboration with academia?

- [ ] R&D
- [ ] Funding
- [ ] Political influence
- [ ] Knowledge about local/regional markets
- [ ] Proximity to local/regional markets
- [ ] Other: _____
- [ ] No opinion on this

Concluding remarks

If you have any other comments on the cooperation or study, you can use the field below to share with us.

Aggregate Results from Survey

Effective Governance

Company		Q1	Q2	Q3	Q4	Q5	Q6
ABT		Moderate extent	Both	Third party	-	-	Moderate extent
Biomega		Large extent	Both	Self-enforcemt	Formal	-	Small extent
CO2BIO		Moderate extent	Both	Self-enforcemt	Informal	Knowledge development	Small extent
Firmenich		Small extent	Both	Self-enforcemt	Formal	-	Moderate extent
Foods of Norway		Large extent	Both	Self-enforcemt	Formal	-	Large extent
Herøya Industripark		Moderate extent	Both	Self-enforcemt	Formal	-	Moderate extent
Mo Industripark		Moderate extent	Both	Third party	-	-	Small extent
ReSiTec		Large extent	Both	Self-enforcemt	Informal	Trust	Moderate extent

Relation-specific investments

Company		Q7	Q8 1	Q8 2	Q9 3	Q10	Q11	Q12	Q13
ABT		Moderate extent	Human	Physical	Site	3-5 years	Don't know	Moderate extent	Often	Moderate extent
Biomega		Small extent	Physical	Site	Human	1-3 years	No	Small extent	Often	Moderate extent
CO2BIO		Moderate extent	Site	Physical	Human	3-5 years	No	Small extent	All the time	Moderate extent
Firmenich		Moderate extent	Physical	Human	Site	5-10 years	Yes	Large extent	Often	Large extent
Foods of Norway		Small extent	Human	Site	Physical	3-5 years	Yes	Large extent	Often	Moderate extent
Herøya Industripark		Moderate extent	Site	Human	Physical	Longer than 10 years	Yes	Moderate extent	Often	Moderate extent
Mo Industripark		Large extent	Physical	Site	Human	5-10 years	No	Small extent	Often	Large extent
ReSiTec		Moderate extent	Human	Physical	Site	5-10 years	No	Small extent	Often	Large extent

Knowledge-sharing routines

Company		Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22
ABT		Very important	Large extent	Somewhat agree	Good	Moderate extent	Moderate extent	Medium degree	Don't know	
Biomega		Rather important	Moderate extent	Somewhat agree	Good	Moderate extent	Moderate extent	Small degree	No	Moderate extent
CO2BIO		Rather important	Small extent	Neither agree nor disagree	Good	Moderate extent	Moderate extent	No degree	No	Small extent
Firmenich		Not important	Small extent	Agree	Good	Moderate extent	Moderate extent	High degree	Don't know	
Foods of Norway		Very important	Large extent	Agree	Good	Large extent	Large extent	Medium degree	No	Large extent
Herøya Industripark		Very important	Moderate extent	Somewhat agree	Good	Moderate extent	Moderate extent	Medium degree	No	Moderate extent
Mo Industripark		Very important	Moderate extent	Neither agree nor disagree	Moderate	Moderate extent	Moderate extent	Medium degree	No	Large extent
ReSiTec		Moderately important	Moderate extent	Somewhat agree	Good	Moderate extent	Moderate extent	High degree	No	Large extent

Complementary resources

Company		Q23	Q24	Q25	Systems	Q26	Processes	Culture
ABT		Large extent	Somewhat agree	Moderate extent	Moderate extent	Moderate extent	Moderate extent	Moderate extent
Biomega		Moderate extent	Somewhat agree	Moderate extent	Not at all	Small extent	Moderate extent	Moderate extent
CO2BIO		Moderate extent	Neither agree nor disagree	Small extent	Not at all	Small extent	Moderate extent	Moderate extent
Firmenich		Moderate extent	Agree	Moderate extent	Small extent	Moderate extent	Moderate extent	Small extent
Foods of Norway		Large extent	Agree	Large extent	Small extent	Small extent	Small extent	Moderate extent
Herøya Industripark		Moderate extent	Somewhat agree	Small extent	Small extent	Small extent	Moderate extent	Moderate extent
Mo Industripark		Large extent	Agree	Moderate extent	Small extent	Moderate extent	Moderate extent	Large extent
ReSiTec		Moderate extent	Agree	Large extent	Small extent	Moderate extent	Moderate extent	Moderate extent

Role of government

Company					Q27							Q28				
		No significant role	Regulator	Driver	Facilitator	Barrier	Resistor	Other	No opinion	Regulator	Driver	Facilitator	Barrier	Resistor	Other	No opinion
ABT		1										1				
Biomega					1					1		1				
CO2BIO		1														1
Firmenich									1		1					
Foods of Norway		1									1					
Herøya Industripark		1				1					1	1				
Mo Industripark						1						1				
ReSiTec					1							1				

Role of academia

Company	Q29	Q30				Q31				Q32	Q33
			R&D	Funding	Political influence	Knowledge about markets	Proximity to markets	Other	No opinion		
ABT		Yes	1								
Biomega		Yes	1	1						Many state-support R&D-projects are driven by academia (for funding), and not focused on making the businesses better.	
CO2BIO		Yes	1								
Firmenich		Yes	1								
Foods of Norway		Yes	1								
Herøya Industripark		Yes	1			1	1				
Mo Industripark		Yes	1	1							
ReSiTec		No									

Descriptive Statistics from Survey

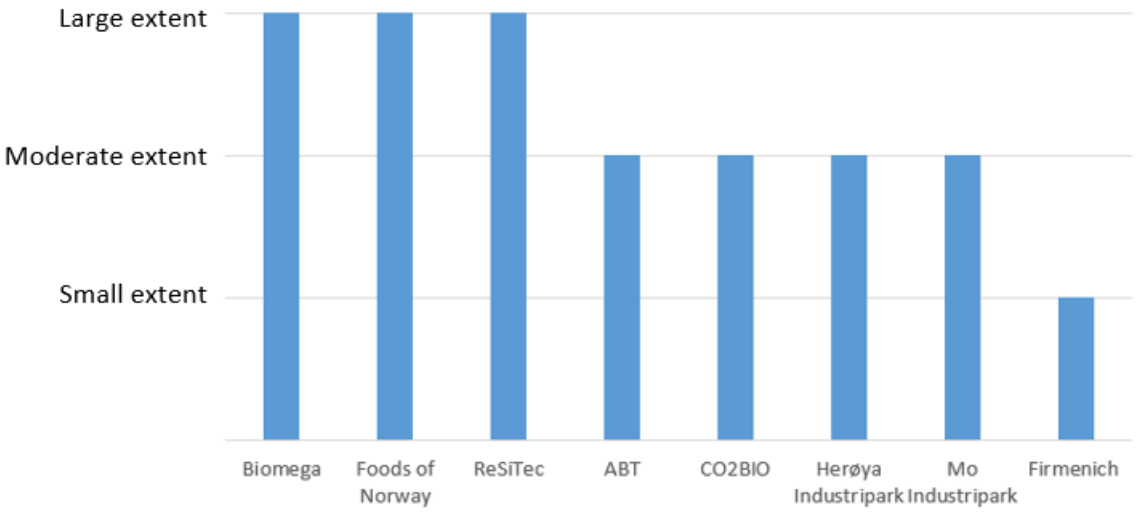

Figure 19: Survey: Tailoring of governance. *The figure shows to which extent the companies have tailored the governance of collaborations according to the respective partners' characteristics (cf. question 1 in survey).*

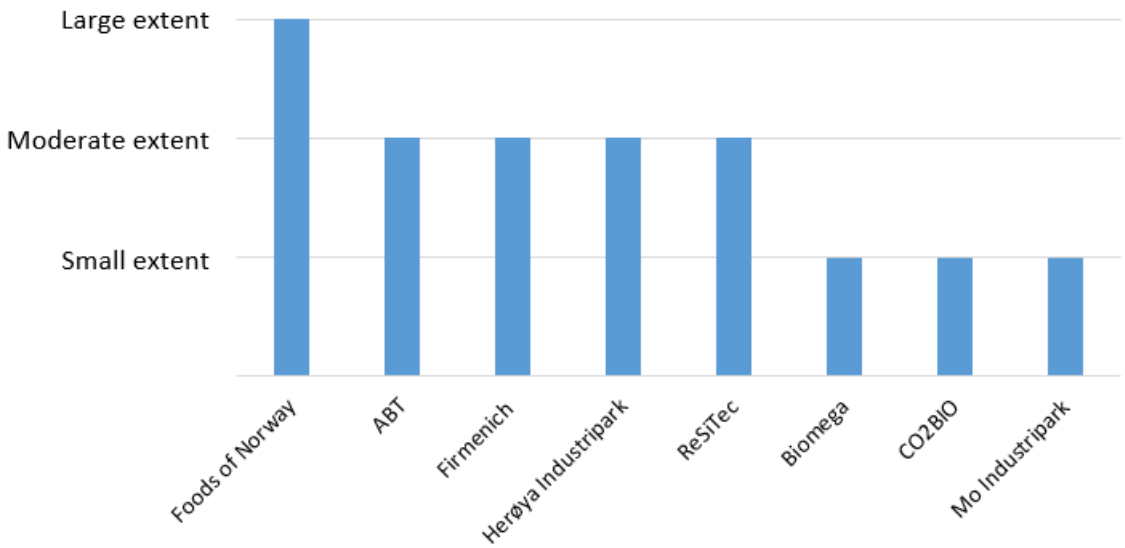

Figure 20: Survey: Importance of alliance experience. *The figure shows to which extent the companies emphasize previous alliance experience in potential partners.*

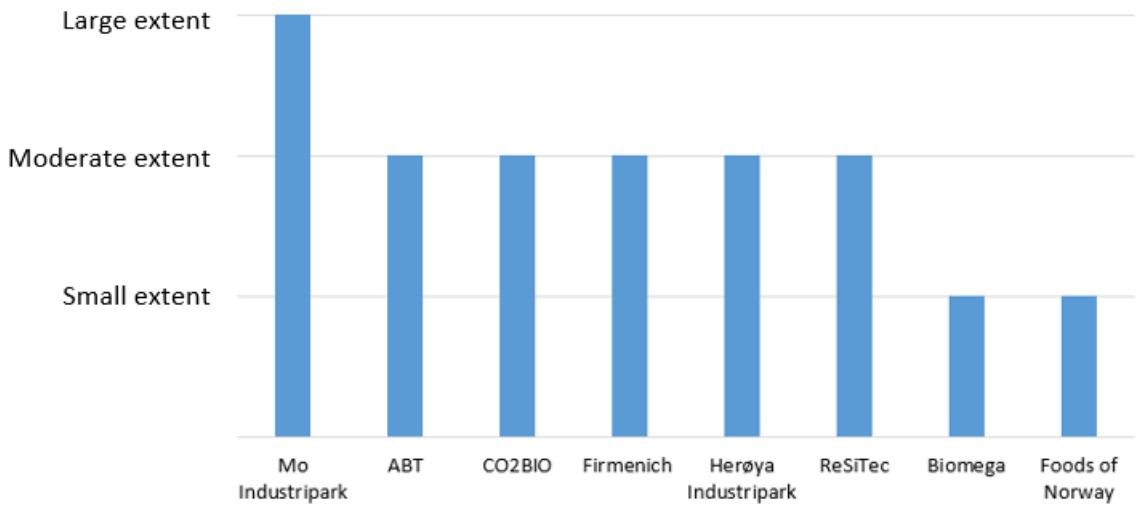

Figure 21: Survey: Relation-specific investments. *The figure shows to what extent the companies and their respective partners have invested in relation-specific assets.*

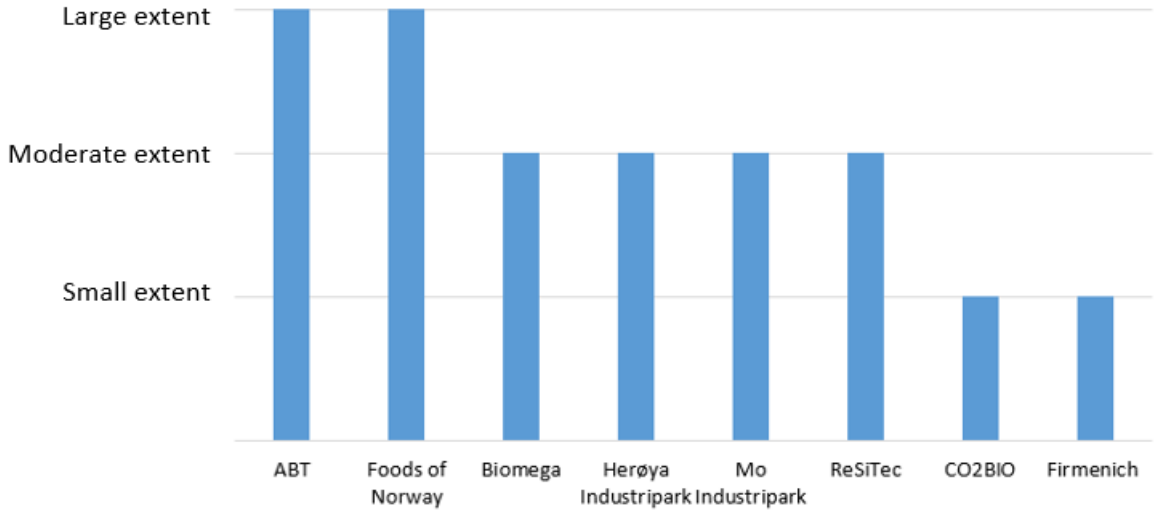

Figure 22: Survey: Knowledge sharing. *The figure shows to what extent they have experience knowledge sharing in their collaborations.*

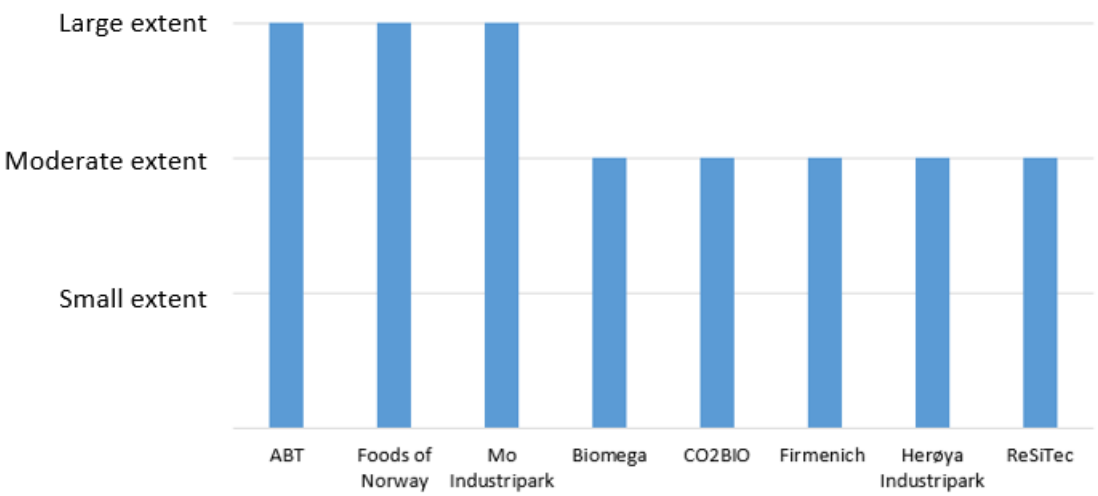

Figure 23: Survey: Complementary resources. *The figure shows to what extent the companies experience that there are complementary resources present in their respective collaborations.*

Appendix C
The CABRISS Project