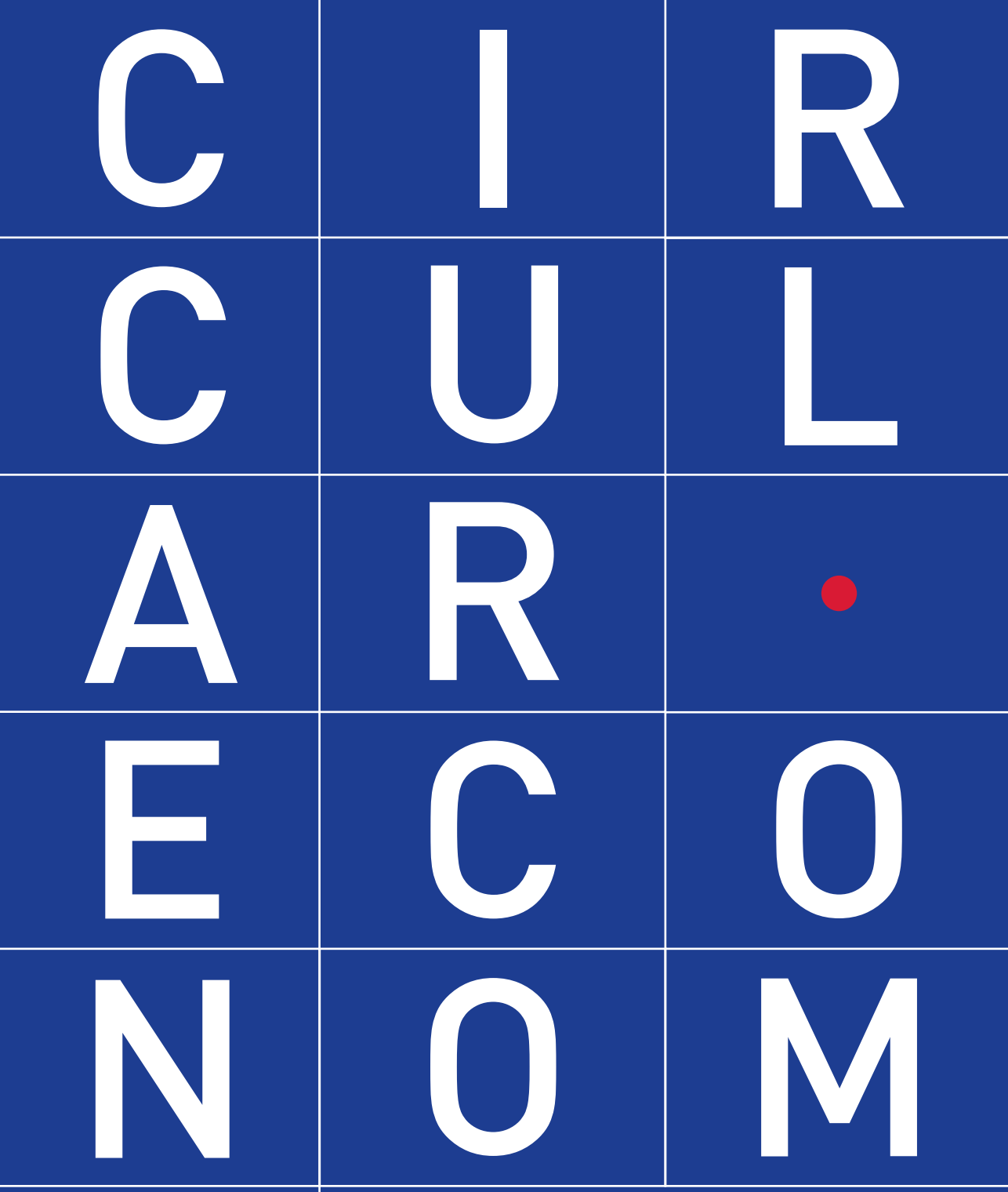

FORGING INSTITUTIONS

On how circular business model innovation shapes the circular economy while instigating the new rules of the game

Aglaia Fischer

Circular economy - forging institutions

On how circular business model innovation shapes the circular economy while instigating the new rules of the game

Aglaia D. Fischer

PROPOSITIONS
A.D. FISCHER

Propositions

1. Circular Business Model Innovation (CBMI), especially in case of more disruptive CBMs, is constrained by the current institutional setting which is reinforcing the linear economic rationale.
(this thesis)

2. CBMI influences institutionalisation of new incentives and formal rules that favour a circular economic rationale.
(this thesis)

3. Digitization and specifically the internet of things (IOT) and distributed ledger technology (i.e. blockchain) plays an increasingly pivotal role in our economy.

4. Understanding the dynamics of policy making processes such as the EU Green Deal is key for sustainable policy scholarship.

5. The value of rich data and insights, thanks to a double role as project manager and researcher, is greater than the value of objectivity to the research subject.

6. When failing to take social aspects into account, the circular economy transition will not lead to a sustainable economy.

7. When one is pressed for time, consider cooking rather than reading.

Propositions belonging to the thesis, entitled

Circular economy – forging institutions; On how circular business model innovation shapes the circular economy while instigating the new rules of the game

Aglaia Fischer
Wageningen, 10 May 2022

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This research was conducted under the auspices of the Wageningen School of Social Sciences (WASS)

Circular economy - forging institutions

On how circular business model innovation shapes the circular economy while instigating the new rules of the game

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Aglaia D. Fischer
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List of abbreviations

CCA	- Coalition Circular Accounting
CE	- Circular Economy
BM	- Business Model
CBM	- Circular Business Model
CBMI	- Circular Business Model Innovation
CSR	- Corporate Social Responsibility
CSRD	- Corporate Sustainability Reporting Directive
EMF	- Ellen MacArthur Foundation
GHG	- Greenhouse Gas
PaaS	- Product-as-a-Service
PAS	- Product as Service (only used in chapter 2) = PaaS
PSS	- Product Service Systems
SQ	- Status Quo

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01.

Introduction

1.1 General Introduction

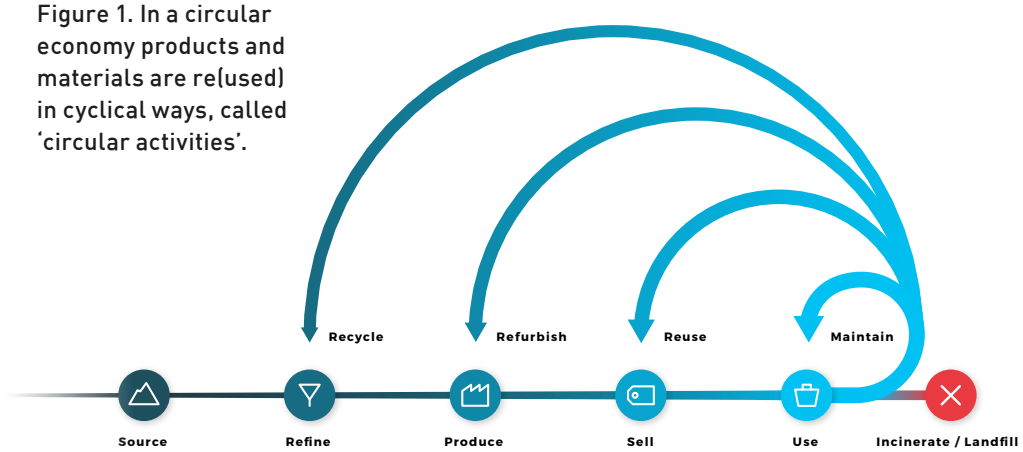
There is a vastly increasing urge for transitioning to a sustainable economy (Brundtland, 1987; IPCC, 2014, 2021). We are not making sufficient progress in becoming climate neutral, as warned by the latest IPCC report (2021). Despite alarming conclusions about rising temperatures, biodiversity loss and climate tipping points, hope lies in a radical transformation of processes and behaviour at all levels: individuals, communities, businesses, institutions, and government. In other words, we are urged to shift to an economy that is sustainable in the long run and functions within our planetary boundaries (Seiffert & Loch, 2005; Wijffels & Toxopeus, 2014).

The concept of circular economy (CE) has emerged in the past decade and has rapidly become a leading sustainability paradigm (Geissdoerfer *et al.*, 2017). The sustainability debate initially centred around reducing harmful emissions (cleaner production by industries, using renewable energy such as solar and biofuels) and proposed companies to strive for sustainability as a separate activity next to their focus, their core product offering. The sustainability discourse further developed towards a focus on Corporate Social Responsibility (CSR) strategy to bring sustainability closer to companies' core strategies. Albeit the efforts, corporate strategy and sustainability seem as compatible as oil and water. Even today, unifying sustainability and economic incentives has remained a paradox. Circular economy proposes an economic rationale of doing businesses according to *circular principles* that propose to (re)use products and materials in cyclical ways, thereby increasing the sustainability of production processes. Could it be that circular economy is the emulsifier that we can use to rebalance our economic incentives and activities to no longer exceed the bearing capacity of our planet and social systems?

1.2. Circular Economy

The transition from a linear take-make-use-waste economy to a circular economy can be seen as an important pillar of a broad societal transformation towards a sustainable economy. Materials are kept in the loop, instead of being discarded in landfills, being incinerated or ending up in the biosphere. Moreover, circular economy proposes the use of renewable energy for all production processes (Ellen MacArthur Foundation, 2012). There has been a vast increase in circular economy scholarship, as well as a myriad of definitions (Kirchherr *et al.*, 2017). **A circular economy is restorative by intention and design** (Ellen McArthur Foundation, 2013) and has the potential to reduce resource depletion and GHG emissions (Ghisellini *et al.*, 2016).

Figure 1. In a circular economy products and materials are re(used) in cyclical ways, called 'circular activities'.



Source: Circle Economy, 2016.

What sets apart circular economy from other sustainability frameworks is that it proposes a new economic rationale. In a circular economy, **businesses are the key actors**. They (re)design their products, services, and supply chain processes in such ways that they optimise the use of products and their embedded materials. Business create new '**circular business models**' (CBMs) in **Circular Business Model Innovation** (CBMI) processes (Linder & Williander, 2017) with the aim of creating a value proposition and designing business processes based on circular economy principles (Lüdeke-Freund *et al.*, 2019).

Recent scholarship has delved into processes of business model innovation based on CE principles for narrowing, slowing, closing, and regenerating resource flows (Bocken *et al.*, 2016; Geissdoerfer *et al.*, 2018). CBM activities such as repair and maintenance, reuse and redistribution, refurbishment and remanufacturing, recycling, cascading and repurposing, and using organic feedstock, lie at the basis of CBMs and circular value creation (Lüdeke-Freund *et al.*, 2019). Narrowing resource cycles implies using less resources, for instance through innovations in the production and design of products, such as resource efficiency and optimised logistics. Slowing resource cycles implies using resources for longer, for example by increasing product longevity through design for durability and remanufacturing. Closing resource cycles means using resources over and over by making sure that all resources are reused in new product life cycles after use (Bakker *et al.*, 2021; Bocken *et al.*, 2016). Moreover, circular business models enable saving energy and reducing greenhouse gas emissions because fewer new products must be produced.

The **complexity of CBMs** can vary greatly. A low-tech example is processing kitchen waste to generate compost. High-tech CBMs can become very complex and can involve many processes and supply chain partners. An example is Philips 'Pay per lux'; providing light as a service. This CBM generates value by optimising the actual lighting systems, as well as the take back processes and being able to maintain and reuse(elements and materials in) the lighting systems. The customer does not own the lighting systems, but only pays for the light itself. On the backend of this CBM, Philips and its supply chain must monitor products and parts before, during and after use, and make clear agreements about the allocation of responsibilities for (the performance of) products, parts, logistics, monitoring et cetera. This type of CBM that offers the use or performance of a product 'as a service' is also called a **Product-as-a-Service (PaaS) business model.** In literature a PaaS model falls under the broader category of Product Service Systems (PSS). PSS are defined as "consisting of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customer needs"(Tukker & Tischner, 2006). There are eight types of PSS models defined in literature, that differ in terms of economic and environmental characteristics (Tukker, 2004). In this dissertation,the focus lies specifically on PaaS, a PSS model that aims to optimise circularity by maintaining ownership while providing performance of a product to customers. PaaS provides an incentive to optimally manage products and materials by engaging in circular activities.

CBMs can ingeniously enable and incentivise capturing value from (re)using products and materials in ongoing cycles. They provide a means for developing economic activities while at the same time reducing environmental impacts (Ghisellini *et al.*, 2016). When companies want to implement these circular business models however, they encounter challenges (Bocken, 2020; Vermunt *et al.*, 2019). An important cause for these occurring challenges can be understood when zooming out and looking at the institutional setting within which companies operate (Fischer & Pascucci, 2017).

1.3. Institutions – the rules of the game

Companies are compelled to operate within a set of frameworks and rules, an **institutional setting** that has shaped over time. Seen through the lens of *institutional analysis,* a multidisciplinary framework focussing on how the "rules of the game" of socioeconomic systems are defined (Ostrom, 1995, 2011; Williamson, 2000), **institutions** can be seen as humanly devised norms, rules and constraints that shape interactions and incentives in human exchange (Coase, 1988; North, 1990; Williamson, 2000). The current institutional setting fits and reinforces the current economic rationale (i.e., take, make, use, waste) (Fischer & Pascucci, 2017). It favours incumbent logics and business models, while hampering future ones. The logic of our current economic rationale is to maximise return on investment by making and selling as much products as possible. This incentivises companies to sell products that do not last and need to be replaced relatively often, since this will drive sales, hence profit.

The logic of a circular economic rationale is about increasing the quality (i.e., longevity) of products to use products and materials for as long as possible. When companies start reasoning this way, selling many products is no longer the goal. Instead, managing products in collaboration with other companies in the supply chain that help to maintain, refurbish, or recycle them, monitoring and optimising products so that products can continuously serve to deliver a performance becomes the goal (think about the above example of selling light instead of selling lighting systems). Since the current institutions are favouring the linear logic, it is relatively easy to create a business case along these lines. However, creating a circular business case can incur all kinds of implicit and explicit

obstructions, ranging from hampering policy measures that prevent companies from from using waste as a resource to a vacuum of financial products to fund CBMs.

1.4. Research Question

This dissertation is concerned with the development and implementation of new CBMs and how their implementation fits within or demands reshaping the institutional setting. Where are the **bottlenecks** within the current institutional setting and what elements should be part of **a new institutional setting** that ignites and supports a circular economy? And how are CBMs and their surrounding stakeholders forging new institutions, functioning as **institutional intermediaries?** These questions lead to the overall research question of this dissertation:

To what extent do circular business models fit within the current institutional setting and how does circular business model innovation forge new institutions that drive the circular economy transition?

1.5. Research context

In this PhD project it is not the CBM itself, but rather the process of CBMI and the viability of CBMs within the institutional environment that is the unit of analysis. To study the (mis)match between CBMs and their institutional environment I iterated between the level of the CBM – understanding and analysing the typical elements and principles of CBMs – and the level of institutions – understanding the (mis)match between new CBM elements and principles and institutions such as legal and financial sector frameworks – that form the institutional environment.

For this dissertation qualitative research was conducted to study the phenomenon of CBMs and CBMI in relation to the institutional setting. For chapter two, data was gathered by interviewing a range of businesses with differing circular business models in the Dutch textiles industry. For chapters three, four and five, data was gathered during a variety of projects organised by Circle Economy, a not-for-profit organisation with a mission to *empower businesses, cities and nations with data, tools and knowledge to put the circular economy into action.* In my role as a project manager, and later lead of the circle finance programme, I was able to collect granular data during several projects and was allowed to use this data for scientific research. Complete and granular data collected in these projects resulted in unique insights in the process of shaping and implementing CBMs. Since these projects focussed on specific legal and financial opportunities and challenges, I was able to write chapters concerning contracting in the circular economy (chapter three) and finance and accounting in the circular economy (chapter four). The chapter on finance and accounting forms an exception to the qualitative nature of this dissertation, since a mix of qualitative research (workshop materials and transcripts) as well as numerical data (financial modelling of CBMs) was used. Chapter five zooms out and looks at the broader process of institutional field formation of CE and the role of institutional intermediaries.

1.6. Four research chapters

The main part of this dissertation consists of four chapters: two peer reviewed journal articles and two peer reviewed book chapters.

Chapter two explores circular businesses operating in the Dutch textiles industry to gain insight in the creation of new organisational forms and the role of enabling organisations (i.e., institutional intermediaries) in the development of CBMs. Two transition pathways are identified; Status Quo (SQ) and Product-as-a-Service (PaaS)[1]. The first focusses on optimizing activities within the current sales model, while the latter aims at providing products in service contracts, implying ownership shifts from the user to the service provider. This chapter pinpoints the development of new institutional incentives concerning contracting, financial mechanisms, and chain coordination.

Chapter three considers contract design as the interface between circular business models and legal dimensions. The research question revolves around how contractual mechanisms can enable innovation processes in the design of a PSS model between service providers and clients in relation to servitisation, longevity and modularity. Analysing data stemming from the Fairphone-as-a-service (FaaS) project to define a circular service contract template results in the idea that the institutional aspects of contracts, ownership and property rights strongly influence how PSS business models emerge. Particularly, we see tensions between ownership aspects created in a linear economy's institutional setting on the one hand, and, on the other hand, contractual aspects required for a truly circular value proposition.

Chapter four focusses on finance and accounting in the circular economy. Current finance and accounting frameworks fail to appreciate value created with CBMs, while perceiving a high risk due to a lack of historical data for CBMs. This results in the lack of a level playing field for companies with a CBM. Using data from three business cases that are in the process of changing from a linear to a circular business model we show specific bottlenecks concerning financial ratios for circular companies and how this hampers risk assessment and ultimately circular investments. The additional value of a circular business model cannot yet be reflected in commonly accepted accounting structures, which is a major hurdle for the viability of CBMs. This necessitates the adaptation of the

[1] Chapter two was published in the Journal of Cleaner Production (Fischer & Pascucci, 2017). In the original article we talk about Product as Service (PAS) instead of Product-as-a-Service (PaaS). In later published work we decided to talk about Product-as-a-Service (PaaS) for continuity of terminology in the field. PAS (only used in chapter 2) means the same as PaaS.

accounting structures, and financiers' interpretation of risks of CBMs, while starting to recognise risks associated with continuing linear business.

Chapter five investigates the process of institutional field formation of CE, by looking at how rule making and taking are emerging in CBMI processes. We particularly focus on the role of institutional intermediaries as translators and brokers between circular businesses on the one hand and regulators and regulatory frameworks on the other hand. We used an inductive case study approach consisting of three strategic projects and documentary data of the institutional intermediary 'Circle Economy'. The results show how emerging circular value proposition elements are anchored in legal and financial structures and finally consolidated in institutional settings. Conceptualizing CE as a new institutional field, particularly expands our knowledge on the role of intermediaries facilitating the institutional change processes supporting CBMI.

Based on the chapters two to five, the conclusions of this dissertation are presented in chapter six. Furthermore, this chapter provides practical insights for business professionals wishing to engage in circular economy practices, as well as directions for further research.

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02.

Institutional incentives in circular economy transition: The case of material use in the Dutch textile industry

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155 (2017) 2. - ISSN 0959-6526 - p. 17 - 32.

Abstract

The aim of this paper is to gain insight into how requirements for transitioning to circular economy creates new organisational forms in inter-firm collaborations, and ultimately how they stimulate the emergence of new institutions enhancing sustainability. Two strands of literature, one on circular economy and one on institutional analysis, provide the theoretical background for this research. Currently a clearly formulated and unified theory on the institutions of circular economy is lacking. Therefore, this research compares and contrasts empirical evidence from cases derived from the textile industry in The Netherlands, and concepts derived from institutional analysis and literature on circular economy to inductively build a cohesive conceptual framework. Using information from cases we identified two pathways to transition into circular economy and to manage circular material flows. We define these pathways Status Quo arrangements (SQ), when firms focus on optimizing up-cycling technologies and infrastructure in their circular relations and collaborations, and Product as Service arrangements (PAS)[2], to indicate a focus on providing products in service contracts. Chain coordination, contracting, and financial mechanisms were identified as key organisational elements for creating new pathways to transition into circular materials flows. However, in analyzing these elements we also highlight differences between SQ and PAS arrangements. SQ arrangements may have implications at the level of formal rules, for example by creating new industry standards for up-cycled fabrics. PAS arrangements may have wider implications, for example by reshaping ownership in service contracts and creating cascading activities. Moreover, PAS arrangements may have bottom-up effects at a formal institutional level, resulting in alteration and creation of formal rules, for example in terms of new approaches to the ownership of materials.

[2] Chapter two was published in the Journal of Cleaner Production (Fischer & Pascucci, 2017). In the original article we talk about Product as Service (PAS) instead of Product-as-a-Service (PaaS). In later published work we decided to talk about Product-as-a-Service (PaaS) for continuity of terminology in the field. PAS (only used in chapter 2) means the same as PaaS.

2.1. Introduction

The current linear system of ever-increasing production, consumption, and economic growth is coming to an end (Ghisellini *et al.*, 2015). In fact, this system is running out of resources, causing price volatility, uncertainties, and economic crises (Ellen McArthur Foundation, 2013). Besides the economic urgency for change, the linear approach to production and consumption is causing deterioration of the ecosystems due to climate change and environmental pollution (Groot et al., 2002; Barker, 2007). In other words, one can conclude that our current system is neither capable of sustaining our economic prosperity (Ellen McArthur Foundation, 2013), nor provide the vital living conditions for human beings and all other animal species (Costanza *et al.*, 1997; Ghisellini *et al.*, 2015).

There has been a lot of theorizing about the way to solve this issue. Scholars have come up with different ways of mapping and decreasing firms' activities that are harmful to the environment (Lozano *et al.*, 2015). Concepts like carbon footprint, life cycle assessment (LCA), zero emissions (Braungart *et al.*, 2007), and eco-efficiency (Verfaillie and Bidwell, 2000) form the basis for frameworks that tackle the environmental degradation connected to firms' activities. All these concepts are in one way or another concerned with using fewer resources and reducing emissions, i.e. being more efficient. They start from the status quo of the common linear, one-way flow of materials. First, materials are extracted from the earth, made into products, and finally, after being used, they are incinerated or landfilled (Braungart *et al.*, 2007). Eco-efficiency approaches attempt to minimize the speed, toxicity, and volume of these material flows, but they do not challenge the linear approach and disposal of materials at the end of the life cycle (Ghisellini *et al.*, 2015). From an economic point of view, eco-efficiency can result in short term cost reduction because of these cutbacks. However, reducing costs as a result of using fewer materials would soon reach a limit, seeing as we still need food to eat, garments to wear, et cetera. Hence, in the long term, the concept of eco-efficiency is leading to the conclusion that the ecological objectives of zero waste and eco-efficiency cannot be unified with the economic objective of eternal growth (Braungart *et al.*, 2007). To summarise, attempts to be more eco-efficient can result in (temporary) improvement, but do not provide a long-term solution.

In contrast to eco-efficiency, another type of solutions can be found in the principles of Circular Economy (Ellen McArthur Foundation, 2013). Circular Economy (CE) is an industrial economy that is restorative by intent and design (Ghisellini *et al.*, 2015). One of the main principles of CE is 'waste is food'. This means that all materials and products that are used can be seen as a temporary depot of materials or nutrients that will become input for new products after their lifecycle (Tukker, 2013; van Weelden *et al.*, 2015). In CE, the concept of waste is eliminated by carefully designing products and industrial processes in such a way that materials are perpetually flowing nutrients and managed in closed loops. These loops are also defined as industrial metabolisms (Ellen McArthur Foundation, 2013; Smol *et al.*, 2015). When firms are part of a metabolism, they engage in organizing industrial symbiosis, in which energy and/or materials flowing out from one firm/process can be used in another process and/or by another firm that is active in the metabolism (Ashton, 2008). In a circular metabolism, waste is designed out. Therefore, CE can tackle the paradox of uniting economy and ecology by aiming at an intelligent design of products and processes. In circular metabolisms, materials maintain their status as a productive resource (Braungart *et al.*, 2007).

The current linear economy however, creates institutional barriers that have to be overcome in order to transition in to a CE (Ghisellini *et al.*, 2015). Institutions are rules that shape economic actors' decision-making, and they are at the core of how firms, consumers, and other stakeholders interact and collaborate at a more general level (Williamson, 2000; 2002). Transitioning from a linear into a circular economy requires the emergence of new rules which need to be aligned to CE principles and practices. For example, when companies engage in a circular metabolism they have to deal with new forms of inter-firm collaborations which are typically related to a wide set of interdependencies and complexities (Grandori and Soda, 1995; Grandori, 1997). Therefore, transitioning into circular economy creates conditions to experiment with new organisational forms to transact and collaborate, as well as reshape the way property rights, regulations, and laws are conceptualised.

Still, the main challenge is to understand how to facilitate this transition when constrained by an institutional system that is aligned with the status quo of a linear economy, and particularly to understand the role of inter-firm collaborations in this process. In our view, the vacuum of rules and related constraints are the drivers that provoke strategic actors (e.g. firms, policy-makers, consumers) to design new rules and thus to behave as institutional entrepreneurs (Pacheco *et al.*, 2010). The aim of this paper is therefore to gain insight into how requirements for transitioning to CE create new organisational forms in inter-firm collaborations, and ultimately how they stimulate the emergence of new institutions. Two strands of literature, one on CE and one on institutional analysis, provide the theoretical background for this research. Currently, a clearly formulated and unified theory on new organisational forms of CE is lacking.

To theorize about these new organisational forms, we selected empirical evidence from cases on the Dutch textile industry. Globally, the textile industry is a debated industry because of its severe impact on the environment due to the consumption of an enormous number of resources, as well as the generation of 5% of total waste in the world (www.textilelab.nl). The two most commonly used resources, cotton and polyester, represent 85% of global fibre production and amounted to a total production of 65 million tons in 2014 (www.circle-economy.com). These numbers are still rising because consumers, on average, are buying 'fast fashion', such as low-cost, low-quality garments that are produced in low-wage countries and sold in high volumes on Western markets (Circle Economy, 2015; Circular Textiles Lab, 2015). The Netherlands is a frontrunner in implementing CE principles. The Dutch textile industry, for instance, shows a transition towards circular usage of materials by creating new organisational forms to collaboratively improve this industry (www.circle-economy.com). This article compares and contrasts empirical evidence from selected cases withconcepts derived from literature on CE and institutional analysis, while aiming to inductively build a cohesive conceptual framework. More specifically, institutional analysis has been used to build a theoretical framework on how circular material flows can be established within linear institutional systems.

2.2. Conceptual framework

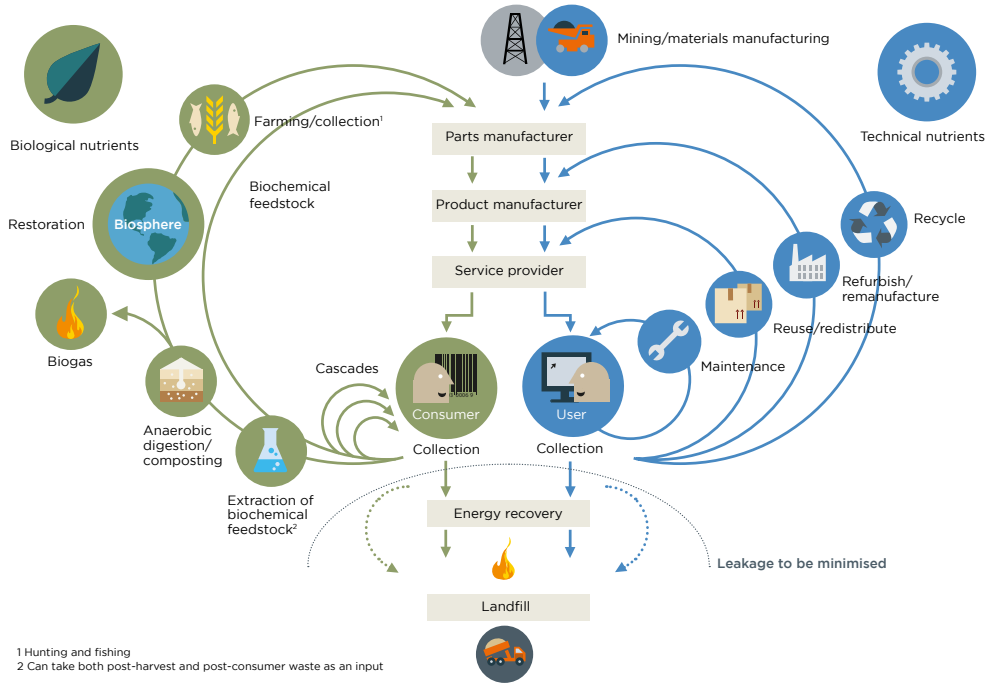
2.2.1 Circular Economy

The Ellen MacArthur foundation refers to CE as an industrial economy that is restorative by intention, and relies on three principles: (i) *waste is food* (i.e. eradicate waste through careful design); (ii) *no mixing of biological and technical materials;* (iii) *rely on renewable energy* (Ellen McArthur Foundation, 2013). CE is strongly connected to the concept of cradle-to-cradle (C2C), and focuses on eco-effectiveness rather than eco-efficiency, aiming at creating 'cradle-to-cradle' materials flows (Braungart *et al.*, 2007; Ghisellini *et al.*, 2015). The C2C concept does not call for minimizing material streams but asks for intelligent design of products and processes in such ways that their constitutive materials maintain their status as productive resources (Braungart *et al.*, 2007). Products and industrial processes are designed in such a way that materials are nutrients in a perpetual flow of either biological or technical metabolisms (Smol *et al.*, 2015). Biological nutrients are biodegradable materials that are safe to return to the biosphere to feed biological processes, such as food, cotton, and timber (Smol *et al.*, 2015). Technical nutrients on the other hand, are materials that can remain in a closed-loop system of manufacturing, material recovery, and reuse (Tukker, 2013). These are often synthetic or mineral materials and are used in a lot of consumer goods such as electronics, furniture, and cars (Braungart and McDonough, 2002). The use of toxic materials should be omitted, especially from products that are consumed or returned to the bio cycle (Ellen McArthur Foundation, 2013). As shown in figure 2, in an ideal CE, products are designed while considering possibilities to reuse products, cascade (parts of) products, and to harvest pure materials at the end of a product's lifecycle (Ellen McArthur Foundation, 2013). Finally, required energy should always come from a renewable source.

Figure 2 shows the loops in which (parts of) products and materials circulate and cascade. The central part of the figure represents the linear system as it is currently known: from taking materials (e.g. mining), to making (manufacturing and service provision ing), to using, consuming, and disposing of the product. In a linear system, disposing of materials means trying to recover energy through incineration and/or landfilling. However, in a CE approach products are carefully designed to be durable, modular, and recyclable on the material level, enabling a closed loop metabolism whilst retaining the largest possible amount of added value. Cascading activities is an example of how to design closed loops and they are most valuable towards the inner circle.

For technical cycles, loops are created by maintenance, reuse, refurbishing, remanufacturing, and recycling (see the 'right wing' of figure 2). Activities near the inner circle need the least amount of energy to create value because the products only need (minor) alterations. At the same time, most of the added value of the product is preserved since the product or its parts are used again, rather than being disassembled or be disposed of (Ellen MacArthur Foundation and McKinsey, 2014).

Figure 2. Visualization of interactions in the biological- and technical material cycles.



Source: Ellen McArthur Foundation, 2013.

From an organisational standpoint, firms engaged in cyclical metabolisms are more interdependent while they also deal with increased complexity as compared to firms engaging in linear supply chain relations (Ashton, 2008; 2009), as is commonly observed in inter-firm networks and collaborations (Grandori, 2012). If we look in particular at the activities used to close cycles in both biological as well as technological metabolisms, such as cascading, we can see that interdependencies are created either because materials need to be jointly managed (pooled interdependency), or because complementary assets or competences need to be jointly applied to, for example, reuse and refurbish materials (intensive interdependency[3]). Simultaneously, interdependencies are created because a second firm can use the stream of output in another stage of the cycle. This is often defined as sequential interdependency, or reciprocal interdependency if the involved material/resource is highly specific for the firms operating in the cycle (Grandori, 1997). Since industrial metabolisms can be made up of several firms and include a large number of processes and nutrients, actors involved in activities to close loops also deal with increased complexity in their decision making and the information they have to process and store (Korhonen, 2004; Ashton, 2008; 2011). Another important feature of CE is that, other than focusing on consuming fewer materials as in eco-efficiency driven approaches, it also focuses on prolonging the use of materials and on

[3] Typologies of interdependencies in inter-firm collaborations are extensively discussed in Grandori (1997)

avoiding use of toxic compounds, thus considering any material used in a cycle as being a healthy nutrient for new cycles. If we look at industrial processes trough this lens, it implies that the used excess materials and end of life products, which are currently seen as waste streams, would become the input for other production processes (Smol *et al.*, 2015). Being able to use materials over and again as a nutrient for new industrial cycles implies the capacity to unite a reduction of virgin materials with economic growth, thus allowing regenerative abundance. In other words, CE provides a strategy that recouples ecology and economy (Ellen McArthur Foundation, 2013; Ellen MacArthur Foundation and McKinsey, 2014).

2.2.2. Institutional Analysis

Similar to the concept of industrial symbiosis, participation in circular metabolisms implies having to deal with a variety of interdependencies between organisations (Korhonen, 2001; 2004; Gallopoulos, 2006; Wassenaar, 2015). These pose the conditions for the emergence of novel organisational forms between firms, in which, similarly to any other inter-firm networking, collaboration is explored in order to take full advantage of a circular metabolism, while limiting its costs (Grandori, 2012). Thus, the main challenge faced by firms engaged in CE transition is to arrange collaboration and business relations, while being constrained by an institutional system that is aligned with the principles of linear economy. In other words, there is a vacuum of institutions, for instance in terms of property rights, regulations, and (business) standards, which can sustain and facilitate inter-firm collaborations in circular metabolisms. Rules are needed because interdependencies are increased and become more specific as compared to collaborations in linear systems. As a consequence, actors (most importantly firms and consumers) engaged in CE transitions are increasingly more stimulated to act as institutional entrepreneurs (Pacheco *et al.*, 2010). As pointed out by Greif (1998), there is a relationship between organisational and institutional changes. More specifically new forms of organisations, such as contracts and arrangements between firms participating in circular metabolisms, can eventually result in altering more general rules in society, thus starting a process of transition at a wider scale. To fully understand this process we adopt an institutional analysis perspective. Institutional analysis is a multidisciplinary framework that focuses on how the "rules of the game" of any socio-economic system are defined (North, 1990; Ostrom *et al.*, 1994; Ostrom, 1995; Greif, 1998; Williamson, 2000). Institutions are often seen as humanly devised constraints that shape interactions (North, 1990) and are considered to be key to structure incentives in human exchange (Coase, 1988; Williamson, 2000; 2002). Institutions shape the way actors (inter)act and collaborate (Anderson and Hill, 2002, 2004). Conversely, actors can also shape these rules, becoming the entrepreneurial and mobilizing resources required to change or transform institutions (Battilana *et al.*, 2009; Pacheco *et al.*, 2010), with the aim of exploiting economic opportunities that cannot be obtained in the current institutional system (Anderson and Hill, 2004). The question then remains how to categorize institutional change related to the emergence of inter-firm collaborations in circular metabolisms. Using an institutional analytic perspective, novel organisational forms can be seen as strategic situations in which actors engaged in circular metabolisms mobilise resources to alter the institutional status quo. Thus, within these collaborations, rules are set as self-enforcing constraints since they are not supported by any external enforcement (i.e. business standards, regulations, and property rights on materials) (Greif, 1998). As such, the unit of our analysis is novel organisational forms of inter-firm collaborations in circular materials flows, where the textile industry provides the micro empirical context of this analysis. We look at changes at the organisational level (inter-firm collaborations) which may re-shape institutions at higher level, such as in terms of formalized rules (e.g. property rights on materials industry standards) and informal rules (e.g. trust and values related to material use and flows) (Greif, 1998).

2.3. Methodology

In line with the perspective of institutional analysis in this research, we follow an inductive approach and implement a methodological strategy based on using data grounded in a specific geographical and historical context (Greif, 1998). Although institutional analysis has mainly employed micro-modelling analytic approaches based on a game-theoretical perspective (Greif, 1998), we deviate from this tradition and perform a more qualitative and explorative analysis based on a theory building from cases approach (Eisenhardt and Graebner, 2007). Particularly we use empirical evidence from multiple cases of inter-firm collaborations in circular materials flows operating in the Dutch textile industry in order to depict the emergence of institutional changes. Building theory from case-based analyses is one of the most suitable methods to develop constructs and testable propositions for mainstream deductive research (Eisenhardt and Graebner, 2007). Additionally, being deeply embedded in rich empirical data, building theory from cases often generates theory that is testable, accurate, and noteworthy (Eisenhardt and Graebner, 2007).
Since CE is a novel phenomenon and the identification of relevant strategic processes and actors in this domain is still limited, we see our analysis as preparatory for a more robust and formalized approach to analyse institutional change in the CE transition. Several existing conceptual frameworks explain why CE is the most effective way to go about material use. However, there is no existing theory or conceptual approach on how CE can be implemented. Institutional analysis so far has not focused on CE.
At the best of our knowledge, no theory exists that provide an insight into how organisations create new institutions in order to facilitate circular materials flows. Because of this lack of existing theorization on this subject, new propositions are needed. This is of importance for both CE practitioners as well as scholars who use institutional analysis to explain the complex and interdependent functioning and change process of institutions in our society. Institutional analysis research with a sustainability focus is of particular importance (Lozano *et al.*, 2015). Our inductive research approach therefore aims at extending institutional analysis on the topic of institutional change, as is the case when transitioning from a linear to a circular economic system.

As mentioned above, empirical cases within the Dutch textile industry were selected . The cases met two main criteria: (i) the case referred to a frontrunner in the domain of CE business practices actively engaged in inter-firm collaborations; (ii) the case was supported by (publicly) available data and diverse sources of information. The selected cases can be clustered in two groups. The first cluster of cases consists of CE accelerating or intermediary organisations, namely Cradle-to-Cradle Products Innovation Institute (C2C), Circle Economy, and Turntoo. These organisations are not primarily active in the

textile industry, but play a role in the acceleration of transition to a circular economy. In that sense, they focus on understanding and developing new business models and connecting actors aiming at creating circular metabolisms. In other words, these organisations are engaged in setting up new organisational forms, such as contracts, to facilitate transition into CE.

The second cluster of cases are for-profit organisations/businesses that have been experimenting and acting as frontrunners in the transition process to circular materials flows in the Dutch textile industry. Examples of these are House of Denim, Mud Jeans, and Lena Fashion Library. These companies operate and strategize by using different business models to create social and economic value within the wider process of transitioning into CE. Moreover they are all concerned and engaged in circular materials flows related to inter-firm collaboration. The organisations selected as cases were all available for interviews and willing to provide information on their activities in creating circular materials flows. Interviews with and documents from these organisations provided rich qualitative data. Firstly, interviews were conducted with the three CE accelerating organisations (C2C, Circle Economy, and Turntoo), discussing several concepts and viewpoints concerning the ways materials cycles are shaped, changing arrangements (i.e. institutional entrepreneurship), and new interdependencies and collaborations with chain partners and other stakeholders. This first cluster of data, concepts and ideas were further fine-tuned and used as input for a new set of interviews, this time with the businesses in the textile industry: Lena Fashion Library, House of Denim, Mud Jeans and Dutch aWEARness. By comparing and contrasting insights from multiple observers and empirical materials, this method of data triangulation reduced single-observer biases (Cohen and Manion, 2000). This approach resulted in different perspectives on state of the art CE practices and concepts, both seen from within the textile industry in general, as well as from the CE accelerating organisations.

Overall, the theory building process consisted of three conceptualization rounds. The first round was aimed at creating the initial theoretical framework in order to find a reference point to start explaining the transition towards CE by using an institutional analytical approach. This provided the main concepts to be used in the in-depth interviews with CE accelerating organisations and CE practitioners in the Dutch textile industry. Particular focus was placed on selecting and defining concepts to identify collaborations, and to understand their antecedents, such as the conditions in which they emerge, the type and intensity of interdependency between actors, and the main organisational elements used to arrange them. The aim was to clearly identify strategic situations in which actors negotiate solutions to manage their collaborations. The second conceptualization round took place during the data collection process, comparing findings from accelerators and practitioners. In this phase, concepts have been fine-grained, and focused on the specific organisational elements used to cope with or change the existing constraints provided by the current linear system. Based on the outcomes of this phase, the third conceptualization round took place within the research team, leading to definition of the conceptual propositions as presented in the discussion below. In this final round, the research team focused on a set of organisational elements that more clearly cope with the current system and thus still relies on existing rules, as opposed to a set of organisational elements challenging the existing rules, assuming the nature of self-enforcing mechanisms.

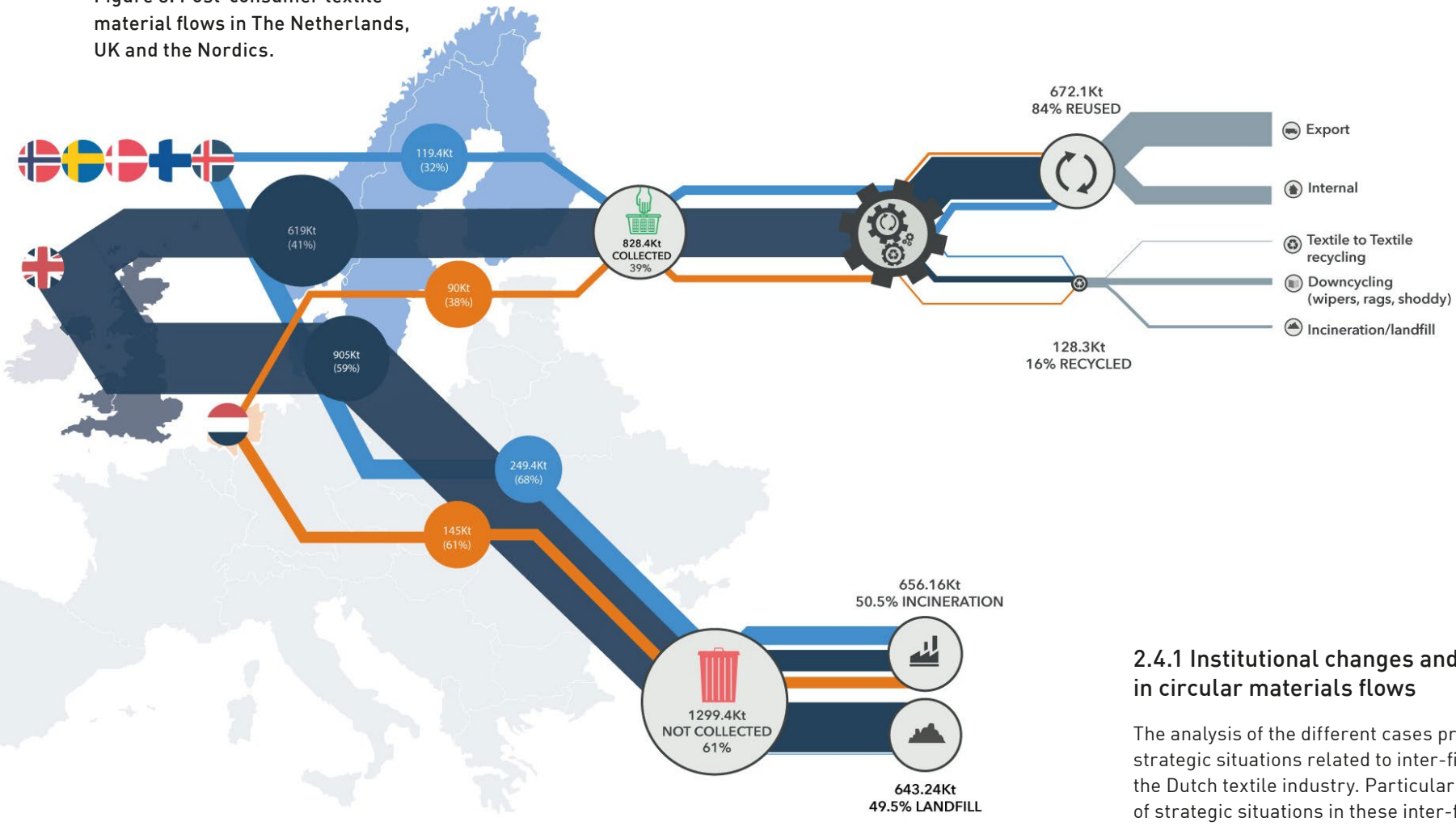
2.4. Analysis

In this section the results of the empirical research are presented. As stated in the introduction, the Dutch textile industry is seen as a frontrunner in the transition to circular material flows. Before analysing the cases, a short overview is provided on the situation in the textile industry.

Fast fashion and an increasing amount of waste are issues of both social- and environmental concern. Companies active in the fast fashion industry introduce new collections monthly in order to cater to their consumers (www.circle-economy.com). Due to the low quality, garments are easily and frequently disposed of. In the Netherlands, UK, and the Nordics it is estimated that 61% of these discarded garments (post-consumer textiles), are lost in household waste, ending up in landfill or incineration. From the 39% of textiles that are collected, 84% is reused and 16% is recycled (Massabalans Textiel, 2014). In reality, recycling means down-cycling[4] and after a second life, for example as cleaning towels, textiles are still incinerated or landfilled. Figure 3 visualizes the material flow of collected textile in the Netherlands. This figure shows that post-consumer textiles are partly sold on the second-hand market, and partly down-cycled by using the fibres for cleaning towels or as fuel. This means that although part of post-consumer textiles is recycled, this is not leading to circular material flows due to the down-cycling of materials.

[4] Products and materials of lesser quality and reduced functionality (www.wikipedia.org)

Figure 3. Post-consumer textile material flows in The Netherlands, UK and the Nordics.



Source: Circle Economy, 2015

The cases selected for this research all deal with the transition into circular economy and involve the Dutch textile industry in diverse ways. Cases were clustered in two groups. First we analyzed the so-called CE accelerating organisations (C2C, Circle Economy and Turntoo) and their specific textile programs. Subsequently, the analysis focused on specific textile businesses, such as House of Denim, Lena Fashion Library, Mud Jeans and Dutch aWEARness. In the following section we introduce the analysis on institutional changes as emerging in the key strategic situations.

2.4.1 Institutional changes and inter-firm collaborations in circular materials flows

The analysis of the different cases provided a number of diverse and heterogeneous strategic situations related to inter-firm collaborations in circular materials flows of the Dutch textile industry. Particularly, we have been able to identify three typologies of strategic situations in these inter-firm collaborations and distil the main institutional rules emerged in order to negotiate solutions in these situations. In table 1 we present an overview of these situations and how they are connected to the specific cases. We have grouped these emerging rules in three distinct categories, namely rules related to *contracting, financial mechanisms,* and *chain coordination mechanisms*.

Table 1 – Overview of the strategic collaborations and organisational elements as emerged from the cases

Case	Project on CE/ material flows	Aims	Strategic situations
Cradle to Cradle Product Innovation Institute	Fashion Positive Program	To design and create Cradle to Cradle materials and circular textile flows	• Pooling know-how and technologies (*contracting and financial mechanisms*) • Managing joint reputation (*contracting*) • Dealing with sequential/mutual dependency with chain partners (upstream) (*chain coordination*)
Circle Economy	Textile Sorting Project	To design and manage a textile sorting platform	• Building a post-consumer textile sorting machine (Fibersort) (*financial mechanisms*) • Developing scanning technology (*contracting and financial mechanisms*) • Collecting and sorting garments (*contracting*) • Developing and coordinating logistics and chain relations (*chain coordination*)
Turntoo	"Product-as-service" project	To facilitate adoption and diffusion of product-as-service business models to manage products and materials	• Managing how to share knowledge and information (*contracting and financial mechanisms*)
House of Denim	Denim Lab	To set an industry wide standard for using non-re-wearable textiles (PCR)	• Managing how to share knowledge and information (*contracting and financial mechanisms*) • Pooling investments in technology development (*contracting*) • Developing and coordinating chain relations (upstream) (*chain coordination*)
Mud Jeans	Leasing jeans project	To facilitate adoption and diffusion of 'lease a jeans' concept with customers (product-as-service business model)	• Managing materials with final consumers (*contracting*) • Developing and coordinating chain relations (downstream) (*chain coordination*)
Lena Fashion Library	Leasing garments project	To establish a library where garments can be rented (product-as-service business model)	• Managing materials with final consumers (*contracting*) • Developing and coordinating chain relations (downstream) (*chain coordination*)
Dutch aWEARness	Leasing corporate garments project	To facilitate adoption and diffusion of leasing corporate wear through a service contract (product-as-service business model).	• Managing materials with customers (*contracting*) • Developing and coordinating chain relations (downstream) (*chain coordination*)

2.4.2. Contracting

Arranging new *contracts* among partners participating in the materials flows turned out to be an important strategic situation in all cases. For the CE accelerators contracting is primarily about facilitating arrangements between "supply chain" actors. In the case of C2C these arrangements are based on setting up a consortium or associational contracts (e.g. long-term multilateral partnership) with upstream chain actors to initially create improved materials and semi-fabricates to be used downstream by the fashion brands and other textile sectors.Making optimised materials more widely available requires some form of open source sharing of new production methods. As long as their specific designs and know-how are protected, fashion companies are willing to cooperate in order to improve material production processes. In the Fashion Positive project there are specific contracts with the fashion companies that deal with large collections of garments and investments of millions of euros. These contracts are the basis for working

together in pilot projects in order to create products that can be entirely up-cycled after use. In order to protect the confidential information, like business processes, formulas, strategies, financial information, et cetera, non-disclosure agreements are a core part of the agreements. These contracts lack specific output targets since it is often unclear what outputs can be expected (Cradle to Cradle, 2015). This way, manufacturing companies are stimulated to transition and guided in this effort more easily as compared to use of more rigid contracts based on expected outputs and penalties. The starting point is to optimise one product or one collection followed by up-scaling the whole collection. The better fabrics and other materials are optimised, the larger the amount of garments that can be used for up-cycling into new garments. The manager of Cradle to Cradle called this process the *'growing material library'* (Cradle to Cradle, 2015). In this sense, the Fashion Positive project uses existing contracts to protect intellectual property and other brand specific resources while creating room for collaboration. Moreover, targets are loosely set as to allow for emerging opportunities.

Whereas C2C moves upstream in the supply chain, the Circle Economy's Textile Sorting project moves downstream in the supply chain. The contractual structure of the project is comparable to Fashion Positive in the sense that supply chain actors use existing contractual agreements to manage the collaboration relationships. Contracts are formalized in order to improve the coordination of sorting post-consumer textiles, and to increase the capacity to achieve a financially viable business model for all chain actors (e.g. collectors, scanning and sorting technology, chemically recycling cotton-polyester blends, et cetera).

Turntoo is primarily concerned with creating products as service contracts. Closing the loop for Turntoo starts with the current situation of the client company. When Turntoo starts a project in cooperation with a client, for example for producing or buying products on a service basis, or for creating a whole service based unit, they start by sketching the strategic situation in which the loop has to be closed, and with whom. Subsequently they analyze how the business model should function, what the consequences are when a service model is created with that product, what the contract should look like, who is the target market, et cetera. A pilot is set up in which the circular cycle/loop is tested for the first time. During and after the pilot, both processes as well as products are fine-tuned in order to improve the circular process for the generation of products in the next cycle/loop (Turntoo, 2015). Turntoo is action-focused and uses pilots to "learn by doing". Contracts used to manage the pilots are always loosely set up. For example, a client company can always stop the project or put it on hold if there is a budget problem or when focus has to be shifted (Turntoo, 2015).

For the textile businesses, the type of contracts used depends on the business model adopted in the specific collaboration. For House of Denim uses for example, business-to-business (B2B) contracts, since their partners in the project are other companies. Contracts are set to facilitate collaboration, mange property rights issues and joint learning, and foster the possibilities of using post-consumer textiles in new fabrics. Lena Fashion Library and Mud Jeans have a similar model in the sense that they offer garments as a service (product-as-service). However, they have contracts with their customers (B2C) in the form of a subscription paid as a monthly fee. This model, advocated by Turntoo, has some implications which will be further discussed in section 5.

Finally, Dutch aWEARness is a frontrunner when it comes to novel contracts and arrangements for collaboration. The Dutch aWEARness case shows that collaboration can result in a chain wide system of circular material flows and provides the incentives to improve company activities aiming at circular material cycles. However, the judicial issues concerned with locating ownership of products and materials in the chain remain a challenge, which they try to manage through formal and informal contracting.

2.4.3 Financial mechanisms

Two main issues arise from the case studies that concern financial mechanisms. The first issue is the need for facilitating joint investment to develop new technologies, proof of concept, and/or scaling up technologies (for instance sorting and fiberisation[5] machines) (Circle Economy, 2015). Investments in specific up-cycling technologies like the fiber-sort machine[6] may seem like a risky investment to banks since they lack the specific knowledge about return on investment, making it difficult to determine the risk of the investment (Circle Economy, 2015). C2C fund and the investments of the different stakeholders collaborating on the circular textiles project are examples of stakeholders in the textile supply chain that co-finance these projects for up-cycling technologies (Cradle to Cradle, 2015; Circle Economy, 2015). For developing new technologies, government funding can be attracted, as shown in the Dutch aWEARness case.

The second issue concerns financing products as service business models. Small-scale entrepreneurs with product-as-service business models, do not have extensive financial resources. A problem arises from the way financial institutions assess business plans in order to grant funding: when businesses for instance applies for a loan to fund a project, the bank often uses a checklist to assess whether the project is likely to be successful. This checklist however, is based on successful performances and features based on standard linear approaches. This means that lending organisations are looking at ownership of materials in order to consider them as collateral assets. However, if businesses sell a product as a service, the assets (e.g. products that are leased to consumers) stay on the balance sheet of the company, resulting in a growing balance sheet with a slowly increasing cash slow instead of immediate sales. Investments are needed to acquire the assets, but because assets are not sold (leading to immediate cash for acquiring new assets) the business needs a substantially increased amount of working capital to continue acquiring new assets (Working Group FinanCE, 2016). This is problematic because these business models/projects do not receive the required investments. An example of the mismatch between new business models and financing models of banks is Lena Fashion Library (Circle Economy, 2015; Lena Fashion Library, 2015, 2016). Lena has a certain amount of members and is assured of a monthly income, cash flow. However, since the garments are not necessarily bought or sold, banks often decline the request for investments. Decision factors behind financing models are based on linear business models. This creates severe barriers for start-ups and small enterprises that try to adopt and scale up a circular business model. Up-scaling problems can be solved when constructing financing models based on cash flows rather than assets (Circle Economy, 2015).

[5] Fiberisation is the process of breaking up fabrics into fibers
[6] The sorting machine created by Circle Economy's textile sorting project.

A promising way to share risks and rewards more fairly in circular materials flows is to apply a so-called "dynamic earning model", which also motivates companies to be more innovative (Turntoo, 2015). Turntoo is working on cases outside the textile industry, for example using the concept of "light as a service", in which a collaboration is set up between the designer, producer, and installer. Another example is the collaboration between a rental housing organization and Bosch for providing a laundry machine and refrigerator included in the housing rent. This collaboration resulted in improved contact with consumers and enhanced information about consumer preferences, which were used to improve products. Moreover, providing home appliances in a service contract established a long-term relationship with consumers and could therefore lead to customer stickiness. Sharing risks and rewards can speed up the transition to circular material cycles since successful improvements to products and processes will benefit all chain actors, resulting in high levels of trust, reciprocal behavior and continuous innovation (Turntoo, 2015; Working Group FinanCE, 2016). Current bottlenecks at the moment are the juridical difficulties concerning sharing risks and rewards of new financial models. This is also shown in the Dutch aWEARness case in which the juridical issues arose when trying to define and allocate the ownership of products and materials collectively, at the chain level instead of the single company level.

2.4.4. Chain coordination mechanisms

Another important strategic situation in collaborations related to circular material flows is when organisations have to define and implement coordination mechanisms at the network or supply chain level. Chain coordination mechanisms can be defined as the interaction between different actors in the value chain. Chain coordination can be performed by chain actors themselves or mediated by an external actor. Chain coordination is often facilitated by collaborations that include software companies or technology developers, such as for instance in the CE program or in the Dutch aWEARness case.

One of the challenges of chain coordination in circular materials flows is often the lack of clarity related to the quality that can be expected from fabrics made with post-consumer materials. Oftentimes, there are misconceptions concerning quality, price, and availability of these fabrics, and suppliers and buyers fail to g*et ali*gned. Many companies operating in the textile industry are still not aware of the possibilities and quality of post-consumer fabrics (Circle Economy, 2015; House of Denim, 2015). At fabric fairs, like Premiere Vision, these fabrics are not showcased and therefore not easily accessible for many brands. Conversely, suppliers often believe there is limited, or even a lack of demand for these fabrics, since brands do not yet ask for them. For these brands and fabric suppliers, coordination is essential. CE is for example very active in creating links between buyers and suppliers of post-consumer fabrics (Circle Economy, 2015).

When concerning product-as-service business models, chain coordination is a more limited issue in the interaction/alignment with customers (either B2B or B2C). Turntoo for instance, links supply and demand by helping their clients to buy products in the form of services. When a certain service does not exist, Turntoo discusses with interested stakeholders to help them set up a specific, tailor-made product as a service business model. Turntoo actively looks for partners to close loops in various materials

flows. In doing so, Turntoo has built enough experience with choosing products and materials such that they are able to select the right products to function as a service model. These products are qualitatively suitable to be modular since they can be re-used and the materials can (generally) be up-cycled (Turntoo, 2015). It must be noted that Turntoo currently does not have clients in the textile industry. Their focus lies primarily on technological nutrient cycles whereas textiles are often biological nutrients. The reason for focusing on technological materials has been the initial interest for this cycle since these "nutrients" are often scarce and thus valuable (Turntoo, 2015). However, Turntoo is also considering expanding their focus to the textile industry, while also influencing companies operating in the sector, such as Mud Jeans.

In the case of Dutch aWEARness, chain coordination is part of the product as a service business model. Dutch aWEARness is the connecting link between several supply chain actors and it is the provider of garments as service. In that sense it combines the activities of going upstream in the supply chain to improve materials, but also going downstream to interact with its clients (B2B) directly. Mud Jeans also has both activities of going upstream in the chain, for example working with Italian factories that can use a large percentage of post-consumer textiles in new fabrics, and downstream in working directly with clients (B2C) in leasing the jeans.

2.5. Conceptualization and theory building: two pathways of institutional change in circular collaborations

Consistently with the inductive nature of our approach, in this paragraph we first present how through an in-depth analysis of the different cases and the specific strategic situations, two pathways have been distinguished in the way actors design and set new rules when collaborating in circular materials flows. As presented in table 2, a dichotomy has been found between what we have defined as status quo arrangement (SQ) pathway and a product-as-service arrangement (PAS) pathway. While the SQ pathway relies on existing general rules of the linear economy, and thus deals with transition into a circular economy through coping with the existing institutional setting, the PAS pathway is characterised by rules that do not rely on existing institutions and assume the connotation of self-enforcing constraints, applied, and implemented at the inter-organisational level. SQ focuses on optimizing up-cycling technologies and infrastructure - for example as promoted in projects run by C2C, Circle Economy, and the House of Denim - using existing rules and aligning them with the current way in which value chains are organized.

SQ emerges prevalently in the contractual and chain coordination dynamics of collaborations dealing with collection of post-consumer textiles. This is arranged by making use of existing infrastructures, such as for example using the network of containers provided by municipalities, in a manner like how glass and paper are collected. The PAS pathway, as promoted by Turntoo, Lena Fashion Library, Mud Jeans and Dutch aWEARness, instead focuses on providing products as service contracts. They are self-enforcing mechanisms since they do not rely on existing rules and value chain structures, such as for example in terms of ownership or distribution of risks and incentives. By providing products as service contracts, like for instance a lease contract, ownership of the product remains at the producer or leasing company while customers pay for using

the product for a certain period. When the product returns to the company after use, cascading activities, like leasing again, re-furbishing or harvesting materials take place. The two pathways are characterised by different rules when it comes to arrange inter-firm collaborations of circular materials flows. Table 2 presents these rules as related to the specific strategic situations in which they have emerged.

Table 2 - Rules emerging in strategic situations connected to SQ and PAS pathways.

Strategic situation	Status quo (SQ)	Product-as-service (PAS)
Contracting	*Relational long-term contracts*	*Relational service contracts*
	Contracts for pilot projects for up-cycling materials	Creating contracts for PAS, contracts with cascading partners
Financial mechanisms	*Standard financing*	*New financing models*
	Investments in technologies for optimizing materials and up-cycling post-consumer materials	Cash flow based financing, dynamic earning models
Chain coordination mechanisms	*Up-cycled fabrics*	*PAS and Cascading*
	Upstream: Develop C2C materials for up-cycling purposes Downstream: Include consumers in the process of collecting post-consumer textiles New value chain: Include collection, sorting, scanning- and sorting technology businesses. New product-market combinations: Link supply- and demand for fabrics with percentage up-cycled fibers	Upstream: Include dying, weaving, yarn, polyester businesses in a collaborative chain Downstream: Consumers become users of the service New value chain: Remote monitoring of whereabouts garments, ownership of garments remains at producer (or other location in value chain) New product market combinations: Product-as-service (lease) instead of product sales, Stimulation of PAS and collaborate in cascading activities

Contracting is the first strategic situation in which differences among the two pathways emerge. The legally binding aspect of contracts ensures stakeholders that contractual agreements will be kept. Although the form of the contract is used as an arrangement to create circular materials flows, the content can be different from the content in a contract for linear economic transactions. Whereas linear economic transaction contracts consist of (a variation on) the agreement (stakeholder A delivers X for stakeholder B delivering Y in return), contracts for transitioning to circular material flows are often set up in a less explicit manner. Since arrangements to develop circular material flows consist of activities like optimizing materials, re-designing products, creating cascading activities, and collaboration between different stakeholders which are poorly codified by the existing regulations and industry standards, contracts are aimed at creating flexibility. For example, to foster group problem solving, interfirm authorities, and various forms and degrees of sharing property and decision rights. Thus, contractual arrangements often assume an informal and relational connotation, in both SQ and PAS pathways. They are primarily oriented to bond partners, create mutual trust, collaboration, and room for new processes and structures that may evolve during the collaborative project. For this reason, these contracts do not explicitly state expected outputs, but merely the goal of improving materials and processes for the transition to circular material flows. Relational contracting is a way of contracting in which gaps in the agreement are overcome by the commitment, reputation, and trustworthiness of the stakeholders (Baker et al., 2002). These contracts are effective when stakeholders collaborate for a longer period and when the goals are modified over time as a result of unfolding events (Slangen *et al.*, 2008). Relational contracting is a tool for aligning stakeholder goals and creating collaborative projects for the transition to circular materials flows. While both SQ and PAS contracts have elements of relational contracting, contracts used in SQ pathways are mostly about long-term collaboration for optimizing materials and technologies mainly at a pre-competitive stage. Differently, PAS contracts are about collaboration for cascading activities and creating service contracts for multiple partners (B2B and B2C). The complementary nature of PAS collaboration, such as different cascading activities are fulfilled by different stakeholder, is more likely to increase the degree of sharing property and decision rights on materials, and facilitate collective action and cooperative behaviours, since a cluster or group of companies is formed in which risks and gains are ideally distributed over multiple collaborating stakeholders.

Proposition 1: Contracts in both SQ and PAS pathways have a relational connotation. In SQ, relational contracts focus on long term collaboration for optimizing materials and technologies at a pre-competitive stage. In PAS contracts, focus is placed on sharing property and decision rights on materials, to facilitate take-back systems between multiple actors (instead of bilateral agreements), aiming at aligning incentives in creating circular material flows.

Financial mechanisms are strategic situations specifically important for PAS. They are a way for firms to work together in creating circular material flows that allow for risk spreading and stimulate innovation (Turntoo, 2015). Providing PAS in collaboration by using dynamic earning models provides an incentive for improving materials and products since this benefits all stakeholders. Since it is legally impossible to construct dynamic earning models, a change in legislation will be necessary eventually.

To push for legislation to be altered, codes of conduct and procedures have to be defined and shared at the business level (Turntoo, 2015) in order to implement these types of models. Currently, the development of PAS business models is limited by the investment criteria used by financial institutions, which are mainly based on assessing ownership on assets. This approach is not suitable for financing PAS models in which ownership is shared and often ill or informally defined. Circular financing based on cash flow can be seen as a more appropriate financing model, since providing PAS in lease contracts generates a continuous cash flow (Circle Economy, 2015). CE accelerating organisations may play an important role as broker between banks and firms, creating PAS business models with the goal of developing circular financing models. This is an important barrier to overcome for accelerating the transition to circular materials flows in PAS pathway. For SQ, new financial mechanisms are less important. Since SQ arrangements concern investments in technology and machinery, asset-based financing can be more easily applied (Cradle to Cradle, 2015).

Proposition 2: *Circular financing mechanisms, like cash-flow-based financing and dynamic earning models, are needed for financing PAS arrangements whereas SQ arrangements can be financed with current financing mechanisms.*

Multiple *chain coordination* activities apply for both SQ and PAS pathways. For SQ, upstream chain coordination mechanisms take place in the form of C2C's Fashion Positive programs, aiming at improving materials for upcycling purposes. House of Denim is also an example of upstream chain directing, but also links supply and demand by actively introducing fabrics with a percentage PCR in the fashion industry. Downstream in the chain, consumers are involved in the process of collecting post-consumer textiles by an increasing amount of collecting initiatives, as discussed in the textile soring project of Circle Economy. For PAS, upstream chain coordination mechanisms are needed in collaborative projects, in which multiple supply chain partners are aiming at long term collaboration for creating circular material flows. In PAS arrangements, partners are also aiming at retaining control over products and materials by selling the service of the product.

Proposition 3: *Chain coordination mechanisms for SQ focus on collaboration for improving materials, improving the post-consumer process, and introducing a new industry standard. Instead, chain coordination mechanisms for PAS aim at long term development of the chain collaborations, in order to keep garments and materials cycling through the chain, while supporting the growth of the market for PAS garments.*

Proposition 4: *PAS will include upstream and downstream partners in order to fully close the loop by bringing the ends together. By including consumers in the loop as 'users', there is a new vital role for these users in closing material loops.*

2.6. Discussion and concluding remarks

Using information and data from cases to create new concepts for the transition to circular materials flows resulted in discovering a dichotomy between SQ- and PAS pathways. Contracting, financial mechanisms, and chain coordination mechanisms have been identified as key elements for stimulating the emergence of new rules. Both SQ- and PAS arrangements, while created by firms to manage collaborations and exchanges, can have consequences at multiple institutional levels. Whereas SQ arrangements may have implications at the level of formal rules, for example in creating a new industry standard for regulating use of up-cycled fabrics, PAS arrangements may have wider implications, by for example reshaping ownership in service contracts and creating cascading supply chain activities. Both SQ- and PAS arrangements aim at creating new rules for managing circular materials flows, albeit through different pathways.

The difference between SQ- and PAS pathways holds important implications for stakeholders. Since it is questionable whether SQ arrangements can lead to circular materials cycles, stakeholders have to decide whether this set of arrangements, aiming at raising industry standards for up-cycling post-consumer textiles in new garments, is a virtuous path to follow. Although it may be worthwhile to collaborate with chain partners in order to address the technological side of up-cycling materials, stakeholders have to realize that the true nature of CE is found in circular materials flows. These flows cannot be achieved by mere technological solutions. There is an essential role for the mechanism that ensures products and materials to return to the supply chain. Therefore, supply chain collaboration should not only be used to improve up-cycling of fibers, but also to think about new configurations of supply chains, as is the case for PAS arrangements. PAS arrangements activate changes at multiple institutional levels. Providing products as service contracts, they facilitate the shift of responsibility for materials, property rights, and the cultural aspect of ownership. Moving ownership back in the supply chain, to for instance the manufacturer or service provider, will result in increased responsibility for materials and will create an incentive for improving quality of products in order to keep products cycling longer before cascading, and cascading longer before harvesting the (raw) materials for creating new products. It is a legitimate question whether the benefits of PAS business models, like Mud Jeans, Lena Fashion Library, and Dutch aWEARness, will convince customers to participate in PAS arrangements. If a critical number of PAS arrangements becomes available and are embraced by customers, it will have disruptive effects at the level of the supply chain structure. At supply chain level, the long-term effects of PAS and cascading can be the transition from linear supply chains to circular supply ecosystems in which products, parts of products, and materials can circulate in multiple sectors and industries. This may imply the vanishing of barriers between industries as we know them today, and the clustering of cascading activities around specific materials or activities instead of a specific industry. To give an example, clustering of cascading activities around wood can occur instead of the separate supply chains for the building industry, furniture industry, paper industry, and other industries that use wood. In other words, the focus of firms will shift from relative positioning in the supply chain (connections with chain partners) to the relative positioning in materials cycles. A question arising with the potential diffusion of PAS arrangements relates to the effects on ownership moving from firm to supply chain level. At this stage of the transition, it is unclear where ownership could be located, since this conceptual model only shows the movement of materials, and not of ownership. Since materials are the focal point of a PAS system, ownership of materials implies a power shift in the circular metabolism/chain. Stakeholders should keep this in mind and should find ways to introduce institutional mechanisms in order to circumvent concentrations of large amounts of materials being

owned by one single stakeholder. Shared ownership models and/or collaboration between multiple small- or medium sized material owners in networks can be a more balanced solution than accommodating large amounts of materials at a few large stakeholders, such as a material bank or multinational. More small- and medium sized stakeholders, as opposed to a few large stakeholders can be a solution to create fair competition and fair prices for consumers. Finally, issues to overcome are how to cope with obstructing legislation and the lack of adequate financing models. If stakeholders can create arrangements that circumvent these barriers, they may become examples for other stakeholders to transition to PAS arrangements.
Turntoo (2015) mentioned an example of such an arrangement by formulating contracts in such a way that limiting legislation is omitted. Moreover, more PAS arrangements may have bottom-up effects on the formal institutional level, resulting in alteration- and creation of formal rules that are in line with PAS business models.

This research is also limited in some aspects. Firstly, the main limitation of this research lies in the pioneering nature of this study. Due to a lack of prior knowledge on transition mechanisms for CE, an institutional analysis perspective was selected in order to create new concepts for transition mechanisms in the form of arrangements created by firms. For the aim of this inductive research, multiple cases in the Dutch textile industry were studied which led to the development of new concepts about the ways firms shape institutions for the transition towards circular material flows. Triangulation was used to introduce concepts from previous cases in interviews with new cases. However, the concept of CE itself is still new and under development. This hindered the triangulation process since respondents did have different ideas about to which extent circular material was desired. At times data appeared in a more anecdotal way then aimed at with the triangulation method. This also resulted in two clearly different sets (pathways) of arrangements, one focusing on optimizing materials and raising industry standards (SQ) and another focusing on cascading and shifting ownership (PAS). Moreover, it can be questioned whether the concept for cascading in circular supply ecosystems can be applied to other sectors and countries. Based on the reasoning that PAS will provide an incentive to take responsibility for material (re)use and opportunities for new PAS arrangements, it is likely that the mechanisms of cascading and circular supply ecosystems can emerge in a similar pattern as conceptualized in this research. However, the inductive nature of this research leaves this question for future deductive research.

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03.

Designing a Circular Contract Template: Insights from the Fairphone-as-a-Service project

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Abstract

Recent scholarship has started to recognize the need to understand the role of contracts in processes of circular business model innovation, particularly in Product Service Systems (PSS) business models. Ownership, usage right, risk allocation, and how to manage circular value propositions are key aspects of contract design, all influencing circular business model innovation. However, current knowledge of how contracts support emerging circular business models is limited. In this paper, we address this gap by presenting an in-depth analysis of a case study drawing on data stemming from the Fairphone-as-a-Service project to define key elements for a *Circular Service Contract Template*. Our findings support the idea that contracts, ownership, and usage right issues strongly influence the core elements of a PSS business model, such as *servitisation, longevity* and *modularity*. Particularly, evidence from the case study confirmed the presence of tensions between ownership and contractual aspects when attempting to manage the circular business practices.

3.1. Introduction

Recent scholarship has delved into processes of business model innovation based on Circular Economy (CE) principles for narrowing, slowing, closing, and regenerating resource flows (Bocken and Ritala, 2021). Building on the notion of business model innovation as "designed, novel, nontrivial changes to the key elements of a firm's business model and/or the architecture linking these elements" (Foss and Saebi 2016, p. 201), this scholarship has highlighted the relevance of circular business models as a vehicle to coordinate technological, social, and organisational change (Linder and Williander, 2017; Bocken and Ritala, 2021). While this scholarship has become an established interdisciplinary and multifaceted field of practice and inquiry (Webster, 2013; Geissdoerfer *et al.*, 2017; Borrello *et al.*, 2020a), only recently it has started to recognize the role of legal and contractual norms in processes of circular business model innovation (CBMI) (Linder and Williander, 2017). Part of this recognition entails, for example, investigating the role of ownership and usage rights of materials, and the regulatory and legal dimensions of business relations – e.g. inter-firm collaborations, customers and suppliers relations - for the definition of novel business models (Annarelli *et al.*, 2016; Fischer and Pascucci, 2017; Schulz *et al.*, 2019). Regulatory and legal aspects, such as industry standards (Tecchio *et al.*, 2017; Flynn and Hacking, 2019), or contractual terms and conditions in inter-firm collaborations (Fischer and Pascucci, 2017) have been addressed particularly in CBMI processes concerning so called Product Service Systems (PSS) or Product-as-a-Service (PaaS) models (Kristensen and Remmen, 2019). In these models, companies are typically delivering performance and functionality, rather than ownership over a product (Tukker, 2015; Stahel, 2016; Geissdoerfer *et al.*, 2018). In PSS models companies operate beyond their organisational boundaries, for example negotiating new norms and standards with regulators (Bocken et al., 2016), redefining ownership and access right with customers (Tukker, 2015), and experimenting with new terms and conditions with their suppliers (Reim *et al.*, 2015; Kristensen and Remmen, 2019). Often, existing contractual elements are not fit for purpose, since they have been identified for regulating business models using linear economy principles (Fischer and Pascucci, 2017). Hence, how contracts are designed – i.e. defined, negotiated or altered - is key to implement any circular business model innovation, and particularly PSS models. Extant literature on contract design has recognized the relevance of *contracting for innovation,* as well as inter-firm collaborations (Grandori and Furlotti, 2019). In this scholarship, contracts are not just legally binding agreements, for example to specify ownership, responsibility, and risk on materials or assets (Scott and Triantis, 2005), but also to enable innovation and organisational processes to unfold under risk and uncertainty (Grandori and Furlotti, 2019).

Despite its relevance, there is limited investigation of contract design mechanisms in the extant literature on circular business model innovation. In this paper, we address this point by developing an in-depth qualitative case study approach, gathering rich evidence and data from the Fairphone-as-a-service (FaaS) project. This is a collaborative effort between Fairphone social enterprise and Circle Economy, a social enterprise with the aim to accelerate the circular economy transition, and with banks, accounting and legal firms to define a *circular template contract* for the FaaS. In our analysis, we abductively code data stemming from interviews to key actors involved in the project, as well as documentary sources, providing a rich account of how the project unfolded. Our coding strategy moved from an informant-oriented to a theory-oriented conceptualization (Gioia *et al.*, 2013), by engaging with key constructs from CBMI literature and contract design scholarship. Based on our analysis, we conceptualise how contractual mechanisms can enable innovation processes in the design of a PSS model between users and providers in relation to *servitisation, longevity* and *modularity.*

3.2. Literature review

3.2.1. Circular Business Model Innovation in Product Service Systems

In the extant literature, the notion of business model innovation (BMI) often refers to a process of organisational change or reconfiguration that is 'designed' (e.g. entailing a strategic intent or intentionality), 'novel' (e.g. entailing a high degree of innovativeness) and 'non-trivial' (e.g. indicating presence of structural or radical change) (Foss and Saebi, 2017: 216). In a BMI process, change involves either the key components of an existing business model - e.g. value creation, delivery and capture - and/or its architecture, characterised in terms of the 'interdependencies' among value creation, delivery, and capture mechanisms and the underlying activities (Foss and Saebi, 2017). Based on this perspective, BMI is seen as a strategic search for new logics for example by finding novel value propositions, sources to generate revenues, and relations with customers, suppliers, and partners (Casadesus-Masanell and Zhu, 2013: 464). Building on this notion, scholars consider a circular business model innovation (CBMI) a process involving strategic and organisational changes in a company, where the components and architecture of its business model are changed or reconfigured based on CE principles (Bocken and Ritala, 2021). A CBMI typically assumes a resource-based view or perspective (Bocken and Ritala 2021), involving changes in how resources can be preserved, optimally or effectively used and reused, and how natural resources and ecosystems can be enhanced (e.g. eco-effectiveness), rather than degraded (Borrello *et al.*, 2020a). In this regard, the literature on CBMI has started to converge on understanding the relation between components and architectures of circular business models, and key aspects of circularity (Bocken *et al.* 2016).

Particularly, the focus is on how resources – e.g. energy and materials – in CBMs are used for implementing the circular economy principles of narrowing, slowing, closing, and regenerating (Borrello *et al.*, 2020; Bocken and Ritala, 2021). *Narrowing* is related to use fewer resources, for example through innovations in the production and design process, such as de-materializing, resource-efficiency, and optimised logistics (Bocken and Ritala, 2021). *Slowing* is a strategy to reduce usage and consumption of resources, by increasing product longevity, design for durability or remanufacturing), as well as limiting or avoiding unnecessary consumption (e.g. incentivizing durability and longevity) (Bocken and Ritala, 2021). *Closing* is a strategy to enhance reusing materials, through reverse logistics, and take-back systems and innovative product design (e.g. design for disassembly and modularity) (Bocken *et al.* 2014). Finally, *regenerating* refers to using renewable material

and energy where possible, e.g., through design for eco-effectiveness, ecological intelligence, and biomimicry (Borrello *et al.*, 2020b; Bocken and Ritala, 2021).

Product Service Systems (PSS) typically translate the above-mentioned principles into a set of implementable and scalable business model components and architectures (Table 1), based on the idea of combining product design for environmental and social care with profit making (Bauren *et al.*, 2013; Annarelli *et al.*, 2016). Particularly at the heart of PSS models lies the idea of 'design for servitisation': delivering *functionalities* and *performance* to a customer by decoupling ownership from use of products and materials (Stahel, 2016; Bocken *et al.*, 2016; Lüdeke-Freund *et al.*, 2019). Accordingly, a CBMI process for PSS is related to creation, delivery, and capture of value to address and satisfy customers' need through carefully designing and embedding functionalities (services) into manufactured products (Bocken *et al.*, 2016). This is based on *enabling access* and *fruition* of these services, rather than transferring full ownership on the manufactured products per se (Bocken *et al.*, 2016; Kristensen and Remmen, 2019). Redefining the 'service' component to create value in a PSS model is the pivotal aspect of a CBMI process, while the 'product' element becomes a 'vehicle' to value delivery, and the 'system' is the bundle of contractual relations that enables the value capture (Van Ostaeyen *et al.*, 2013; Bocken *et al.*, 2014).

In a PSS model different 'degrees' or 'aspects' of the servitisation can be experimentedwith, ranging from selling a product with a 'bundle of services' attached to it, to a completely 'servitised' model, where a manufacturer is no longer selling products but the 'functional results' of these products, as a service (Van Ostaeyen *et al.*, 2013). This categorization of PSS defines three broad typologies, or ideal-types, often reported in extant academic literature as (a) *product-oriented PSS,* where ownership of the product remains with the customer, but the provider sells additional services; (b) *use-oriented PSS,* where ownership remains with the provider and usage rights are sold to the customer; (c) *performance-oriented PSS,* where product's 'functional results' (performances) are sold, that directly fulfil customer needs (Van Ostaeyen *et al.*, 2013: 261).

While the degree of *servitisation,* and related ownership and usage rights, vary in these three ideal-types, they are all concerned with utilizing products/materials designed for *longevity* and *modularity*. Longevity and modularity decouple value creation, delivery, and capture, from the actual ownership of the product, and attach it to the usage and performance, thus prolonging its lifecycle. In a PSS, in fact, both service-providers and service-users are interested in higher quality materials that can increase the likelihood to deliver higher quality performance (Reim *et al.*, 2015; Annarelli *et al.*, 2016). A PSS model typically focuses on slowing, narrowing, closing, and regenerating material flows, thereby translatingthe aforementionedcircular principlesinto value propositions, delivery and capture (Bocken *et al.*, 2016) and aligning socio-ecological, and economic goals (Beuren *et al.*, 2013; Tukker, 2015).

Table 3– Key CBMI processes in PSS models

Key architectural change or reconfiguration	Key implications for ownership and usage rights	Key implications for PSS model components	Alignment between economic and socio-ecological goals
Design for servitisation	Product-oriented: ownership and usage transferred to the customer Use-oriented: ownership retained by the service provider access transferred to the user Performance-oriented: specific usage rights are transferred to the customers based on their needs	Enhanced value creation, delivery, and capture in relation to augmented product functionalities	Economic incentives decoupled from materials/products → Closing, slowing, and narrowing resource use is incentivized simultaneously
Design for longevity	Ownership and usage rights aligned with technical and economic life cycle of the product	Enhanced value creation, delivery, and capture in relation to continuity between product quality features and customer relations	Economic incentives decoupled from planned obsolescence → Slowing and narrowing resource use is incentivized
Design for modularity	Ownership and usage rights coupled with specific modules of the product	Increased value delivery and capture around reparability of modules and upgradability of the product-service bundle	Economic incentives are decoupled from the product as a whole but managed at module level → slowing and narrowing resource use is incentivized

Source: Adapted from Van Ostaeyen et al. (2013); Tukker, 2015; Bocken et al. (2016).

3.2.2. Contract design for innovation in Product Service Systems

The interest of scholars to examine how firms can implement business model innovation based on CE principles have also triggered attention for understanding legal and contractual aspects (Fischer and Pascucci, 2017; Ballardini *et al.*, 2021). In PSS models, in fact, narrowing, slowing, closing, and regenerating resource flows entail operating beyond the firm's boundaries and engage with both intra-firm and inter-firm changes and reconfigurations (Bocken and Ritala 2021). Moreover, as indicated in the previous section, designing for servitisation, longevity and modularity implies redefinition of

ownership, responsibilities and risks over modules and materials, as well as financial aspects (Ploeger *et al,* 2019). Operational tasks, including sourcing, product design, logistics, storage and inventory, and customer services need to be re-organized through novel *contractual agreements* between different input providers, supply chain and service partners, and client-companies or customers. When confronted with the need to design these agreements, companies can only rely on legal frameworks supporting contractual aspects of service models in the linear economy (Backes, 2017; Steenmans and Malcolm, 2020). Hence, they need to redefine, renegotiate, and adapt existing norms to the contract arrangement they ought to design, while innovating in a kind of regulatory vacuum.

Recent scholarship in innovation management has acknowledged the role of contract design as part of innovation processes – i.e. contract design for innovation - particularly in conditions where uncertainty stems from co-creation of knowledge, processes of discovery, and entrepreneurial endeavors, typically dealing with unknown settings and outcomes (Grandori and Furlotti, 2019). In this approach, it is highlighted how involved parties, including suppliers and customers, may tend to commit to pooling resources and their use, rather than agreeing on overly-specified tasks, actions, or transactions (Grandori and Furlotti, 2019). In contract design for innovation it is crucial to define which property or use rights the parties have on the committed resources, and who decides on their use, as well as allowing for adaptation (Gulati *et al.*, 2005), learning and discovery (Grandori, 2006). This often translates in a process of learning from 'errors and problems' encountered during the innovation process, that most likely will enable the parties to enrich the contractual agreement in all its parts, including operational tasks ad procedures, as well as the coordination of joint tasks (Grandori and Furlotti, 2019).

The relevance of contract design has started to be recognized by academics in the literature on CBMI and circular business models, particularly with reference to PSS models. Van der Laan and Aurisicchio (2020), for example, mention contracts as one of six 'architectural levels' of PSS models, referring to contracts as key to define *ownership,* for example in terms of possession of (obsolete) products, components, and materials, as well as associated responsibility and liability for their state and flow (Van der Laan and Aurisicchio, 2020). Interestingly, in their study they also highlight the link between contractual aspects and *obsolescence*, looking at the dynamics of various social, technological, economic, and environmental factors that determine the end of the product lifetime. Pascual *et al.* (2017) discuss contracts as enablers for coordination in the context of use-oriented PSS. They find evidence that a well-designed PSS achieves mutual growth agreement for the customer and the supplier if it aligns their incentives through *coordination.* Building on the PSS literature and using an institutional perspective, Fischer and Pascucci (2017) have stressed the importance of contractual agreements and proposed a difference between contracts that are used in 'linear supply chains' versus contracts designed to support novel circular business models, and more specifically PSS. In this study, the authors emphasize the need to focus on contracts as embedded in the wider legal context of *property rights* and *ownership* (Fischer and Pascucci, 2017). The importance of contract design is due to the shift of property and usage rights from provider to user, which has also consequences on property and usage rights between firms dependingon the type of PSS model, and the degree of servitisation (Fischer and Pascucci, 2017). Cherry and Pidgeon (2018) wrote about risks and responsibilities of entering into contractual agreements to ensure acceptance of PSS models.

Contractual obligations are mentioned in their work, particularly emphasizing the role of *financial risks* and personal *product responsibility* in the acceptance of PSS by users. Moreover, in this study, concepts such as flexibility, autonomy and control are related to *property right*s and *ownership* in PSS (Cherry and Pidgeon, 2018).

The convergence of these two strands of literature is of particular interest for this research, since it highlights the need to investigate further the role of contract design in the processes of circular business model innovation, particularly looking into how contractual aspects influence the definition of the components and architecture of PSS models and vice versa. This has informed the identification and selection of our case study, as well as our analytical approach, as described in the next section.

3.3. Methodological design

3.3.1. Research context

We have used the literature review on Circular Business Model Innovation and contract design for innovation as guidance to develop an in-depth qualitative case study methodology to investigate the role of contractual issues to enable CBMI for PSS models. We use extensive evidence from a project coordinated by Circle Economy, a social enterprise based in Amsterdam (NL), actively involved in the design and implementation of PSS models since the early 2010s (Circle Economy, 2020). Our case study builds upon the Fairphone-as-a-Service (FaaS) project, spanning from June 2017 until January 2018. This project took place in the Netherlands and was characterised by an interactive format with the goal of developing a viable business case. Workshops and thematic deep dives were organized around certain topics and experts, such as lawyers, financiers, and accountants, were invited to discuss opportunities and challenges, rules and standards to support the FaaS model. During the project it was debated whether the FaaS business model would be a use- or performance-oriented PSS. Due to the complexity of creating the FaaS model it was decided to first create a use-oriented model e.g., making the mobile phone device available to be used by clients. In a later stage, yet out of scope for this project, performance elements - such as downtime and/or energy use - would be considered and eventually added. The approach taken for the FaaS project was indeed different from existing smartphone leasing models. Lease is a type of earning model that is based on a lending technology that uses the value of underlying assets to provide credit. An earning model in itself is not circular. It is the broader set of intentions, agreements and supporting mechanisms (e.g. monitoring, reverse logistics) that defines the circular aspects of the business model.[7] A key topic in this project was the development of a contract template to fit the characteristics of the FaaS model. As indicated in our literature review, ownership is a corner stone in use-oriented PSS models, since it triggers the involvement of both supply chain partners and users, causing a set of specific challenges. These challenges demanded a close interaction of, and mutual understanding

[7] For more information on lease versus PaaS, please see the white paper 'Create a Financiable Circular Business in 10 Steps', p.13.

between the organization implementing the FaaS (e.g., Fairphone), its partners and customers, and legal and financial experts/advisers. As such, the FaaS case provides a rich and detailed account of how businesses, supply chain partners, customers, and professional experts engage in designing and implementing a contract template to enable PSS models. Particularly, this case aligns with our research question and engages with our inquiry on how contractual mechanisms can enable innovation processes in the design of a PSS model between users and providers in relation to *servitisation, longevity* and *modularity.* In the FaaS case, particularly, this is represented by the process of shaping a new contractual agreement, in the form of the Circular Service Contract template (see Appendix 1).

3.3.2. Data collection and analysis

In our analysis, we abductively code data stemming from interviews to key actors involved in the project, as well as documentary sources, providing a rich account of how the project unfolded. Our coding strategy moved from an informant-oriented to theoretically oriented conceptualization (Gioia *et al.*, 2013), by engaging with key constructs from CBMI literature and contract design for innovation scholarship. Data were collected during the FaaS project in the form of project session recordings, contract iterations and archival documents (please see table 4). Two rounds of manual coding have resulted in emerging themes related to the design and development of the Circular Service Contract template.

Table 4. Overview of data sources

Category	Data source	#Entries
Project sessions (transcripts)	Fairphone project meetings	21
Contract interactions	Circular Service Contract iterations	3
Archival documents	Flowcharts, meeting notes.	12
Total data sources		36

Given the nature of abductive research, this study entailed an iterative process from data to theory and a purposively selected case to provide evidence of the conceptual categories emerging from the research questions (Gioia *et al.*, 2013). Thus, an iterative process of data collection and analysis was undertaken: (i) to identify legal and contractual processes (e.g. verbalization of new organisational activities, the emergence of contractual topics and elements) prevailing in the case, (ii) to identify tensions and negotiations concerning the FaaS model and activities on the one hand and legal perspectives and rulesets on the other hand, and (iii) to identify and analyse the emergence of shared concepts, definitions and the translation into contractual elements. After collection of reports and meeting notes, one of the authors started to code the contents of the documents for the qualitative analysis.

First, all data have been summarised, categorized, and coded. The coding process was generated from the authors' interpretation of emerging patterns from the empirical data, which led to the alignment with existing conceptual lenses as indicated in the extant literature (Gioia *et al.*, 2013).

3.4. Findings

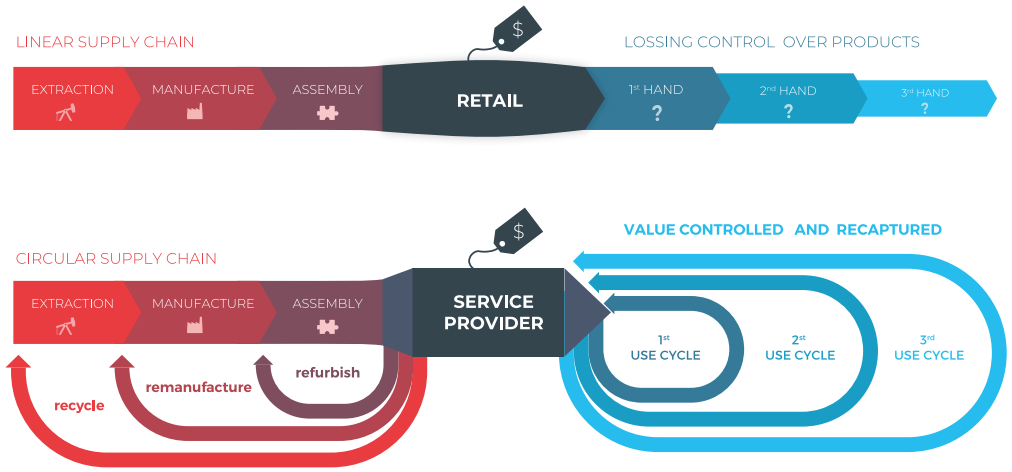
This section presents the main findings of our research. It is organized around three themes that emerged from the analysis of the CBMI process in the FaaS project, and related contract design mechanisms. Before presenting the specific themes, we discuss the context in which the *FaaS project* and *the related contract template* have emerged.

3.4.1 The CBMI process in the FaaS project

The Fairphone-as-a-service (FaaS) project started with the idea to create a collaborative space to experiment a CBMI process to redefine key PSS components and architecture for Fairphone. Fairphone had set a number of objectives for its new PSS model: first, the core value proposition had to remain focused on 'gaining revenue by offering a circular PaaS' in a business-to-business context; second, Fairphone would provide services related to cascading activities (i.e., maintenance & repair, refurbish, remanufacture, recycle) around the (hardware) product. In this model, reverse logistics, maintenance, repair, and refurbishing, would enable the extension of the product life (see figure 4).

In this way, a 'product' like a smartphone could be used by several sequential users in different use-cycles (i.e., being used multiple times with the intermezzo of maintenance, repair, refurbishing at the producer's premises). The logic of the CBMI process was therefore to engage with key reconfigurations of the PSS architecture, and namely intertwining *designing for longevity* (e.g. extending the overall smartphone life cycle), *designing for modularity* (e.g. adding multiple use-cycles for the different hardware modules) and *servitisation* (e.g. offering cascading activities to customers). At this stage, Fairphone, focusing to offer services around a product like a smartphone, had to address the challenge to manage a front office as service provider, as well as a back office dealing with the technical, legal, and organisational aspects of multiple use-cycles of a product (and modules). Instead of dealing with activities concerned with standard sales of products to an end user, creating the FaaS model implied that the service provider (e.g., Fairphone) would have retained the ownership of the product and its modules, moving into the adoption of a use-oriented PSS model.

Figure 4 – Extended customer-service provider relation in circular vs linear servitisation



Source: Circle Economy (2016, p8)

How to manage the Fairphone's different modules (see figure 5) quickly became the key aspect to be defined in a contractual agreement with customers (end user), as well as the related ownership and obsolescence issues. This had far-reaching consequences for the entire business model, and particularly to the agreement between parties involved, and how to translate this into a contract. One lawyer involved in the FaaS project framed this challenge in the following way:

"We have actually found that we do not even want to talk about hardware leasing but that we really want to provide a service for the content of the contract. The service that is offered is functionality in the form of making calls, being able to be called and being able to use the internet, so to speak, which remains entirely managed and owned by Fairphone." (Lawyer, 2017-10-16).

A project for designing the contract agreement was put in place to respond to the challenges of the CBMI process. Particularly, the different contract clauses had to be (re-)considered and agreed upon, in relation to the different modules and their lifecycles, adding a layer of complexity to the process of definition of a contractual agreement. During the project barriers and enablers were identified for the creation of the FaaS contract template. Understanding these conditions has been key for making sense of the relations between the CBMI process and the legal and contractual aspects of the contract template. We present the detailed analysis of these relations in the next section.

Figure 5 – Main challenges linked to the management of the Fairphone modules

Modules[6]	Main Subparts	Obsolescence drivers	
		Wear & Tear	Market
Top Module	Earpiece speaker, proximity sensor, front camera, audio port and connection to core module	Audio connector is subject to mechanical forces when used	Camera technology advances at fast pace but depends on the target users
Bottom Module	Charging port, loudspeaker, the vibration mechanism and connection to core module	Charging connector is subject to mechanical forces when used	New charging port USB type C is becoming the norm.
Display Module	Display, closing mechanism, connection to core module	Glass on display may break due to impact when dropping and scratches may appear in time	A plateau has been reached on actual improvement of image quality.
Camera Module	Main Camera and connection to the core module	The camera module is not heavily affected by wear and tear	Camera technology advances at a fast pace
Battery	Li-ion battery and connection to the core module	Loses capacity with every charging cycle	Not relevant, technology in batteries is not changing substantially
Core Module	Chipset, antennas, battery connector, multiple other electronic components, connectors to all the modules	Wear and tear is not significant for this module	Main driver is the development of new chipset technologies
Back Cover	Composed of two elements: back and front rim	External parts of the device suffer most of wear & tear	Not relevant, only if Fairphone releases new covers

Source: Circle Economy (2018, p.7).

3.4.2. Emerging contractual design mechanisms to enable the FaaS innovation process

Our findings reconstruct how Fairphone and partners in the project have dealt with these conditions and devised contractual clauses accordingly. The Fairphone company and partners had organized the FaaS innovation process in such a way, that first key challenges would be identified at CBMI level and then tackled through the design of the contract temple. In table 5 we summarise the main findings and discuss them in the text in further details.

Table 5 – Clustered codes and meanings of contractual elements

First order codes and related exemplary evidence	Clustered meanings
Defining the service specification Managing customers' performance expectations Focusing on product's modules and functionalities Dealing with malfunctioning products or components Devising the appropriate operational processes (e.g. swap pool) **Embedding take-back services for the customers** Implementing handling and monitoring systems for reverse logistics operations	Servitisation - Defining the scope of circular services (Theme A)
Supporting continuity in the ongoing provisioning of the service Avoiding customers and service-provider have incentive to steer activities towards terminating the contract Adding opportunities to extend contractual clauses for cascading and take back system operations **Balancing technical and sustainability performance** Avoiding depreciation by aligning economic and technical product lifespan Balancing technical performance and sustainability performance of the devices over time as circumstances change **Handling and termination** Provider can adapt to underlying infrastructure Adapting termination to new optimal lifespan predictions and remaining value at risk	Longevity - Defining the tenure of the contract (Theme B)
Redefining and removing a warranty period Making clear who is responsible for breakages and malfunctions Formulating new ways of dealing with the responsibility for the product **Redefining rights and responsibilities** Reframing with the service-user the accessibility of the product Providing the right incentive for both the service provider and the user Reconsidering schemes to perform beyond corrective maintenance Differentiating between a device breakdown and physical damage Specifying potential penalties for users	Modularity - Defining customer- and service provider risks and securities (Theme C)

Theme A: Servitisation - Defining the scope of circular services

The first set of findings relate to how participants in the project have defined the '**scope of the circular services**' in the contract template in order to enable the servitisation configuration. The scope of the servitisation has emerged as a key theme for the contract design process and provided the contractual boundaries for agreements between Fairphone, as service provider, the business customers, as service user. Our analysis indicates two key dimensions of the servitisation design process addressed by the contract template, as summarised in table 6 below:

Table 6 - Representative quotes related to defining the scope of the circular services

First order codes and related exemplary evidence	Exemplary quotes
Defining the service specification	*"What we want to propose is 'these are the components of our smartphone device. If you just get someone who has a broken screen then you can tell your customer to put a new screen on it, or you can change a battery that no longer works well, or your cover"* *"[...] so we want to suggest that they do things like this in house [at the company premise]. [...] And then you have a level deeper that you will therefore dismantle these components, but we think that that probably does not come in the entire hassle-free model, because I think that is a bit too much hassle."* (Fairphone manager, 2017, 16-10)
Embedding reverse logistics/take back services for the customers	*"In this kind of business what you want to prevent is that you get stuff back of which you don't know what it is. So an RMA is a return of material authorization, so they contact the vendor, Fairphone, hey, we have stuff to send back, there is something wrong with it. Then we look ok what's wrong with it, whatever the reason, then you get an RMA number, which is actually an authorization."* (Fairphone manager, 2017, 16-10)

Defining the scope of the service provisioning was intensified as a key aspect of the configuration of the FaaS model to specify the expected performance of the product, and to identify the **level of service** to expect in case the performance would not be met by the device. Fairphone as service provider had to anticipate potential malfunctions and 'down time' of the service that they could offer. Specifying this in the contract and backing up these agreements by having the **appropriate operational processes installed to provide customer services** was considered key for a successful servitisation. In the case of FaaS this was about the functioning of the smartphone devices and their seven modules, and how to handle malfunctioning modules.

In order to guarantee a quick response to experienced malfunctions, part of the scope of services included a 'swap pool', a stock of devices and separate modules on the premises of a client company that would enable quick replacement of malfunctioning devices or modules. **Procedures** and **a manual on how to swap modules would have been included,** also to help clients to handle the delivery of modules from Fairphone as well as how to send malfunctioning modules back.

The creation of a swap pool defined the second dimension of the servitisation about when to swap modules and about which modules would be 'swapped' at the client's premises versus devices being sent to Fairphone. One of the challenges was represented by the different levels of complexity of repairing and refurbishing modules since some of them can be clicked into place more easily than others. Moreover, this process demanded clear rules about the number of modules required in the swap pool to keep the swapping process going. It was decided that the swap pool would consist of a number of modules equaling 2% of the total amount of phones, with a minimum of five. Participants also decided that the contract would refer to 'functioning modules' instead of 'new modules', to move away from the assumption that clients would receive 'new' modules whereas these modules would be actually managed in ongoing cycles thus would not be new.

The definition of the boundaries of the servitisation, and when, how and what to send back devices and modules also led to the definition of the take-back system for Fairphone and to keep track of modules going back and forth. **Track and trace of reverse logistics** should take place in an organized way, in order to monitor what modules come back for which reason and in which quantity. Generating data about the reverse logistics would enable Fairphone to learn continuously about the performance of certain modules and to improve continuously on technology and supporting services.

Theme B: Longevity - Defining the tenure of the contract

The second emerging theme in our findings relate particularly to the longevity of the FaaS model, and therefore the 'tenure of the contract', e.g., the duration of the service contract, and definition of procedures to revise the service contract clauses. In fact, some clauses that would be typically part of service contracts had to be revised in order to consider the longevity of modules and devices (see table 7).

Table 7 - Representative quotes related to defining the tenure of the contract

First-order concepts	Exemplary quotes
Supporting continuity in the ongoing provisioning of the service	*"What kind of contract duration should you have? [...] We have to put that on two years because then we sort of get out of the costs. Then I also suggested that you can make it completely flexible by working with a handling fee and a termination fee or a recovery fee."* (Lawyer, 2017-10-16). *"This Agreement shall be effective from the Effective Date and shall be valid for a period of one (1) year and can be extended for consecutive periods of one (1) year."* (Version 1, Circular Service Contract Template – version 1) *"This Contract shall be effective from the date of this Contract and shall be valid for an indefinite period of time."* (Final version, Circular Service Contract Template – final version)
Balancing technical and sustainability performance	*"Look if you say it lasts for two years because you actually want to have paid it, then your service fee will also be much higher. Actually, there should be no asset component at all anymore [...] I think that is very important in the presentation of your modelling, there should be no more depreciation or asset element, it is all a service element so that you simply do not get the feeling that you actually paid for that phone, and you still don't get it because it's access you get."* (Lawyer, 2017, 16-10).
Handling and termination	*"Yes, because we already said instead of the termination, you can also call it a handling fee for termination. And that is very much dependent on whether you actually want to have paid for that thing before you get it back, but that has a lot to do with the re-use risk; Just where do you put the risk of reusing that specific device. [...] You can make it completely flexible by working with a handling fee and a termination fee or a recovery fee.* (Lawyer, 2017, 16-10) *"Each Party shall have the right, without prejudice to its other rights or remedies, to terminate the Contract with immediate effect by giving a [x] days' written notice to the other Party."* (Version 3, Circular Service Contract template).

Particularly, since the FaaS model marked a change from selling a product to providing a service for a prolonged period and with changed responsibilities, the consequence is that also the contract tenure must be changed. Typically, the duration of the contract is chosen based on the assumed optimal period for the agreement and based on the principle that after the point of sales, responsibilities shift towards the buyer/customer of the service. However, the **FaaS business aimed to provide an ongoing service**, in line with **optimizing a product lifespan in multiple use cycles and circular cascading activities** (see figure 4). Therefore, to ensure continuity of service provisioning in the FaaS model it was decided that an **ongoing agreement** should be used instead of an agreement with a fixed term.

Similarly, the focus on ongoing services created flexibility for Fairphone to adapt the contractual conditions, **balancing technical performance and sustainability performance of the devices over time as circumstances change**. A predetermined contract with a fixed duration of one year, for instance, would have not reflected nor incentivized the aim of using modules for as long as possible in recurring use-cycles. On the contrary, a one-year contract period would resemble a linear business model, characterised by the asset (e.g. the product) being depreciated over a relatively short period of time with no value attributed to reusing that asset in multiple use-cycles. In the FaaS model modules and devices would likely be depreciated substantially slower, since through performing maintenance, repairing, refurbishing, remanufacturing, and/or recycling activities, value would be added every time a product, or module, returns to the service provider for starting a new use cycle. Changing the contract duration from one-year to an indefinite period raised another challenge in the FaaS project. Namely, if the contract would last for an indefinite period, how could parties end the contract and what would be the consequences? There was a need for a clause about how parties could terminate the contract. This clause should enable Fairphone to cover its value at risk (e.g., the resources invested by Fairphone and/or investors that are not yet earned back). On the other hand, there was the need to build in flexibility for parties to be able to exit the contract as easily as possible (e.g., the contract should not force parties into an agreement that can never be ended). Debating this question led to proposing a **flexible termination** combined with a **handling fee that covers the value at risk** (i.e., the risk of loss investments). The handling costs and termination fee should cover the costs Fairphone had to make when a client wants to terminate its contract. This included costs for logistics of the phones, maintenance, and potential repairs of the devices before they put the devices to work again in a new use cycle for another client. Moreover, a handling fee would be included that consists of a formula that covers a decreasing value at risk over time. This meant that terminating the contract sooner was going to be more expensive then terminating later.

Theme C: Modularity - Defining customer- and service provider risks and securities

In a linear business model a contract would define the producer responsibility in terms of a (given) warranty period. If the product/service shows a malfunction within this period, it falls under the responsibility of the company providing the service to tackle the issue. Since the FaaS model devices are no longer sold as such, but coupled with 'ongoing' services, **a standard approach to define a warranty period was no longer relevant**, and therefore it needed to be reconsidered. Nonetheless, the risk of a product breaking down remained. Therefore, still the contract should have made clear the responsibilities for any breakage and malfunctions, and under what circumstances and referred to which module. The solution to define responsibilities between the service provider and the user was identified in **providing incentives for both service providers and users, to take responsibility** for respectively an ongoing performance and careful use of the product. These incentives would have been made explicit and included in the contract template based on an agreed procedure. The first attempt of formulating responsibilities considered the average monitored breakages of the Fairphone modules, and used as reference point to define a threshold for the service provider's responsibility for each module. For example, in the case of the display module, this threshold was set at 12%, meaning that for every user, 12% of the screens could be replaced without any additional costs.

Table 8 - Representative quotes related to customer- and service provider risks and securities

First-order concepts	Exemplary quotes
Redefining and removing a warranty period	*"We have formulated it that way [...] that 12% may be replaced free of charge on an annual basis, that we have linked exactly to Fairphone's calculation how much can normally go wrong."* (Circle Economy Project Manager, 2017, 16-10)
Changing the customer mindset and reframing	*"There is indeed a kind of aspect of 'don't be gentle it is a rental' what you want to try to prevent."* (2017, 16-10), said one of the Circle Economy project managers *"But what you are actually saying is that this is an agreement about being allowed to break down so many [12%] screens at your own fault."* (Circle Economy Project Manager, 2017, 16-10).
Redefining rights and responsibilities	*"What you could think of if preventive maintenance is [...] batteries that have about a life span of x-number cycles which roughly amounts to between one and a half years and two years, [...] Then you could say ok after one and a half or between one and a half and two years we just send new batteries, let those old ones come back and then they all have a new battery."* (Fairphone manager, 2017, 16-10) *This potential inaccessibility of the product must be made clear in the contract.* *"[...] again you can say it doesn't have to be mandatory but it is also [...]it is a disturbance of the service that needs to be covered because you say I want preventive maintenance and therefore I can ask to do a swap on all the phones. It means that everyone has to return their things."* (Lawyer, 2017, 16-10)

Although this seemed like a logical solution, the procedure to redefine responsibility had to also consider other aspects and in particular the potential changed behaviour of users towards the different modules. There seemed to be a need for redefining property and usage rights, and responsibilities for the devices, and its components, and distinguishing between different causes of breakages. This resulted in a **maintenance scheme** enabling Fairphone to add a **corrective maintenance scheme** (i.e., if something breaks), a **preventive maintenance** scheme (i.e. before something breaks). This would allow Fairphone to use data about performance and malfunctions to decide precisely what is the right moment to perform maintenance and update activities. This can for instance mean that Fairphone decides to update a batch of batteries that is becoming old,

being able to perform activities in a larger scale (whole batches instead of one by one when they break down) and consider cost- and sustainability factors in their decision. When doing preventive maintenance, the service provider must intervene and take back the product. This can be inconvenient for users that will not have access to the product for a certain amount of time, which needs to be specified in the contract. The discussion on the maintenance service also led to the **redefinition of rights and responsibilities** substantiated in the contract by **differentiating between a machine breakdown and physical damage.** This implies that monitoring should point out if a malfunction is due to a manufacturing flaw (*machine breakdown*) or due to poor usage (*physical damage*) and therefore the fault of the user. Therefore, the FaaS contract template should specify the difference between the two situations, and a potential penalty for the user when (deliberately) mistreating the product.

3.5. Discussion

Our findings have indicated the relevance of contract design to understand CBMI processes related to PSS models. Particularly, our analysis has brought to light the strategic relations between how design for servitisation, longevity and modularity are related to the *scope* and *tenure* of the contract, and the definition of *customer and service provider risks and securities*. Based on these findings our analysis offers two key contributions to the extant literature: (a) first, our research contributes to our understanding of contractual mechanisms to enable critical CBMI processes in PSS models. This is evidenced by the definition of norms, rules and procedures to allocate decision, property and usage rights, to define dispute and adaptation mechanisms and to coordinate activities enabling key processes for the reconfiguration of the FaaS architecture, such as the servitisation, longevity and modularity. (b) Second, our research helps to enrich extant literature on contract design for innovation with further empirical evidence. Particularly our findings engage with previous studies investigating how challenges associated with innovation processes dealing with uncertain and unknown outcomes can be tackled with a contract design approach. Both contributions have implications for our understanding of the applicability and scalability of PSS models. We will first elaborate in further details the conceptual outcomes of our research, and then we will highlight the key takeaway points for practitioners.

3.5.1 How contractual mechanisms enable CBMI processes in PSS models

Compared to previous studies (e.g. Van Ostaeyen *et al.*, 2013; Bocken *et al.*, 2014; Bocken *et al.*, 2016), our findings more explicitly relate contractual dimensions to processes of configuration of the PSS model architecture: particularly the redefinition of ownership in the FaaS contract template defines three key aspects of the contractual design relevant for the CBMI process, in terms of servitisation, longevity and modularity. Particularly, the definition of the '**scope of circular services**' (Theme A) seems to be a pivotal contribution for defining a contract template in relation to *servitisation*. Our findings also indicate that the lifespan and obsolescence (longevity) of the products and its components are defined by key contract features and clauses, and particularly by the '**tenure of the contract**' (Theme B). Particularly, in the FaaS contract template an adjustment of the tenure has been needed to *optimise the product lifespan in multiple use cycles,* thus aligning economic and technical product lifespan, adapting termination to new optimal lifespan predictions, balancing technical performance and sustainability performance and finally avoiding linear depreciation of the devices over time. The third set of our findings highlight how relevant is the definition of the risks and securities between the service provider and users (Theme C) for a user-oriented PSS model. These findings enrich extant literature on CBMI since they further emphasize the key role of defining the scope and tenure of the contract in a PSS model. Looking at our findings, the scope of the contract, particularly, had created the 'boundary conditions' for the implementation of the servitisation, for example by introducing rules and procedures, and setting expectations on services for both the service provider and user. Furthermore, we have highlighted how servitisation, modularity and longevity are deeply interconnected in the CBMI process for configuring a PSS model. In fact, beyond the definition of the boundary conditions, through the definition of the norms, rules, and procedures in the scope of the contract, actors involved in the contract design have been able to detail key configurations of the FaaS model related to the longevity and modularity. This is a key outcome of our analysis to enrich extant knowledge on how in PSS models, the different components interact and can result in value creation, delivery, and capture. As evidenced in previous studies, the servitisation process tends to decouple ownership of the product from value creation, delivery and capture, while longevity and modularity connect them to usage and performance (Reim *et al.*, 2015; Annarelli *et al.*, 2016). For instance, detailed rules and procedures had to be identified at module rather than product level, indicating that design for longevity and modularity are deeply intertwined, particularly in a use-oriented PSS model (Bocken *et al.*, 2016). The capacity of procedural rules, such as norms for managing ongoing services, novel handling and termination conditions, a code of conducts for maintenance of the modules, and clear take-back rules and risk-allocation, all have a crucial role in helping PSS model to be effective, implementable by all parties and thus able to translate the principles of *slowing, narrowing, closing and regenerating* into circular value propositions, delivery and capture (Bocken *et al.*, 2016; Bocken and Ritala, 2021).

3.5.2. The role of associational and procedural contracts for enabling CBMI processes

Our findings and analysis also offer an opportunity to enrich extant literature on contract design for innovation (Grandori and Furnari, 2019). The FaaS project is an informative case of circular business model innovation implemented under conditions of uncertainty. These conditions are related to the need of involved parties to challenge their current knowledge and technological, organisational, and contractual practices, moving from the status quo shaped by linear economy rules, norms and procedures to an unknown state. This is uncertainty stemming from the innovation process itself, due to unknowns in the co-creation of knowledge, as part of the process of discovery Fairphone and its partners in the project had to experience. Consistently with extant literature, our findings highlighted how involved parties have committed to pooling resources and their use, and have defined joint and collective norms, for example in the case of corrective and preventive maintenance, rather than agreeing on overly-specified tasks (Grandori and Furlotti, 2019). Similarly to other studies, in the contract design for the FaaS innovation process, involved parties have focused on defining which property or use rights the parties have on the committed resources, and when, how and who decides on their use (Gulati *et al.*, 2005;

Grandori, 2006). The innovative approach for defining handling and termination flexibly, or to redefine warranty through a corrective and preventive maintenance scheme confirm extant understanding of contractual mechanisms for translating learning from 'errors and problems' encountered during an innovation process, and the need of involved parties to enrich their contractual agreement as they go along with the innovation process (Grandori and Furlotti, 2019). What emerges from our investigation on contracts in CBMI processes to configure PSS models also aligns with the theoretical literature on contract design for innovation (Grandori and Furnari, 2019), and namely:

- a contract design in a CBMI process tends to focus on *defining ownership of and access to joint materials, resources and modules,* of the product, rather than focusing only on transactional aspects;
- a contract design in a CBMI process tends to be *procedural* rather than *substantive,* and revolves around 'when and how to decide what to do' rather than 'on what to do'.
- a contract design in a CBMI process tends to be *associational* rather than *operational,* defining key rules for all involved parties in relation to the longevity and modularity of the product.

3.5.3 Use contracts to enhance applicability and scalability of PSS models

Beside the conceptual and academic contributions, the links between contractual aspects with the CBMI process have wider implications, particularly, in terms of applicability and scalability of the PSS model and the alignment of economic and socio-ecological goals. Extant literature highlights that designing for servitisation, longevity and modularity enhance the capacity of PSS models to simultaneously narrow, slow and close loops of resources use (Bocken *et al.*, 2016). This makes PSS models a rather promising option to induce businesses to consider engaging with circular practices that are beneficial for both their strategies and the wider society. However, as we have demonstrated in the FaaS case, the applicability and scalability of this model has proven more challenging than anticipated. Although our findings refer to a case where the service provider is a social enterprise (e.g. Fairphone), thus with a strong commitment to social and environmental goals, we believe our results can be extended to a wider set of PSS models, since they shed light on challenges that are common in several CBMI processes. The core take-home outcome of our analysis is that a contract template should be designed to tackle 'tensions' related to servitisation, longevity and modularity, and to provide the legal enabling conditions for the implementation of a PSS model. For example, finding a new way to define the contract term is key to tackle these challenges to provide an ongoing service while ensuring optimal product lifespan, multiple use-cycles and cascading activities. The contract term has direct effects on the capacity of the FaaS to close, slow, and narrow material loops in smart phone devices. This point is not trivial, since using a contract with fixed term conditions in a PSS model is technically possible but it may provide counterproductive incentives, since user and service-provider may be incentivized to steer activities towards the moment that the contract will be terminated. In practice, it becomes less likely that parties will extend the contract, reducing the opportunity to align technical and economic longevity of the product and to make fully use of its modularity. Without exploiting the benefits of longevity and modularity, a PSS model becomes just like any other service model with a lease contract, which has little to do with circular business models and strategies.

3.6. Conclusions

This research has highlighted a few critical challenges that connect contractual elements to the definition and implementation of a use-oriented PSS model. Contracts and agreements between suppliers, manufacturers, customers, and potential other parties play a role in the process of getting a product to a consumer and - in a PSS model - back into the supply chain after every use cycle. Balancing ownership to manage servitisation, longevity, and modularity between the different involved parties is the key aspect emerging from the case study analysis. This has also implications for better understanding the socio-ecological impacts of PSS models, since by using higher quality materials in multiple cycles (longevity) and for the different parts of a product (modularity) a service provider (e.g., Fairphone in our case) is able to deliver higher quality performance and functionalities (servitisation), while increasing environmental health and social desirability at the same time. Indeed, balancing ownership and longevity of materials and components are at the basis of a functioning a use-oriented PSS model. However, all these contractual aspects are still subject to experimentation, as clearly showed in our FaaS case study. Contract templates, norms, procedures and clauses must be developed and piloted before they can be modified and perfected to be used on a large scale. The challenge at hand is to create contracts that emphasize the ongoing nature of the service in PSS models, while it needs to also provide flexibility and adaptability.

Clearly, our study has some limitations. First, it provides conjectures on a specific case, with a relatively high degree of complexity, both from a technological and organisational perspective, which might indicate some idiosyncratic aspects of the case study. However, it is likely that at least for products that involve technology (such as consumer appliances and IT equipment) companies aiming to create a PSS model will encounter similar challenges. Second, our approach did not consider an in-depth analysis of the different processes, including participants' views during the innovation process. A process methods approach could be instead more suited to unearth dynamics between participants, relevant for both the contract design and the CBMI processes. Finally, it builds on evidence gathering in an engagement where the service provider is a social enterprise, thus already committed to social and environmental logics and goals. Although the FaaS project targeted for-profit clients, as well as engaging in designing an economically feasible business model, it should be acknowledged that future research should consider investigating CBMI processes in/between less 'sustainable-born' firms. Still, while our analysis is limited to a specific case and CBMI process, we believe that the evidence provided should stimulate future research in other contexts and for other products, thus expanding our understanding of the interplay between contract designs and enabling contractual mechanisms for the adoption and diffusion of PSS models.

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04.

Finance and accounting in the circular economy

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Abstract

This chapter discusses finance and accounting in the circular economy transition. Strategic decision making in organisations is determined mostly by financial ratios to maximise financial profits. When companies adopt a circular business model, creating a positive environmental impact becomes part of the strategy and needs to be accounted for. Unfortunately, accounting for circular business output and impact is at odds with classical accounting, which is based on linear business models. By using data from three business cases that are in the process of creating a viable circular business model, we show opportunities and bottlenecks of financial accounting and financing for companies with circular business models. The inability of current accounting principles and structures to register the additional value of- and the lack of understanding the risks and value creation of circular business models are major hurdles for valuing and funding these business models.

4.1. Introduction

Circular business models (CBMs) are characterised by their value creation through circular activities and strategies designed to close the loop by reusing resources and materials. Design for longevity, modularity, refurbishing and recycling are all examples of company strategies to create financial value without harming the planet and its inhabitants (Bocken, *et al.* 2016). For a company in transition towards a CBM, it is important to know how to capture and report the multiple values it aims to create with its CBM (Lahti, Wincent, and Parida 2018). Understanding all costs and benefits of economic, environmental and social value created, and connecting them with the decision making process, will support businesses that aspire to a CBM (Dewick, *et al.* 2020).

It allows companies to integrate economic, environmental, and social value and report on their multiple value creation. However, current managerial and financial decision making is primarily informed by financial profits. This results in a situation where companies delivering high financial returns are favoured by capital providers even if they generate negative impacts and cause social and environmental harm. This creates an imbalance where companies that generate positive social and environmental but have relatively low financial returns have difficulties to raise enough capital to grow or to survive. In short, externalities of business activities (i.e., the positive and/or negative social and environmental effects) are not sufficiently considered in decision making because their impact is not expressed in financial terms.

Understanding the differences in financial and accounting valuation of linear and circular business cases, could bring us closer to creating a level playing field which enables to assess all companies by the same standards. This could result not only in accounting for financial value, but integrating financial, environmental and social costs and benefits (Aranda-Usón, *et al.* 2019). Adding climate change and other environmental and social risks into the economic context, would require mapping of and accounting for the externalities of creating products and services. The next step would be including them into the production and selling costs. (Albuquerque, *et al.* 2019). This way, companies that generate the highest overall positive impact will become most attractive for investors in their pursuit to receive return on their investment (Elkington, 2017; Garcés-Ayerbe, et al. 2019).

Creating a level playing field is easier said than done. The financial sector focusses on optimising financial profits (Musinszki and Suveges 2019) and neglects positive environmental and social impact (Galletta, *et al.* 2020). This paradigm is not a matter of bad intention: it finds its origin in the industrial era in which large amounts of natural and human resources were available. Currently, society is facing the consequences of human and natural exploitation, and the damage to biodiversity and the onset of climate change (Salvioni and Brondoni 2020). The effects of climate change on living conditions requires society to move to a new paradigm in order to stay within our planetary boundaries (UNESCO 2013). In this chapter we make the case that financial profits can no longer be the measure of success, but that economic prosperity depends on balancing financial, environmental and social returns (Wijkman and Skanberg 2014), and on executives who steer on maximizing positive overall impact instead of financial profits. The case studies presented in this chapter show how businesses aim to develop CBMs that balance these returns. At the same time these cases illustrate the hampering effect of current financial and accounting rules and frameworks.

With all societal and environmental challenges, companies and financiers have become aware of the economic costs of externalities and are changing their strategies. Companies with circular strategies create value for society and are the type of companies that we ought to invest in order to avoid more and larger damages in the future (Ghisetti and Montresor 2020). The lack of understanding of CBM value creation and the vacuum of investment strategies hinder recognizing and valuing the full potential of companies with CBMs (Aranda-Usón *et al.* 2019). Financial institutions are inclined to finance business models that they are already familiar with. This means that financiers are more likely to invest in CBMs that are familiar, such as recycling (Djuric, Stosic-Mihajlovic, and Trajkovic 2017), and reluctant to invest in CBMs taking a more radical approach: i.e. redesigning entire products or selling services connected to products (i.e., Product Service Systems, (Tukker 2004, 2015)(Stumpf, Schöggl, and Baumgartner 2020). More radical CBMs can deliver more substantial environmental and social benefits. But because they are different in terms of how and what value is created, hence financiers and accountants have difficulties understanding the strategy and the financial incentives behind them (P.K. Ozili and F. Opene 2021). Depending on the type of revenue model of a CBM and how circular incentives and activities are included in the agreements, the financial reports of CBMs – the main informants of financial decision making – will differ from the reports of their linear counterparts. Hence, CBMs will encounter major obstacles in attracting necessary funding.

We have used empirical materials from three cases to explain the current perspective of financiers and accountants on (the value of) CBMs, and how the financial sector is challenged to rethink assumptions and principles needed to a better understanding of value creation by and financial funding for CBMs.

4.1.1. Methodology

Empirical data have been gathered by the authors in the Coalition Circular Accounting (CCA) (Coalition Circular Accounting 2020a, 2020b, 2020c). This coalition was initiated by Circle Economy and the Dutch association of chartered accountants (NBA) with the aim *"to identify and overcome accounting related challenges that hinder the transition to the circular economy"*. The coalition is characterised by its pre-competitive environment through which experts and scientists in the fields of finance, accounting, law work on practical cases. Our case study focuses on three CCA cases: (A) Road-as-a-Service (RaaS), (B) Facades-as-a-Service (FaaS) and (C) Valorising Residual Resources (VRR), spanning from 2019-2020. The three CCA case trajectories were organised with an interactive format in which a real-life circular business case was the focal point. Workshops and thematic deep dives were organised to discuss specific topics such as the value proposition, valuation and reporting issues, risk perception and financeability issues of the CBMs.

The three case trajectories have been fully recorded, and afterwards have been transcribed, coded, and analysed. Also, financial models of the CBMs that were created and discussed during the case trajectories were used in our analysis. These data provide detailed accounts of how CBMs are developing their value propositions and what- and why financiers and accountants experience difficulties to correctly interpret and value these CBMs within their current professional frameworks.

This chapter is written as a position paper. Based on the empirical materials, ideas and concepts that are relevant for scholars and practitioners interested in the interface of CBM creation and finance and accounting are explained and discussed. Section 2 provides key concepts regarding CBMs in relation to accounting and finance are provided. These concepts are further clarified by using a illustrative business case[8] to compare accounting and finance results for circular and linear BMs. In section 3, three empirical business cases are introduced, and results are presented that show difficulties regarding understanding, valuing, and financing CBMs. Section 4 discusses what changes can be considered to better understand and support CBMs and create a level playing field. Section 5 is a brief conclusion section.

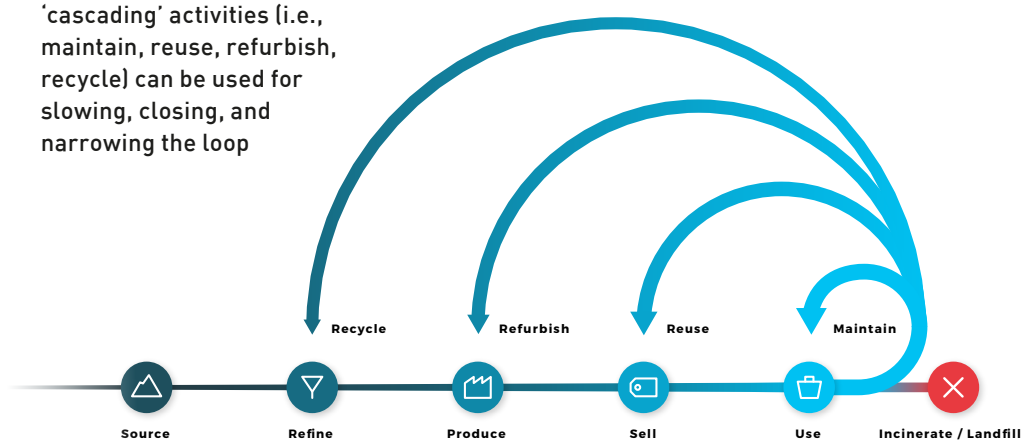
[8] Given the confidentiality of the financial figures of the three cases, which are based on business cases for actual investment proposals, the insights from these cases have been incorporated into a illustrative case study, washing machine-as-a-service case study. In this illustrative case, financial figures can be shown and the insights from a business case, financial and accounting perspective can be shared.

4.2. Circular business models, accounting, and finance

4.2.1 Circular business and value creation

In the circular economy, institutions and companies take a more long-term perspective on value creation. Instead of the linear take-make-use-waste trajectory of a product, a CBM aims at using products and materials in continuous loops where products are managed in ongoing cycles (Geissdoerfer, *et al.* 2017). To get the most out of the value of raw materials, each product life cycle phase should be extended as much as possible, by applying the circular principles of cascading e.g. staying in the inner loops as long as possible and finally reaching the last loop of material recycling (Ellen MacArthur Foundation 2013). Bocken *et al.*, (2016) describe these fundamental circular strategies as *slowing, closing,* and *narrowing* the loop. Figure 6 visualises the cascading activities that can be used to slow, close, and narrow the loop.

Figure 6: Circular 'cascading' activities (i.e., maintain, reuse, refurbish, recycle) can be used for slowing, closing, and narrowing the loop



Source: Circle Economy, 2016.

One-directional linear supply chains must develop to multidirectional value chains with products and materials going back and forth. They will have many different interactions between supply chain partners and have to be supported by IT and software and supporting services to organise and manage the system effectively (Genovese, *et al.* 2015). In a circular value chain companies can capture the value of products and materials not just by selling them at once, but also by selling them and buying them back at a later stage or even by retaining total ownership. There are three general ways for a company to make their products or materials available to a client and generate revenue, sometimes referred as revenue models (Lüdeke-Freund, Gold, and Bocken 2019).

The revenue models that we distinguish are:
1. **Sale**: A sale is a transaction between two or more parties in which the buyer receives tangible or intangible goods, services, or assets in exchange for money. A classic example is a company that sells a product to a client. By far most economic transactions are sales transactions. In a sales transaction the ownership of and the responsibility for a property is transferred (Ritzén and Sandström 2017).

2. **Sale and buy back**: In a sale and buy back transaction the producer sells the product to the user with the aim (and potentially a formal agreement) to buy it back at end of use. There can be an agreement on a price upfront or the agreement can be made at the point of buy back. Since the seller does not know what the state and value of the returned product will be agreeing on a price beforehand can be a risk. However, if resource prices turn out substantially higher at the point of return, an upfront agreed price can be a benefit. When a sale and buy back is formalised in a contract this provides clarity and obliges both parties to adhere the contract. Without a formal agreement a sale and buy back becomes facultative. The sale can fall through in a situation where there is no formal agreement and the producer does not want to pay the price at the time of buy back, or when there is another party that offers a higher price (Peace 2014). In 2020, the Swedish furniture company Ikea started a large buyback programme in 27 countries without a contractual agreement with its customers. They can get up to 50% back for their old Ikea furniture.

3. **Product-as-a-Service**[9] (PaaS): In a PaaS business model, not the product is sold but rather the performance of the product is sold. An example is the 'pay-per-lux' business model from Philips. Philips stays the owner of- and responsible for the fittings and light bulbs while the client pays a periodic fee for enjoying the light (lux). PaaS is characterised by an ongoing contractual agreement – a service agreement - between the producer (and service provider) and the client. Moreover, since all products are returned to the producer after their use, the producer will benefit from creating a sustainable product that can easily be maintained, repaired remanufactured and recycles (Romero and Rossi 2017). These three revenue models each have certain effects on accounting structures of a company and are perceived differently by financiers. The longer the time horizon and the more control over products and materials (through buy back agreements or service agreements), the more challenging for accountants and financiers to value circular companies. The reason behind this will be further explained below.

4.2.2 Circular business and accounting

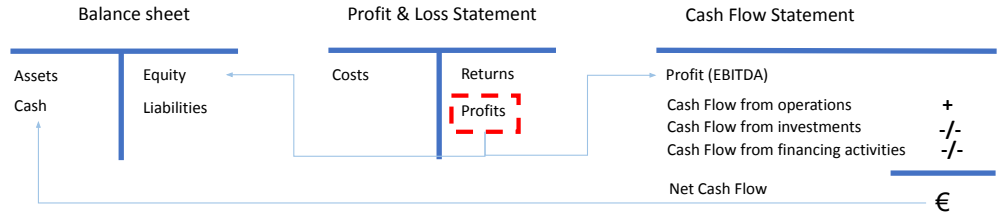
The accounting process includes recording, summarizing, analysing, and reporting financial transactions pertaining to a business. The **financial statements** used in accounting are a concise summary of financial transactions over an accounting period, summarizing a company's operations, financial position, and cash flows. These financial statements include (1) the balance sheet, (2) the profit and loss statement (or income statement) and (3) the cash flow statement.

[9] There are many ways of combining products and services. Please see the extensive literature on Product Service Systems (PSS) for a complete overview.

Balance sheet

The **balance sheet** shows the assets of the organisation, which must be in balance with the equity and debts of the company to finance the assets (Atrill and McLaney 2006). **The profit and loss statement** (P and L) shows the costs and revenues, and the profit (or loss) made.[10] The **cash flow statement** shows the cash flows of an organisation, consisting of profits, cash flows from operations, investments, or financing. Transactions are recorded in the general ledger – the structure of accounting –, each of which has a relationship with the balance sheet or profit and loss account (see figure 7). Based on the relationships within this common structure, analysts and financial institutions can assess the vitality and the continuity of an organisation compared to other organisations in the sector. The financial statements are subject to accountancy and other rules and guidelines set by financial and accountancy authorities such as the International Financial Reporting Standards Foundation (IFRS) or the Generally Accepted Accounting Principles in the United States (US-GAAP). Figure 7 presents a stylised picture of how Balance sheet, Profit and Loss statement and Cash Flow statement are related.

Figure 7: General accounting structure and relationships between the balance sheet, P and L and cash flow statement.



Accountants are responsible for the financial accounts and reports. The reports may include additional (non-financial) information to the financial data provided. In order to rightfully assess the activities and assets that a CBM represents, auditors have to understand the value created by companies that apply circular strategies and activities (Goretzki, Strauss, and Weber 2013). Depending on the type of revenue model of a CBM and how circular incentives and activities are included in the agreements, these reports will differ from the reports of their linear counterparts. CBMs base their revenue on the multiple value created through circular activities (e.g., maintain, reuse, refurbish, recycle). Their aim is to use circular economy principles to create insight in the multiple value creation – optimising the use of products and materials and closing materials loops for continuous re-using of materials. Extending value creation beyond one product use

[10] Definitions matter. Profit (loss), for instance, can relate to ongoing operations only, but can also include one-off transactions such as acquiring a firm or changing a firm's reserve position. Usually Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) is focused on.

cycle implies a long-term perspective. Moreover, this manner of managing products and materials in ongoing cycles implies a decrease in resource depletion hence a decreasing environmental impact.[11] Exactly these two benefits of circular business – (1) taking a long-term perspective and (2) including external benefits into account in production processes hence into the price – are also visible in their accounting structures and are currently not well perceived by financiers. The reason for this is that when compared to reports from linear companies, the reports of circular businesses will show additional burdens due to holding on to products and materials for a longer time span and performing circular activities that may yield return on investment only in the long run. Moreover, CBMs activities that generate external benefits can entail extra costs that appear in the financial statements of the company.

Future financial results of CBMs are uncertain because they have strategies and revenue models that go beyond traditionally assumed time horizons and their control over products and materials. Because of their novelty, there are no long-term historical data available for CBMs, which makes it difficult for external auditors and financials to assess their performance. Besides this lack of historical data, investment patterns often differ from their linear counterparts, because some CBMs choose to remain owner of, and responsible for, products and materials over a longer period instead of buying materials and selling products following a rapid sequence, as is the characteristic of linear supply chains. Hence, companies with CBMs seem the odd one out when they are benchmarked against their linear counterparts. Why and how financial reporting of CBMs is so different from linear ones will be discussed below.

Asset valuation and depreciation

Composing a balance sheet involves listing all the assets of a company. Assets contain economic value and/or future benefits and can be converted to cash. There are two broad asset categories. (1) Current assets can be converted into cash within one fiscal year. Examples are cash, accounts receivable, and inventory. (2) Fixed assets are used to produce goods and services and have a lifespan of more than one year. Examples are land, buildings, and machinery. Assets are depreciated throughout their useful life, meaning the asset value declines over time. This enables spreading the initial price of the asset over its useful life (i.e., economic lifespan). When an asset is no longer used, it is depreciated to zero, meaning it no longer has value for the company. In a circular economy however, products and materials are managed in ongoing cycles. Therefore, one could argue that in a circular economy we must take a different perspective on depreciation (Korse *et al.*, 2016).

[11] In reality this is more complex. There is a trade-off between reducing resource depletion and increasing logistic movements. We assume that the impact of resource depletion is substantially more severe than the impact from increasing logistics. Moreover, organising logistics in a sustainable manner can further support this argument.

4.2.3. Circular business and financial assessment

Companies need financial capital to start and develop their business. Their financial structure reflects the mix of debt and equity that a company uses to finance its operations. Financial structures differ from company to company and from sector to sector.
To increase the comparability of companies, financial ratios have been developed. Financial ratios are calculated with specific formulas and based on the numerical values taken from the financial statements. They provide a quantitative analysis to assess a company's solvency, liquidity, leverage, growth, margins, profitability, rates of return, valuation, and more. Related ratios, explained in some details below, have been developed over many centuries and are designed to give the capital providers an insight in the risks they are taking with investing in the firm.

Financial ratios

Here the focus lies on three commonly used ratios that will turn out different for linear and circular business models: liquidity, solvency, and profitability.

- The *liquidity ratio* indicates whether a company has sufficient cash in hand to m*eet all* its payment obligations in the short term and is calculated based on cash and cash equivalents and short-term borrowed capital. Quick ratio and current ratio are both indicators for cash flow and liquidity. Quick ratio is defined as the ratio between quickly available or liquid assets and current liabilities. The current ratio measures whether a firm has enough (financial) resources to meet its short-term obligations.
- The *solvency ratio,* which indicates whether a company can repay all its debts if it ceases to exist or goes bankrupt. This ratio looks at the long-term debts and is the ratio of equity capital to loan capital or total assets. An example of a solvency ratio is the Debt-to-Equity (D/E) Ratio.
- *Profitability* ratios are used to assess a business's ability to generate earnings relative to its revenue, operating costs, balance sheet assets, or shareholders' equity over time. The most used ratio is the gross profit ratio. It is the profit a company makes after deducting the costs associated with making and selling its products, or the costs associated with providing its services.

A company that is financially healthy can (1) meet its short-term financial obligations with the liquid assets available to it (e.g., liquidity), (2) pay off its long-term debt (solvency) and (3) is able to generate a profit (profitability). Historical data have been collected over many decades, resulting in clear brackets for ratios for instance mining companies or consumer appliances companies. When a company that has traditionally been a manufacturing company wants to create a CBM and wants to increase its control over its assets (products) for instance in a PaaS model, this impacts the ratios. These ratios will likely fall outside the 'commonly accepted brackets', hence are difficult to accept within the current finance and accounting rules and regulations.

Risk

An important reason for applying the financial ratios is to calculate the risk profile of an organisation, or, if an organisation or investor is engaged in multiple activities, of an investment portfolio. One of the reasons management accounting was introduced is to monitor continuity perspective and therefore indicate the risk profile of a company (the continuity principle) (Vámosi 2000). For investors and other financial stakeholders, the risk that a company will not continue to exist to meet its financial obligations is being assessed by financiers while using the commonly accepted accounting structures. When business models are altered to become more circular, the financial flows of an organisation will change as well (Larrinaga and Garcia-Torea 2021). The above-mentioned ratios will turn out differently in the financial reports of many circular businesses with a CBM. This results in a difficulty to compare these companies with their linear counterparts. From a financier's point of view a company with a CBM is perceived to have a higher risk profile, since the upside benefits are long-term (often beyond financial assessment time horizon) and uncertain (due to the lack of historical data). Such a company and will have to pay higher risk fee for its funding, if able to attract funding at all.

4.2.4. Application of concepts to an illustrative case

Having introduced basic and essential concepts related to accounting and finance for CBMs we can now apply some of these concepts in a fictive case. This fictive case has been created based on the financial models that were developed during the real case trajectories and is a comparison of a linear and a circular scenario. For the sake of simplification and to protect sensitive company specific data the authors have created a dummy model for a sales model (the linear scenario) and a Product-as-a-Service model (the circular scenario) for washing machines.

Illustrative case - Washing machines business model: linear versus circular

For this illustrative case we assume there is a washing machine producer that wants to move from selling the products (i.e., the linear scenario) to providing the washing machines in a PaaS model (i.e., the circular scenario). In the circular scenario, customers will pay a fee for every time they use their washing machine. The financial assumptions were modelled in a simplified balance sheet, income statement and cash flow statement for both scenarios to explain the differences between the two and to pinpoint the challenges to change from a linear to a circular business model.

The company currently sells 5000 washing machines per year for a selling price of € 750 each. These washing machines have a lifespan of approximately 10 years. In the proposed new circular model, Washing-as-a-Service (WaaS), the company will charge the customers for a unit price of € 1.50 per wash, which amounts to a variable fee received by the producer every month. First, the balance sheet of the fictive linear and circular washing machine company is provided in figure 8 (linear) and figure 9 (circular).

Figure 8: Linear scenario balance sheet: selling washing machines for a fixed price (*€)

Balance Sheet (linear)	Year 1
Assets	1.500.000
Machines to produce washing machines	1.000.000
Cash	500.000
Liabilities	1.500.000
Equity	500.000
Debt	1.000.000

Income statement (linear)	Year 1
Turnover	3.750.000
Costs overhead and retail	2.500.000
Depreciation	100.000
Interest	50.000
EBT	1.100.000

Figure 9: Circular scenario balance sheet in year 1: washing-as-a-service (WaaS) (*€)

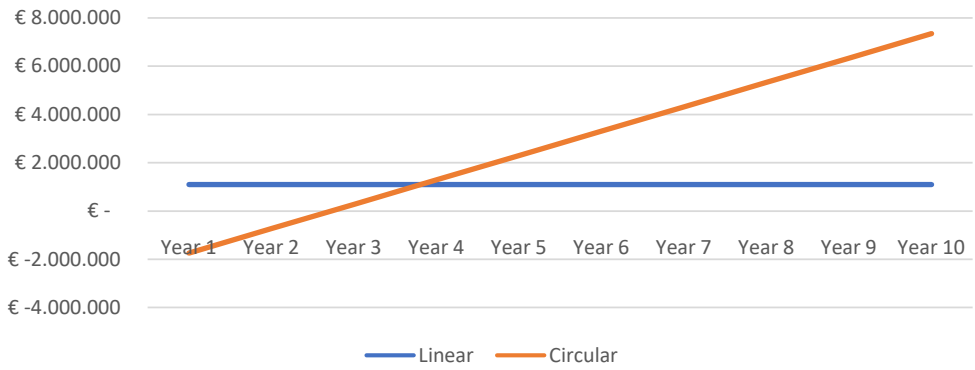
Balance Sheet (PaaS)	Year 1
Assets	3.500.000
Machines to produce washing machines	1.000.000
Rented washing machines	2.500.000
Cash	0
Liabilities	3.500.000
Equity	500.000
Debt	1.000.000
Extra debt	2.000.000

Income statement (PaaS)	Year 1
Turnover	1.260.000
Costs overhead and retail	2.500.000
EBITDA	-1.240.000
Depreciation	350.000
Interest	150.000
EBT	-1.740.000

In the balance sheet, the equipment (machinery) to produce the washing machines are reflected as fixed assets, which will be depreciated to zero within 10 years and fully financed by debt. In the case of a linear business model, the organisation will make a profit every year. Based on the CBM, the asset-base (the amount of assets owned by a company) of the company will be expanded by the amount of washing machines that are being 'serviced' to customers that pay a variable monthly fee (# wash cycles * € 1.50). The circular company will make a yearly loss in the first few years and will need additional working capital to finance the production of the washing machines and to survive as a company in the first few years.

The washing machines, which have been produced by this company, are valued against the cost price on the balance sheet for € 500 each, which results in an amount of 5000 washing machines, hence a valued asset-base of washing machines for € 2,500.000. This extended balance sheet results in a solvency ratio of 14% (equity/total liabilities), which implicates a higher risk profile for this company than the linear business model, that has a solvency ratio of 33%.
The amount of rented washing machines will increase in the years to come, since per year 5000 new units will be produced and provided to customers in a service agreement. In the second year the company provides services of 10,000 units and the third year of 15,000 units. Based on the price per wash of € 1.50 times 14 wash cycles per month the business model will become more interesting over time. Figure 10 shows that the circular scenario starts to generate more revenue that the linear scenario in year 4.

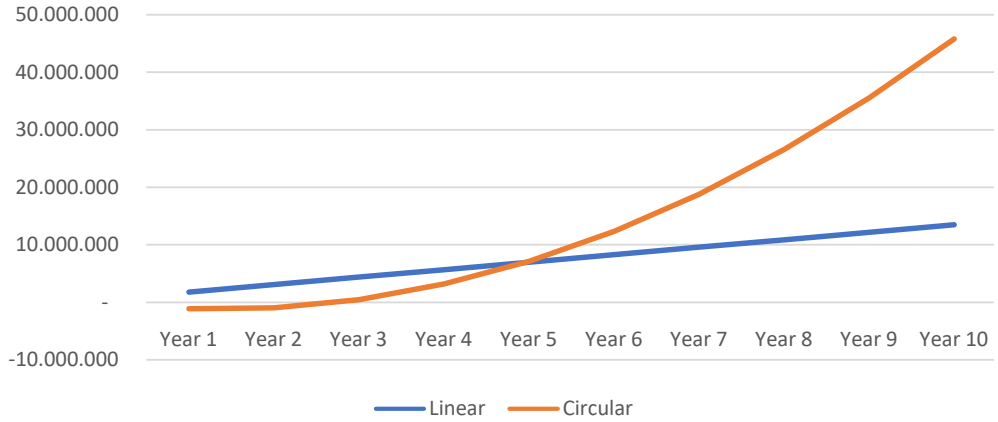
Figure 10: Earnings before tax - linear and circular business model comparison washing machines (*€)



The financial results of the linear sales-business model will be more stable in the short run since sales transactions imply cash coming in quickly and this satisfies the short-term horizon of investors. However, the CBM has more future potential since the amount of assets increases over time and the revenue grows. Moreover, a circular asset base implies longevity of the assets, hence more cash can be generated per asset. The perceived higher risk profile, based on a lower solvency rate and negative income in the first few years marks an investment that results in a higher potential for the longer term. Based on this simplified financial model, a cash flow forecast was generated to explain the financial differences between the linear and circular scenario. To start this CBM, additional cash is necessary to invest in an asset base. When revenue increases, based on a growing number of washing machines, the cash potential will strongly increase as well.[12] Figure 11 shows that the circular scenario will become more financially attractive than the linear scenario after 5 years.

[12] For the simplification of this model, possible maintenance costs or other costs to support this business model are excluded from the financial model assumptions.

Figure 11: Cash forecast linear- circular business models washing machines (*€)



The profitability of the CBM will further increase by closing the loop and re-using old washing machine materials, since this enables to save on raw material costs. Using high quality materials, which will lengthen the technical lifespan of the product, can result in an increased long-term profitability. Adding more services to the washing-as-a-service business model such as including the energy in this service model and therefore incentivising adding energy-reducing techniques to the washing machines, can further strengthen the network of sustainability and circularity businesses, provide incentives for both producers and user and can strengthen relationships between producers and users of the washing machines.

Financiers who were asked to invest in such a circular scenario were focussed on the solvency ratio which was 33% in a linear and 14% in a circular business case, which makes the linear case more attractive from a solvency point of view. Moreover, in the years 1 to 5, the circular business case requires more cash, and the cumulative earnings will be higher in the linear business case. However, in the long run, the circular business case yields higher cumulative earnings.

This section starts with an introduction of the three empirical cases that were analysed. The case introduction is followed by the analysis, supported with anecdotal examples of the difficulties these CBMs encountered regarding accounting and convincing financiers to invest.

4.3. Key accounting and finance challenges for CBMs

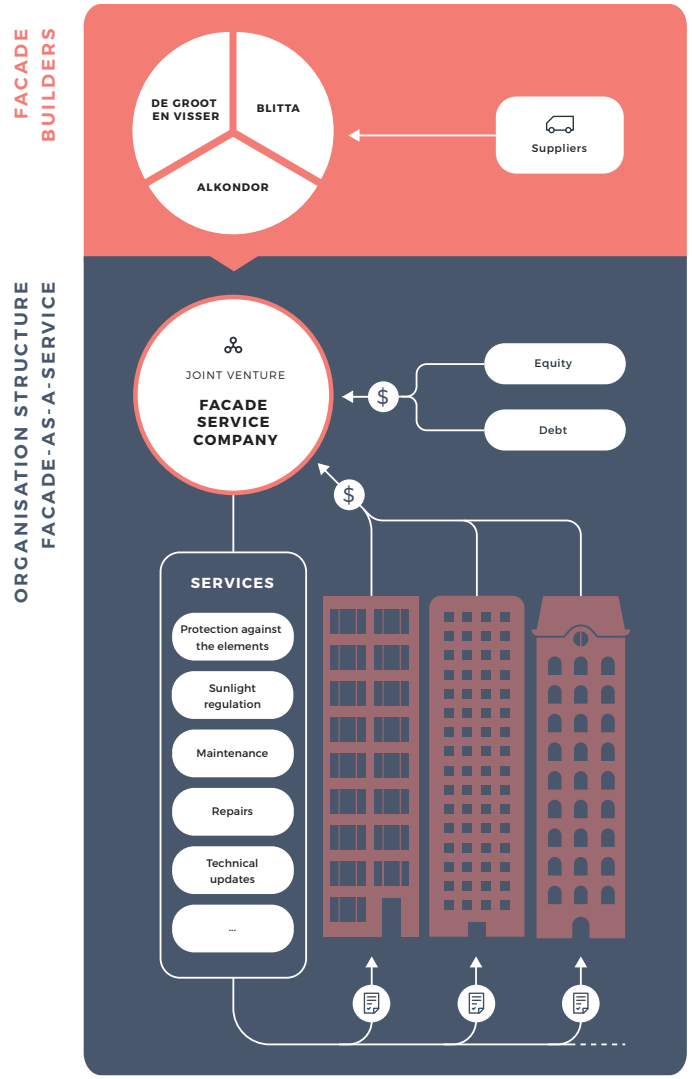
Case A - Road-as-a-Service
The Road-as-a-Service case revolved around the idea to (1) create a circular road and (2) exploit this road as a service. The two main parties involved were a road building company (RBC) and a regional government (RG). The RBC has been experimenting with

reusing materials from their old roads into new roads. This has resulted in a more sustainable road that can be used longer and can be taken apart to be reused. Under certain circumstances the circular road could be demounted completely to be installed elsewhere. The RBC wants to explore the possibility of changing from a 'sales' revenue model to a 'Product-as-a-Service' revenue model. This implies that, instead of selling the road to the RG, the RBC stays owner of the road and remains responsible for the quality and safety. The RBC must maintain the road optimal condition through monitoring, maintenance, and repair activities. The RG does not buy the road from the RBC, but instead pays a periodic fee for the services of the RBC (i.e., access to a road that is maintained to meet the standards of Dutch public roads). In this case we focussed on the financial reality (i.e., accounting) and financeability (i.e., the ease of attracting funding) of a PaaS business model.

Case B - Facades-as-a-Service

The Facades-as-a-Service case revolved around the idea to (1) create a circular facade and (2) exploit this facade as a service. The main parties involved were a facade building company (FBC) and a real estate developer (RED). The FBC has developed a modular facade system that can be demounted and reinstalled. In this case the focus lies on the contractual and financial structuring of a PaaS business model in the built environment. This case shows that the built environment is subject to a legal arrangement that complicates PaaS. In this case, so-called 'accession' was a legal obstacle from real estate law that had to be overcome. Accession is a legal figure in which a smaller, independent physical object becomes part of a larger physical object. The FaaS-case provides a clever contractual solution in the form of combining a rental agreement with a service contract. This provides a way to use contract law to bypass the issue of accession. From a financial perspective however, no mortgage rights can be established in case of a PaaS contract. This results in a mismatch between contractual and financial structuring. Figure 12 shows the structure of the Facades-as-a-Service business model.

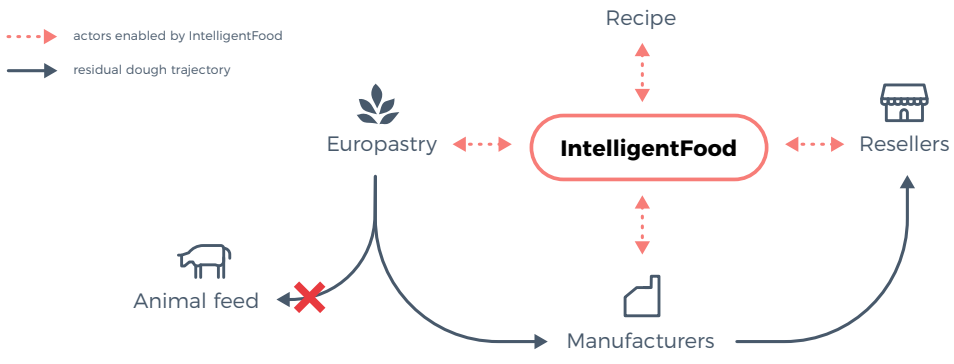
Figure 12: CBM structure of Facades-as-a-Service



Source: The Circular Facade; Building a sustainable financial reality with Facades-as-a-Service (2020)

Case C - Valorising Residual Resources
This case revolved around a company that started a cooperative structure to use and valorise leftover resources from a food manufacturing processes in new food products for human consumption. This enables higher value use of the leftover food that would otherwise be downcycled into animal feed. This company takes the lead in organising a supply chain that brings parties together with the aim of making new products from residual flows earlier in the supply chain. The profit is divided among the parties in the supply chain in proportion to their contributions. Specific challenges of this case were: How do we value the assets of this company, when all parties involved, have a stake in the cooperative and the main resource of the new food product is a waste product from another food production process of one of the parties involved? How do can we create incentives within this cooperative to pursue win-win situations where every collaborating party is rewarded fairly for its contribution? This case led to a vibrant discussion about how to value residual resources, an important topic for circular economy that is based on cycling resources continuously. Various viewpoints were exchanged, leading to a range in the valuation of the residual stream. Figure 13 shows how residual resource flows are managed by the company 'IntelligentFood'.

Figure 13: CBM structure of the Valorising Residual Resources case



Source: Coalition Circular Accounting (2020, c)

Each case provided a different challenge in terms of finance and accounting. In Case A, the challenge was to create incentives for long-term usage of the materials within the CBM. Moreover, there were discussions on how to structure the service contract for the circular road on specific terms that reuse by the road building company would be guaranteed while staying within the brackets of what is acceptable for financiers. Case B zoomed in on the uncertainty in valuation of real estate when this real estate is being developed in by circular principles. The lack of historical data on separating material value from overall real estate value posed a challenge to valuation and to financial decision making. Case C, focussed on the pricing of residual (e.g., waste) streams, and on how to incentivise higher values reuse of residual resources. Creating a secondary market for residual resources resulted in discussions about how to correctly value of these resources. Moreover, this CBM aimed at sharing profits by using a distribution key that was dependent on the value of these resources. A discussion about attributing value to resources before or after the sales of the final product was the result. The idea of sharing risks by dividing revenues in a later stage instead of paying a set price for resources and or services at the outset of a production process is interesting for incentivising circular supply chains yet leads to discussions amongst accountants and financiers. This complexity translated in an additional identified risk.

Accountants, auditors, and other financial professionals are trained to view organisations through the lens of risk and return. The illustrative case in the previous section has shown substantial differences between linear and circular CBMs. The structures and guidelines that financial professionals use for assessing organisations are based on linear principles rather than circular ones. This section will show how linear accounting guidelines are an obstacle for a company to create a CBM.By using exemplary evidence from the three empirical cases (see case boxes in section 1) we illustrate to that the current lenses are not equipped to fully understand and appreciate the value created with CBMs.

Financiers, investors, and shareholders are informed on how a company is performing by a combination of non-financial and financial information. Financial assessment criteria presented in section 2, are the main data that inform financial decision making. Financial ratios of circular businesses differ from their linear counterparts because of their circular business' strategies and activities and their different relationship with products, materials, and the value chain. In CBMs the value of resources is recognised and optimised before, during, and after being used in products.

A company with a CBM aims to continuously reuse materials. For such a company, it is important to keep control over its assets, products, and the embedded materials to ensure the continuity of a circular company. For a circular company, value lies in being less dependent on the availability of raw materials and less affected by price fluctuations of different resources. This goal of controlling the assets shifts the focus from assets to a combination of being in control of the assets and the management (controlling) of the value chain. The quality and continuity of the products and materials that flow back and forth through the value chain define partly the value of individual companies. Moreover, services become a more important part of the value proposition, especially when producers want to retain ownership of their products and make their use available in a PaaS model.

4.3.1 .Balance sheet extension and ratios

In both PaaS cases (Road-as-a-Service and Facades-as-a-Service) the fact that companies wanted to remain owner of their products posed issues. Financial modelling of these cases showed that when a company owns a vast amount of assets this results in an 'asset heavy' balance sheet. Based on the financial statements, financial ratios were calculated and discussed, to assess the financial 'healthiness' of both projects. Perspectives of an accountant, a banker, and a controller (i.e., internal accountant) provide insight in the perceived difficulties.

"Financing is difficult, balance sheet extension has been mentioned in this regard, including ratios that will be completely different [for PaaS]." (Accountant)
"Preferably, I do not want it [the asset] on my balance sheet. But you notice that in the conversations we have with banks and other financiers that they are also struggling with this problem. Suppose 100 million [euro worth of assets] is added onto our balance sheet, then you see that it lowers the [solvency] ratio. Well then it probably wouldn't be financed by a bank". (Controller).
"We are looking into how we, as a bank, can play a role in this and find a solution in the case of balance sheet extension." (Banker).

4.3.2. CBMs and new securities

The revenue model behind a PaaS model is first and foremost about generating income through providing an ongoing service with an asset. It would be simple to compare selling a product with providing it as a service and earning a periodic fee. However, the activities that are taking place at the backend of a PaaS model - e.g., organising take back and logistics, monitoring software systems such as track and trace, maintenance, and repair, allocating products, elements and materials to the right value chain partners in order to add value again by circular cascading activities (refurbish, remanufacture, recycle) before products enter a new use cycle - create the real circular value potential. These elements also add substantial complexity to the system and to the exercise for accountants and financiers to judge its viability. The shift from selling products to PaaS models can be translated into financial structures – changing one single financial transaction (selling a product) into multiple and more frequent transactions (selling a service). The underlying contracts between companies and their customers on the one hand and between companies and their supply chain partners on the other hand can serve as new securities for financiers. These agreements secure ongoing cash flows (client contracts) and a smooth operation of the service (supply chain contracts). To guarantee cash flows with PaaS, the service provider must be sure there will be enough clients to use (and pay for) its service. The FaaS case shows how this uncertainty is perceived by financiers.

"The more certain the cash flow is, the better. We did talk about vacancy [of the apartments], but we also indicated that this risk is very limited. But they [financiers] do take that into account, so you have to show this in your scenarios and in your sensitivity analysis." (Controller of real estate developer)

Another bottleneck occurred relating to securities. Providing facades as a service (FaaS) implied that mortgage rights - a well-known security used in real-estate – could not be established. A lawyer proposed to circumvent the issue altogether by creating an alternative contractual structure: a combination of a rental contract and a service contract. From a financial perspective, the underlying securities of this contractual structure are not mortgage rights, but step in rights (in case of default the bank can step in) and the right of removal (the FaaS company has the right to remove the facade if the user stops paying).

"We developed a rental structure that can be enforced by the owner of the façade. This is based on new case law, and it gives a legally enforceable right to take away the façade in case of non-payment [step in right]. Of course, this is undesirable, but it also gives the opportunity to say to the trustee in case of bankruptcy of the building owner, "are you going to fulfil the obligation? If not, then I will remove it, you are left with a building without facades. That would probably be enough pressure for the curator to continue to pay. Then you would have also secured those cash flows and could base financing on that." (Lawyer)

However, current risk models assume mortgage rights, not step in rights nor the right of removal. The financial sector currently has no framework or reference point for assessing this new contractual structure. This typically results in an increased risk premium, hence higher financing costs if such a CBM succeeds in obtaining financing at al.

"Establishing rights of superficies is from a legal point of view a somewhat less strong position than in case of mortgage rights, so you have to rely mainly on securing the cash flows as a security for the bank" (Banker)

This example shows how circular businesses encounter many challenges due the need to operate within the current linear financial metrics and ruleset. What is seen as a promising legal structure by pioneering businesses and legal experts, can be interpreted as a liability by financiers. It shows how the conditions of the financial system and the (perception) of the risks in new CBMs lead to difficulties in valuing and financing CBMs.

4.3.3. Value, depreciation, and risk allocation

Another challenge in the financial structures and valuation of CBMs is the uncertainty of estimating the value of a product during and after use phases. Roads (RaaS case) and buildings (FaaS case) will last for a long period of time and estimating the future value and application of materials is difficult because they depend on several variables such as future technical developments (e.g., new technologies such as self-driving cars) and geographic developments (e.g., how areas develop over the years). It is important to look at these issues from an accounting and valuation point of view, because in a circular economy being able to retain and control the value of materials and resources is the main goal. Current accounting rules are designed to do the opposite; to depreciate their assets as quickly as possible[13].

The introduction of a circular product may require more preparation, innovation, and development. The purchase price can therefore be higher. On the flip side, being able to reuse components and materials harvested from used roads to compose a new road, production will require fewer virgin resources and potentially lower manufacturing costs if elements can be reused without much processing activities. After every use cycle value is added again by circular activities such as maintenance, refurbishing, and recycling.

During the RaaS case trajectory, it was discussed to stop *depreciation,* and start with the *appreciation* of materials. After all, these materials can be used indefinitely in continuous cycles. Current accounting rules do not allow for the full implementation of this residual

[13] This is supported by current taxation schemes. Hence, tax is an important lever to discuss, yet remains out of scope in this chapter..

value due to insufficient availability of practical examples and historical data. Due to insufficient data about the potential future value of products and materials in a CBM, depreciation stays the norm. This means the actual residual value remains 'nice to heave' at the time of harvest (i.e., when the road is dismounted after let's say 35 years). However, to take this upside value into account in financing CBMs, we need to assume this 'future value' from the start. Several options of how to go about the value throughout the lifespan of the road were discussed.

"You could agree contractually that you have an annual or ten-yearly reassessment of the value of the entire property and then adjust the fee accordingly. We expect that the property will increase in value and thus the needed securities for the financier will decrease [over time]." (Accounting specialist)

Depreciation is still applied to these materialsdue to a lack of experience data of the value of raw materials over a long period and for reasons of prudence. Even if there are second-hand markets and a futures market for steel, concrete, bitumen, wood, and other re-usable materials in construction, valuing these materials 30 years from now is tricky because it needs insight in future economic developments. Moreover, assuming a higher residual value of products and materials in the future entails certain risks because of uncertainty. Contract parties must decide and agree beforehand how they will allocate these risks.

"Both [service provider] and [client] have to think very carefully, do I want certainty or am I also prepared to accept a minus in 30 or 40 years if the value turns out lower than expected. Or do I prefer to pay a little more periodically and have certainty that I do not have to pay extra in 30 or 40 years in case that the value has collapsed. That is what you should take into consideration." (Accounting specialist)

In the Valorising Residual Resources (VRR) case, the aim was to use excess resources (for instance from production processes) in high value products. A resource flow that until recently was marked as a 'waste stream' would become a valuable input for creating new products (in the case the topic was making high quality cookies from left over dough that used to be sold against bargain prices to the animal feed industry).

A cooperative structure has been created to incentivise all stakeholders to collaborate and to benefit from sharing the profits from selling the new product. This inventive cooperative structure poses some challenges for valuing the residual resources (t=1), since their value depends on the profit margin after sales (t=2).

"For accounting we do not have many choices on valuation methods. It is regulated in the law and in accounting standards. Cost price or lower market value is applicable if you talk about inventory. If you receive the dough from the supplier, then there is the discussion on: what is the valuation on the balance sheet. When it is waste there is a valuation of 0, and if you must pay something then it's the cost price. If you feel that we might sell this product with the lower price, then you have a lower market value. This is not the case here I presume. However, the cost price is not known initially because the cost price can be considered as the 40% profit sharing which can be calculated only afterwards. That is a difficulty or challenge in this case study which is very interesting." (Accountant)

Also, in the VRR case there were discussions on how to take the value of the residual resources into account from the outset and not just as a nice to have after the sale of the final products. Being able to make this value explicit in the balance sheet signals a higher value of the business and makes it easier for a company to attract funding.

"The company really wants it [the value of the resources] on the balance sheet or at least somewhere to be visible because it provides a proof of actual value. When it is seen as 0 value it is seen as a waste stream. You want to signal that it does have a value towards financiers and other stakeholders." (Project manager)

This section has shown that CBMs represent possibilities for adding and managing value through circular strategies and activities. The empirical materials from the three cases exposed the mismatch between current finance and accounting practices and rulesets and CBMs. The following section presents solution directions for accounting and finance to better support of CBMs.

4.4. Finance and accounting for CBMs as the new default

A fresh perspective on accounting and finance practices and rulesets is needed to better understand and assess the value and risk profile of companies with a CBM. The current mismatch has profound consequences for adoption and diffusion of CBMs in both new and existing companies and for the wider circular economy transition. We argue that there is a need for an adjustment of the financial frameworks to acknowledge long-term sustainable value created by CBMs. Moreover, it is important to judge all companies with these adjusted frameworks in to create a level playing field.

In section 2 key accounting and finance concepts were presented. Accounting is used to report the financial situation of a company in its financial statements. Financial ratios are calculated based on the financial statements. They enable comparing companies among one another and with historical data of similar companies. Moreover, financiers use these ratios to calculate a companies' risk profile; the likeliness a company will be able to fulfil its short term- and long-term financial responsibilities. Section 3 showed that due to the newness of CBMs, historical data is often not available. Moreover, their tendency to generate value over a longer time horizon, and often by taking increased control (and potentially ownership) of their products and materials causes the financial ratios to be outside the accepted brackets. This results in CBMs being perceived to be more risky than linear BMs, which makes it more difficult and more expensive to finance these CBMs, if possible.

How do we get out of this reinforcing cycle of not funding CBMs due to a lack of track record, which instigates the continuation of the lack of data? The answer lies in assessing the risks of not transitioning to a circular economy.

4.4.1.Mitigating climate risk and raw material risk

Financial professionals assess organisations one dimensional based on financial risk. Taking a long-term perspective, circular economy enables mitigating risks that occur at a different level than at the company level towards considering climate risk and the risk associated with scarcity of materials (Durán-Romero *et al.* 2020). Climate- and resource risks will affect the continuity of businesses. Contributing to the circular strategies and activities can mitigate these risks and can support the long-term continuity of businesses.

Climate risk is increasingly recognised in annual reports but has not yet found its way into the accounting guidelines. Since the year 2000 an increasing number of listed companies have started reporting on their carbon emissions, mostly according to the guidelines of the Greenhouse Gas (GHG) Protocol, with its scope 1,2 and 3. The GHG protocol has become the reporting norm also in the legislation on corporate sustainability reporting and is used by governments to account for carbon emissions on country level. Certain industries have already been subject to carbon pricing, but because of the complex calculations and thresholds, the financial costs of carbon pricing are not immediately recognisable in the financial accounts. The integrated annual reports of listed companies show their emissions, but not the related costs and not the direct and indirect risks related to carbon emissions. That is why in 2015 the Task Force for Climate-related Financial Disclosure (TCFD) has developed a framework for listed companies and financial institutions to disclose their physical and transition risks related to climate change.[14] Research shows that even though carbon accounting is still in its infancy, investors are already making their own assessments of the carbon risks of listed companies and pricing them in (Aswani, Raghunandan, Rajgopal, 2021). Companies that fail to take climate risk into account will likely drop in value when newly announced legislation such as carbon pricing becomes the norm. When this happens, the cost of carbon emission will show up in the financial accounts as a cost (as priced by the emissions trading system; ETS).

Raw material risk. The impending scarcity of raw materials is not yet visible to many companies within the short-term horizon on which they manage their business. However, price volatility has increased over the years and there are prognoses of increasing material scarcity. Resource shortages and increasing prices will create a need to deal with raw materials differently. A company that anticipates this by creating circular strategies and activities that enable ongoing resource cycling will have an important competitive advantage over companies that fail to control their resource streams. These upsides of CBMs and risks of linear BMs are not sufficiently recognised in the accounting guidelines and remain out of scope for financial decision makers. These risks are not yet included in risk assessments, although they threaten the continuity of companies. The *continuity risk* in the longer term means that these risks do need to be clarified. CBMs do so by focusing on the long-term continuity of their own business, by preserving materials, reducing waste and environmental pressure (Gaustad, *et al,* 2018).

[14] https://www.fsb-tcfd.org/.

4.4.2. Rethink depreciation and appreciate residual value

Rethinking depreciation in the circular economy can have an important positive effect on the financial attractiveness of CBMs. When a company owns assets that are no longer (fully) depreciated, this means they will end up having a higher *residual value* when compared to their linear counterparts that are fully depreciated. This is the case because in a CBM products are designed so that they are easy to disassemble (modular), and they consist of durable materials that can be recycled. These products (and parts) are designed to be able to be used in multiple use cycles. A linear product made without these features is less easy to reuse and more likely to break down and be discarded. With its design for many use cycles, the circular product will likely have a higher *residual value* than the linear product. A higher residual value is beneficial to the owner of the product or materials. As explained in section 3, the residual value of products and materials is currently seen as a 'nice to have' at the end of a product lifespan and cannot be taken into account as a real value from the outset of building the circular business case. If the residual value of the product or material can be priced in at the moment the product is created, it will likely have a positive effect on the value proposition of a company: lower costs, higher profits. At the same time the future residual resource can be valued as an asset.

Valuation of materials and products is currently determined based on historical prices and knowledge. Because of physical and transition changes in the economy, these historical data are no longer reliable or sufficient, it would require a review of calculation and valuation models, structures and methodologies currently used financial professionals. At the same time capturing ecological and social value of companies and insight in how companies capture value over different time periods demand changes in risk management. Adapting to or mitigating climate change risks and continuously re-using raw materials would change the risk profile for a company and improve its license to operate and its continuity. A complicating factor that requires further research is the fact that value is determined by supply and demand, hence the existence of a market. When residual material markets are non-existent or supply and demand disconnected, the price of residual materials will be subject to uncertainty. The development of transparent (second-hand) markets is therefore a key leverage point for actual circular value creation and convincing financiers of accepting residual value as a security.

4.4.3. Longevity and increased control over assets as key risk mitigants

Above it was shown that a company that wants to transition towards a CBM in the form of a PaaS model encounters financial obstacles due to the growing amount of assets on the balance sheet. Companies with many assets are considered to be risky, because too much capital is tied up and its cash flow can be a problem. For financiers that falls beyond their commonly accepted brackets.However, if accountants and financiers would also consider the financial risks of the above-mentioned climate-, raw material- and continuity challenges and can assume a higher price and attribute less uncertainty to a future residual value, CBMs are mitigating risks for themselves and their financiers. As we have shown, CBMs are able to put value of reusing products and materials in multiple use cycles and make sure to keep control over their assets.

If we systemically start reusing products and materials and incentivised to produce and manage production in a sustainable way by scarcity and increasingly stringent policy measures, we can expect a higher market value for these products and materials in the future. With new policy measures in the pipeline especially in Europe, slowing, narrowing, and closing the loop will increasingly become cost-effective. Companies that postpone the transition to CBMs will be confronted by extra costs, either through carbon pricing, tax measures, or scarcity. If this trend becomes apparent, companies with a CBM will turn out to be lower risk investments than their linear counterparts.

4.5. Conclusions

CBMs focus on long-term continuity and limit negative environmental impact by optimising product- and material re-use. Externalities are currently not considered in product prices, nor are they visible in the financial statements or risk assessments of a company. We propose accounting and finance practices, and frameworks must be adjusted to correctly value the upsides and risks of CBMs and Linear BMs.

This chapter has shown that the financial and accounting frameworks have been developed for an economic system, where depreciation is a leading principle and investments decisions are based on short term financial profit rather than long term value for society. Investors and financiers have become better in assessing environmental, social and governance performance of companies and have started changing their investment strategy and policy. But their assessments are still an overlay on old fashioned financial assessments and fail to understand and value CBMs. The short-term focus and perceived higher risk profiles impedes a rapid adoption of CBMs.

The current system of depreciation and reduced *residual value* is not reflecting the value of products and materials in CBMs that are maintained at their highest possible level throughout their lifespan. Depreciation costs reflect the diminishing value of materials and reduces profitability of the business case. A key element in CE is striving to keep the materials in a continuous loop of usage by recognising their usability and value. CE would require an alternative accounting standard for the value of materials used in a circular business model.

CBMs create new financial structures in balance sheet, cash flow and profit and loss statements. In the current system, this leads to a higher risk perception of financiers and investors, based on their interpretation of the financial ratios. At the same time, these new CBMs enable incorporating *climate change risks* and *raw material risks* which are currently missing in the in linear business models. Depending on the trade-off between the different risks, CBMs could therefore be perceived as lower-risk business models. New standards for accounting structures and financial ratios will be necessary to reframe and recalculate the risks and truly appreciate the long-term value of CBMs.

Understanding all aspects of CBMs and how value is created is key. Moreover, this requires multiple disciplines to tune in to one another's' value proposition and collaborate in developing circular activities that optimise and strengthen the value chain. Understanding the potential upsides of CBMs regarding climate- and raw material risk mitigation and increased residual value of products and materials is key for accountants to include this information into the financial statements and for financiers to recalibrate financial ratios and consecutive financial decision making.

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05.

Understanding the role of institutional intermediaries in the emergence of the circular economy as an institutional field

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Abstract

This chapter investigates the process of institutional field formation of CE, by looking at how rule making and taking are emerging in contracts supporting circular business models. In this process, we particularly focus on the role of institutional intermediaries and take the literature about institutional field formation for theoretical guidance (Hardy and Maguire, 2017; Zietzma *et al.*, 2017). Conceptualizing CE as a new institutional field, particularly expands our knowledge on the role of intermediaries facilitating the institutional change processes supporting circular business models. We used an inductive case study approach consisting of three strategic projects and documentary data of the institutional intermediary 'Circle Economy'. The results show how emerging circular value proposition elements are anchored in institutional intermediary positions and consolidated in institutional settings.

5.1. Introduction

Circular Economy (CE) is an emerging framework aiming to tackle 21st century socio-ecological crises (Korhonen *et al.*, 2018; Skene, 2018, Borrello *et al.*, 2020). Industrial ecology, performance economy, cradle-to-cradle design, complex adaptive system thinking, and biomimicry, are often identified as the intellectual and conceptual foundations of CE (Webster, 2013; Stahel, 2016; Geissdoerfer *et al.*, 2017; Borrello *et al.*, 2020). It is around the early 2010s that CE has been identified as a context in which novel principles could be 'translated' into business and policy-makers practices (Ghisellini *et al.*, 2016; Lieder and Rashid, 2016). Previously, CE had appeared mostly as a fragmented conceptual framework influencing some regional or national strategies, for example in China (Geissdoerfer *et al.*, 2017; Hu *et al.*, 2018). During the last decade, CE has instead emerged as an agenda to scale up environmental practices through 'closed loop strategies', from product and firm level to supply chain and industry level (Ghisellini *et al.*, 2016; Korhonen et al., 2018; Lüdeke-Freund *et al.*, 2019; Borrello *et al.*, 2020). From this perspective, CE aims at redesigning the global economy and recognises the need for disruptive changes at an unprecedented scale (Ferasso *et al.*, 2020; Konietzko *et al.*, 2020).

CE entails profound institutional processes to foster socio-economic transitions (Termeer and Metze, 2019; Flynn and Hacking, 2019), beyond business strategies and practices (Fischer and Pascucci, 2017; Schulz *et al.*, 2019). The formation of a novel institutional field, where business activities are possible, is triggered only when formal institutions support informal practices shaping the alignment between business-driven strategies and novel regulatory frameworks (Lawrence *et al.*, 2002; Abbott *et al.*, 2017). For instance, circular business practices, typically embedded in so called circular business models (Bocken *et al.*, 2016; Geissdoerfer *et al.*, 2018; Lüdeke-Freund *et al.*, 2019) need a legal system and a regulatory regime to emerge and be established in order to allow these practices to move from niche innovation contexts to a larger societal level (Termeer and Metze, 2019; Konietzko *et al.*, 2020).

This chapter investigates the process of institutional field formation of CE, by looking at how rule making and taking emerge in 'contracts' necessarily for supporting circular business. In this process, we particularly focus on the role of institutional intermediaries, and thus use the literature on institutional field formation and the role of institutional intermediarie in that process for theoretical guidance (Hardy and Maguire, 2017; Zietzma *et al.*, 2017). Conceptualising CE as a new institutional field particularly expands our knowledge on the role of intermediaries facilitating the institutional change processes supporting circular business models.

The chapter unfolds as follows. Firstly, section 2 sets out how we can understand- and experiment with institutions in the circular economy. Section 3 sets forth the methodological design of this chapter. In section 4, we provide the empirical findings of our case study. Section 5 discusses the implications of our findings and theorizes about the relation between circular value proposition elements and institutional settings through institutional intermediary processes.

5.2. Experimenting with institutions In Circular Economy

Scholars have suggested looking at CE not as the emergence of dispersed business practices or strategies, but as a field of institutional experimentation (Schulz *et al.*, 2019; Borrello *et al.*, 2020). CE currently appears as "a collection of diverse, interdependent organisations that participate in a common meaning system" (Scott 2014: 106), thus, in our view, forming a nascent institutional field (Zietsma *et al.*, 2017). Following this approach, we investigate how intermediaries have led to the identification and definition of rules and norms, defining key patterns towards the emergence of CE as a novel institutional field. The presence of intermediary organisations, such as network facilitators and policy advocates, is abundantly discussed in the CE empirical literature (Lüdeke-Freund *et al.*, 2019). The EMF, Circle Economy, Metabolic, Accenture, KPMG, the Circular Economy Club, the Cradle to Cradle Products Innovation Institute, amongst many others, are reported cases of prominent service and network providers for businesses, policy makers and entrepreneurs engaging with principles and practices of CE (Fischer and Pascucci, 2017; Lüdeke-Freund *et al.*, 2019). These intermediaries have been able to position themselves in between rule makers, like the EU commission, the World Economic Forum, and other national or regional governments, and rule takers, like companies, local communities, and citizens. At the same time they have also lobbied and influenced the definition of public policies and initiatives, for example to support the experimentation and transition into CE, both at local and global levels (Lüdeke-Freund *et al.*, 2019; Borrello *et al.*, 2020). In our view, their intense and persistent intermediary role has made these organisations key actors in the definition and formation of CE as an institutional field. Not without ambiguities (Corvellec *et al.*, 2020), these intermediaries have enacted the role of institutional entrepreneurs, thus orchestrating actions, mobilising resources, and constituencies, in order to define a dominant logic and set of practices within the field (Pacheco *et al.*, 2010). The role of intermediary organisations in the field formation and structuration is widely recognised (Purdy, and Gray, 2009; Polzin *et al,* 2016; Eberhart and Eesley, 2018). Intermediary practices and logics are adopted by institutional entrepreneurs to facilitate codification, formalization and eventually isomorphism characterizing emerging fields (Hardy and Maguire, 2017). Extant literature highlights that the role of regulatory intermediaries is particularly critical in the emergence stage of an institutional field, for example by shaping key relations between 'rule makers' and 'rule takers' (Abbott *et al.*, 2017).

Several intermediaries have emerged in the CE landscape with various functions and roles. As said, the EMF has played a decisive role in framing and positioning the CE in the early 2010s (EMF, 2012; Webster, 2013). Through a series of reports and the set-up of the CE100 network, the EMF has been able to quickly influence the business and regulatory landscape and create a global agenda on CE (EMF, 2015). In parallel, other intermediary organisations have developed networks of collaboration using CE as a framework to design and implement feasible transformational projects at regional and national level. Circle Economy, for instance, has developed an extended network of collaborative projects, connecting start-ups, established businesses, municipalities and public agencies operating in different sectors and regions (Bauwens, *et al.*, 2020). While all these organisations have had a key role to define principles and practices of CE, so far, limited research has been dedicated to the role of these intermediaries in the making

of the CE institutional field. What is particularly missing is a conceptual understanding of how intermediaries have been able to influence the definition of rules, for example influencing the identification of CE principles, legal structures and policy measures, and their 'translation' into feasible and implementable circular business models.

5.3. Methodological design

5.3.1. Research context

In line with an inductive focus, this chapter theorises about the emergence and formation of CE as institutional field and focuses on the role of institutional intermediaries through a qualitative case study approach. We define an institutional intermediary as any 'actor that acts directly or indirectly in conjunction with a regulator to affect the behaviour of a target' (Abbott *et al.*, 2017: 19). The intermediary is a go-between, whose presence necessarily makes some aspects of regulation indirect, as the intermediary stands between the regulator and its target' (Abbott *et al.*, 2017: 19). We selected Circle Economy (Circle) as the pivotal case of an institutional intermediary to investigate. Circle, as social enterprise based in Amsterdam (NL), has been one of the most active intermediary organisations since the early 2010s, particularly shaping the relation between 'rule makers' and 'rule takers' in the Netherlands and European Union to set a CE agenda. Since its foundation, Circle has focused on 'accelerating practical and scalable implementation of the Circular Economy', thus facilitating the establishment and development of a community of practitioners, businesses, and institutions (Circle Economy, 2020). Circle has been contributing to the development of several projects and programmes, linking public organisations with businesses and entrepreneurs in all the key sectors of the economy, and particularly in finance, built environment, infrastructure, textile/fashion, and waste management sectors (Circle Economy, 2020). Our case study focuses particularly on three strategic projects coordinated by Circle during the last 4 years, namely Fairphone-as-a-Service (FaaS), Building Value (BV), and Coalition Circular Accounting Road-as-a-Service (CCA), spanning from 2017 until 2020. These projects were all characterised by an interactive format in which a tangible circular business case was the focal point. Workshops and thematic deep dives were organised around certain topics and specific expertise - for instance from lawyers, taxation experts, financiers, and accountants - was invited around the table to discuss opportunities and challenges, professional rules and standards and the need for developing new rules and standards to support circular business models. Thus, the case study – bearing in mind that these projects have been pioneering activities in the CE landscape in the EU – provides a paradigmatic example of the characteristics of intermediary organisations and offers a particular focus on the changes of CE as an emerging institutional landscape over the past 4 years.

5.3.2. Data collection and analysis

To carry out the case study informing our theory-building from cases approach (Eisenhardt and Graebner, 2007; Eisenhardt and Ott, 2017), data were collected from a wide range of documentary data and triangulated with meeting notes and archival information recorded by Circle Economy programme managers (please see table 9). More specifically, we have selected and triangulated secondary data derived by published reports and online documents and platforms, with data stemming from internal discussions and processes, thus delving into a rich set of information and sources.

Table 9. Overview of data sources

Category	Data source	#Entries
Circle Economy Published Reports		**51**
	Business & Insights Reports	13
	Brands & Design Reports	1
	Built Environment Reports	4
	Cities & Regions Reports	11
	Finance, Legal & Accounting Reports	10
	Jobs & Skills Reports	4
	Textiles Reports	8
Project sessions (transcripts)		**40**
	Community of Practice Fairphone-as-a-Service	21
	Community of Practice Building Value	15
	Coalition Circular Accounting Road-as-a-Service	4
Project archival files		**28**
	Circular Service Contract iterations	3
	Powerpoint presentations (internal)	20
	Powerpoint presentations (external)	5
Knowledge Hub documents		**489**
	Regulatory and Legislative instruments	138
	Economic instruments	162
	Soft Instruments	189
Total data sources		**608**

The use of case studies for theory development is appropriate when new phenomena, in this case intermediary processes influencing the emergence and formation of CE as institutional field, have yet to be fully understood and conceptualized (Eisenhardt and Ott, 2017). Given the nature of inductive research, this study entailed an iterative process from data to theory and purposively selected one case of intermediary organization

(Circle Economy) to provide evidence of the conceptual categories emerging from the research questions (Eisenhardt and Graebner, 2007). The research team focused on three projects in which intermediary activities appeared to be relevant, rich and widely reported, integrating primary and secondary data, and namely: (i) Community of Practice Fairphone-as-a-Service; (ii) Community of Practice Building Value and the (iii) Coalition Circular Accounting Road-as-a-Service. Thus, an iterative and inductive process of data collection and analysis was undertaken. After collection of reports and meeting notes, the first author coded the contents of the documents for the qualitative analysis. First, all data were summarised, categorized and coded to delineate the different institutional and intermediary processes in the three projects, following a data-driven categorization. Then, second author followed in the coding process, and through authors' interpretation of emerging patterns from the empirical data, inductively defined suitable theory-driven themes (Eisenhardt and Graebner, 2007). The entire coding process, from first to second round was performed manually and by sharing and categorising quotes and notes from documents and interviews. At the end of the analytical coding process, we identified and discussed emerging patterns of intermediation in the CE institutional formation process (see Figure 1 in section 6).

5.4. Findings

In this section, we present the main findings of our analysis. More specifically, in section 4.1 we present how circular value proposition elements (e.g. residual value, time horizon, collaboration) and professional regulatory principles (i.e. contracting, accounting practices, financing considerations), ostensibly at odds with one another, are reconciled to make CE business activities feasible. Based on this evidence and analysis, in section 4.2., we present and discuss findings on the role of the intermediary in the process of rulemaking and taking, and the formation of a regulatory landscape for CE.

5.4.1. Co-designing circular business models as institutional process

Theme 1: Emergence of circular value proposition elements

In the studied CE projects, there has always been a tension around the understanding of what circular economy actually is. Even at the end of projects, stakeholders have been rephrasing this or asking again the question of 'what makes this a circular product'. For instance, in the project of circular business models for infrastructural development such as road construction (CCA), an accountant posed this question at the end of the project:

"But how do we define circularity. What is a circular road? When is it circular? If it lasts ten years longer, will it be circular?" [...] "And what percentage is circular? 100% circular means that you will pick up that road after forty years, including the sand bed underneath and completely built it up again somewhere else. And then, you are only talking about material. I think that should still be possible." [...] "So no addition of raw materials to put it that way. Is that circular?" (Controller at road company, CCA)

The question of what is circular was not definitively answered by participants, but linked to the emergence of circular value proposition elements. These elements need to be translated into terms that commercial partners could work with. For instance, the topics longevity and cascading activities (i.e. reuse, repair, refurbish, remanufacture, recycle) play a critical role in building circular value propositions. The phrase below shows how the road construction company comprehends reusing asphalt, the top layer of the road. Moreover, the company representative links this issue to the concept of economic residual value. In other words, he assumes a certain value at the end of the user life of the road (e.g. longevity vs cascading).

"The incentive we built in is the residual value. [...] We want to be able to throw this asphalt back into the mill after ten years. Then we will create more sustainable asphalt and instead of just the top layer, we will do it all [e.g. the whole road]. The focus becomes different." (Road company, CCA)

Similarly, in the 'Building Value' project (BV), parties have been discussing the value propositions entailing a circular building. One point of view is that a building should be made of *circular raw materials,* i.e. materials that can be reused after the user life of the building. Another point of view is to assume the use of elements and materials harvested from neighbouring buildings that are planned to be demolished, as a value proposition to prioritize the reuse of existing materials above using new materials. This existing building stock could inform architects in their new building designs.

These examples reveal the complexities entangled in the definition of value propositions in the formation of a circular business model, due to ambiguity of the CE terminology. For instance, there are trade-offs between several options that are determined by assumptions and choices about short term versus long term, materials used, collaboration versus dependency. Our cases are all indicating conversations and negotiations about what circularity means and entails in specific circumstances and what choices have to be made to build the circular value proposition for each specific circular business model. Therefore, how to 'translate' terms and definitions of key value propositions, such as longevity and cascading, as elements of circular business models seems to be one of the key steps emerging from our analysis.

Theme 2: Anchoring circular value propositions to institutional settings

The second theme that emerged in our analysis refers to the anchoring of the circular value propositions to institutional settings. Our findings indicate that defining and enforcing rules through contractual agreements has been particularly relevant to develop a circular business model. Contracts have evolved over years to enable business activities. In a linear economy approach contracts take a standard shape using consolidated legal principles. Instead, parties involved in the formation of a circular business model often need to develop new template contracts. Template contracts usually are developed over time to balance interests and adhere to important societal values, captured in regulatory and legal frameworks. Commercial projects entailing the development of a circular business model also need to adhere to rules and values, but without the availability of underlying regulatory frameworks. Therefore, the definition of 'template contracts' as a new and emerging regulatory framework needs to be co-developed during the formation of circular business models. For instance, during a project to develop a new value

proposition for Fairphone, called Fairphone-as-a-Service (FaaS), a new contract template was developed. This would entail Fairphone to offer the functionality of smartphone devices to businesses (i.e. companies that provide their employees with a work phone). Part of this project was to set up a contractual agreement between Fairphone and its client. The process of moving from a first idea of what this service entails, to a draft 'Service Level Agreement', to the final contract template has shown some pivotal elements to be included in contracts that aim to structure agreements between parties that have circular principles at their core purpose. The contractual design and enforcement process used a pattern of enactments that we can summarise as follows: i) first, actors put *circular principles at the core of the value proposition;* ii) then they focused on *defining ownership & implications;* iii) then they engaged in the *definition of contractual term and termination*. Finally, iv) they anchored *circular value propositions to wider institutional settings*. We present and briefly discuss findings of these four enactments below.

Stage 1. Putting circular principles at the core of the value proposition

The process of shaping the contract evolved in several iterative rounds. During the FaaS project, particularly, Circle Economy was facilitating the process of anchoring circular value propositions and core contractual elements for the first time. Part of this exercise was to create a contract template that would be published open source, so it could be used by any businesses interested in Product-as-a-Service value propositions. In order to guide others to use this template, it included notes for the reader to specify the purpose of newly added clauses that would embody the circular aspects of the contract. These clarifications were added after several conversations about the purpose of a circular Product-as-a-Service value proposition. Namely, Product-as-a-Service in itself is not circular, it can be done with an unsustainable product in a rent-based value proposition. Therefore, the interested parties were very keen to clarify their circular intentions through putting them explicitly at the core of the contract template by stating:

> *'1/ [...] the background of the circular service contract (from linear sale to circular service model);*
> *2/[...] the circular objectives that are being pursued with this circular service contract (to ensure the re-use and/or recycling of the respective product at the end of its technical or economic life or that of any of its components and that the responsibility for that re-use and recycling remains with the producer and is not, upon the sale of the product, passed on to the end consumer who is least equipped to know what to do with the product at the end of such technical or economic life and/or to reduce the energy consumption of the respective product over its lifecycle since the producer is best equipped to achieve that);*
> *3/ [...] the background of the parties and their interest in this circular service contract. These considerations give 'colour' to the contract and can assist with the explanation of the further contractual provisions." (FaaS, Circular Service Contract Template, final version)*

Stage 2. Defining ownership & implications

A key element in the design and enforcement of contracts for circular business model propositions has been the *definition of ownership issues*. For example, an essential element for Fairphone was to remain the owner of the smartphone devices. In this way, Fairphone would have full control over its devices and would receive them back after use in order to be reused, refurbished or recycled. In order to ensure circularity, and in support of the product-as-a-service concept, consumers should not own the device but pay for the service it provides. Whereas this was not formulated explicitly in earlier iterations of the agreement, the final contract template encompasses the following clause about ownership:

"The legal title to the Product(s) shall remain with the Service Provider and shall at no time pass to the Customer." (FaaS, Circular Service Contract template, final version)

This implies ownership remains with the service provider. Many contracts in similar circular 'Product-as-a-Service' projects contain a differently formulated ownership clause, similar to the established way of formulating lease contracts. These contracts typically contain a clause about potential transfer of ownership when the contract is terminated.

Stage 3. Defining contractual term and termination conditions

The other aspect emerging from the analysis of template contract definition is the pivotal role of term and termination conditions. During the process of developing the contract template, the contract term has changed from one year to an open-ended contract. Standard contracts, used in 'linear' business models, necessarily have a fixed term, while circular economy by definition is supposed to be an ongoing process. Formulating a contract with an 'open end' incentivizes ongoing services and optimal circularity, instead of steering to the end of a contract and therefore the end of the product lifespan. These considerations led to the definition of two alternative contractual termination definitions:

"This Agreement shall be effective from the Effective Date and shall be valid for a period of one (1) year, and can be extended for consecutive periods of one (1) year." (FaaS, Circular Service Contract template, version 1)
as opposed to:

"This Contract shall be effective from the date of this Contract and shall be valid for an indefinite period of time." (FaaS, Circular Service Contract template, final version)

In an open-ended contract, the service is the focal point. How this service is provided, with what specific asset or combination of assets and activities (e.g. a product and maintenance and repair services), is subordinate to this. However, the backside of this open-ended contract period was that *termination was not set at a specific date*. Moreover, parties should be able to terminate the contract flexibly:

"Each Party shall have the right, without prejudice to its other rights or remedies, to terminate the Contract with immediate effect by giving a [...] days' written notice to the other Party." (FaaS, Circular Service Contract template, final version)

An additional clause was inserted about termination of the contract, for example in case the customer would not be satisfied with the services. A provision on termination should be specified in order to cover value at risk in case of termination. Since 'value at risk' directly relates to the possibility to finance aspects of a circular value proposition, such a clause is needed. Without it, a CE project would not be able to get finance.

Step 4: Anchoring circular value propositions to wider institutional settings

The final step emerging from our analysis refers to the anchoring of circular value propositionsto a wider set of institutional elements, going beyond the contractual and inter-organisational level. Particularly, these elements related to accounting and financial issues. From an accounting perspective, a template contract, serving a circular business proposition, implies transfer of risk and reward and therefore resembles a sale. In the Road-as-a-Service project, initially the contract was phrased for the linear economy, resulting in a regular leasing agreement (i.e. sale). This implied that the road company would not remain the owner of the road, hence losing the right of re-using the materials after its use phase, and the incentive to build and maintain the road as sustainably as possible. We report the conversation below as informative of the process just described:

(Accountant): *"The contract is essential. If it becomes clear that the province is likely to take over the road in ten years from now, this implies a 'sale'. You [road company] have a long-term claim on the province that is being paid over a ten-year period. Then you [road company] actually have no road on your balance sheet, and also no raw materials."*
(Accountant,): *"Accounting follows risk and reward and what you agree with each other is very decisive, and this is actually a sales contract."*
(Regional government): *"Yes, that is exactly what I thought. It is just like a lease structure. You just get a kind of maintenance costs that you then settle on a monthly basis. So in that sense you are getting close to the way it is now."*
(Road company): *"Yes, they actually just postpone that [sale] for 30 years. That is then all you achieve."*
(Accountant): *But should we take this as a starting point or should we say "no, the idea was to have it on the road company balance sheet?"*
(Accountant): *"The advice is actually to try to build the contract up in such a way that it will be a rental contract."* (CCA)

Tensions can also arise in new ownership structures when agreements involve more than two parties, and risks and rewards are shared in new ways. We report the following key conversation to support this finding:

(Banker): *"If you look at it from a financing perspective, then I look at the contracts, which parties are involved, where lies the ownership, how is it shifting, and how are cash flows generated? This involves several parties and multiple ownership options and thus also multiple benefit trackers and therefore multiple cash flows. So your point is quite right to try and understand what the risks and rewards are and whether they are distributed evenly between several parties."*
(Accountant): *"And I find those risks and rewards in particular crucial for reporting. Do you see it in the financial statements?"*

(Banker): *"I also understand that it is sometimes very opaque because current standards do not assume multiparty agreements."*
(Accountant): *"And maybe those risks and rewards are shared."*
(Banker): *"In fact, I think from a circular perspective that is precisely the incentive."*
(Accountant): *"That is actually..., indeed you say that belongs to.. [circular economy], but that does not fit into the.. [current reporting standards] - it is either one or the other, and you ultimately determine the report. It is very interesting, that risk and reward issue is essential."* (CCA)

From a financial perspective, this is complex and difficult to accommodate. However, bankers stated that this sharing of risks and rewards is an important incentive in a circular business model. Therefore, bankers have to broaden their perspective in order to re-interpret risks and rewards in circular business models that are characterised by long term collaboration and interdependence of companies. This entails the emergence and definition of new rules at sectoral level, able to regulate risk and reward across clients and circular business projects.

5.4.2. Orchestrating different institutional intermediary positions

In the previous section circular value propositions have been connected to institutional mechanisms that translate these propositions into contracts and rules for defining ownership, and for allocating risks and rewards, in order to make these projects attractive for financiers and investors. This is not a straightforward process since many iterative steps are made between and across value proposition elements, and legal and regulatory principles. This iterative process is key for the rulemaking and taking, and it is the outcome of the orchestrating actions of Circle as intermediary organization (*Theme 3: Orchestrating different institutional intermediary positions*). Thus, in the following section the role of the intermediary activities in this process is further elaborated. An institutional intermediary organization will be orchestrating three kinds of sequential activities, namely: *framing and goal-making,* followed by *translating,* and finally *structuring.*

Theme 3: Orchestrating different institutional intermediary positions

Phase 1: Framing and goal-making

To begin with, the institutional intermediary needs to make sure that a common purpose is defined in a circular business project. All parties need to understand that a CE goal is pursued, and that pursuing such a goal requires new thinking and clear definitions/ terminology. Keeping stakeholders with different professional backgrounds involved and on the same page demands a constant reframing and translating of the goal and means at hand.

"So it is also a bit of definitions, agreement on what we are actually talking about and clarity in what we are doing." (Project Manager Circle Economy, CCA)

The different options need to be spelled out, including their consequences for the parties involved, and for the common objective of delivering a circular project. Specifically, the core value proposition elements (re-using elements versus new CE elements) and commercial structuring elements (e.g. between CE value proposition elements and contracting, and

ultimately financial viability) need to be jointly framed and clearly phrased. We have defined framing and goal-making the process of sensing and checking with stakeholders their understanding, buying in and fine-tuning of a common purpose in the definition of the circular value propositions.

Phase 2: Translating different institutional narratives

Once the first step of framing collective has resulted in reaching a common aim, the next step entails that the different players agree on how to devise a contract template. However, they 'speak' different institutional narratives, since many are involved in ongoing commercial activities that are shaped by linear economy regulatory regimes. Producing something in the linear economy involves delivering it to the customer, and at that moment, transferring future responsibilities (liabilities) as well. This is not just about a mindset, but it has consequences for financing a project, about how to account for costs, revenues and risks. These aspects need to be reflected in contracts underlying a project. For instance, when a road construction company maintains ownership of a road, rather than selling it to the regional government, it charges a rent to the government. In such circumstances it needs to be clear who takes which risks. Under linear economy assumptions, the owner bares (most of) the risks, but for the road construction company this may be unbearable. In addition, if the road construction company maintains ownership, the assets mentioned on its balance sheet will expand substantially, with consequences for how it may operate as a commercial player, and the pace (and magnitude) of the income stream will change too. In terms of the latter, it matters greatly if a firm is dependent on irregular one-off payments as income, or on a dependent stream of rent-income. Higher predictability of income streams come at the risk of greater challenges in the future, however. More assets on the balance sheet leaves the firm vulnerable to fluctuations in the value of these assets. On the other side, owning a future stock of resources and guaranteeing a stable cash flow have spurred interest of many parties to create these new (circular) business models. The following phrase shows an accountant's perspective on why this is an attractive idea and what the difference between a sale and a service model entails:

(Accountant): *"The main issue is a sale or not? When there is a sale, the road goes to the province and on its balance sheet. Then the road company starts collecting money for the sale. This can be all at once or it can be in instalments. But that's really just paying off a long-term receivable from the sale. Risk and reward have been transferred to the province. That has actually always been the usual practice. But this coalition actually wants to work on Road-as-a-Service, whereby the road company remains the owner of the road, which also remains as a fixed asset on the road company's balance sheet. The province will pay for the use, it is really just rental. And then a very relevant question arises about risk and reward, since the province can say 'I stop the renting'.* (CCA)

Translating institutional narratives is therefore the process of moving back and forth between circular value proposition elements and regulatory principles, and how actors from different backgrounds interpret them, adjusting them to one another. When successful, the result is a common language and understanding that creates the space for a shared institutional narrative.

Phase 3: Supporting the structuring of new rules

As discussed previously, a crucial aspect of circular business models is to understand how to spread risks and rewards over time. Moreover, decision making for circular business models demands banks and financial institutions to rethink some long-established assumptions and practices. The following conversation between bankers and Circle shows how financial rules can be used for ongoing circular contracts. The underlying business cases entail an asset component (for instance a road) with which a cash flow is generated (payment of the service fee). This kind of value proposition demands a fundamentally new interpretation of the financial statements and balance sheet. Moreover, it demands new forms of interaction between different departments of the bank, namely corporate finance and project finance:

(Road company): *"..it is not that important for the project financing, but at a certain point from the corporate finance perspective they say 'wait, your solvency is going to be very low, all of which consists of receivables".*
(Project Manager Circle economy): *"And how should I envision that in a bank?"*
(Banker A): *"You mean who is in charge of the two [i.e. project finance versus corporate finance]?"*
(Project Manager Circle economy): *"Yes exactly. And do they correspond or not?"*
(Banker A): *"Yes absolutely. But who's in charge, it depends... "*
(Banker B): *"Yes in principle, they are two separate parts, so they both look at their own financing and their own merits and of course you talk to each other. But they are not going to coordinate with each other: "hey can you do a bit more debt, then I do a bit less". So in principle it must for both processes simply fit within the project financing policy metrics, and within the corporate financing policy."*
(Project Manager Circle economy): *"Ok, but I'm not very familiar with how these kinds of processes go in a bank, so I'm curious. Do you have a financing request and there is a bit of corporate finance and a bit of project finance, or how does that work?"*
(Banker A): *"No –"*
(Project Manager Circle economy): *"Those are very different types of applications?"*
(Banker B): *"Well on the risk side it all comes down to one. And there has to be a decision. It is somewhat dependent on the amounts. In the end it can coincide with corporate risk or with central risk and then it becomes interesting because then, what are we going to emphasize?"* (CCA)

In this conversation, the intermediary asks bankers about project finance (non-recourse debt) and corporate finance. Since this circular proposition entails an asset with which cash flows are generated, it would fit in a project finance structure. However, keeping ownership of the roads implies a growing balance sheet of the road company. From a corporate finance perspective, this may be problematic, since some financial ratios by which a bank is rated will no longer comply with a business-as-usual balance sheet from a company that sells products instead of holding on to them and providing services through their customers using them. The intermediary asks the bankers whether these two departments in the bank correspond with one another. This is the case, but they do not coordinate and make their own separate decisions – each being held responsible for their own bottom line. This is an interesting finding, since growing balance sheets - i.e. the

financial consequence of Product-as-a-Service business models - will likely be a common issue in circular business models. What the bankers here express provides an indication of how circular business models will be able to expand in the near future: offering low-risk, reliable-income investment opportunities first. Moreover, the clean-cut divide between corporate finance and project finance may impede effective financing of these business models. This means financiers have to shift their perspective by translating this narrative into a new institutional structure.

(Banker) *"Look, I think - and that is progressive for banks to think that way, I have to say - that the crux is in those stimulants towards a circular economy. And then ownership - legal and economic ownership - is going to have a different impact. And that makes it very difficult when I am talking to my constituencies [...], because they only look at those things from a certain framework and then you simplify everything, and you do not manage to open up to change. And I think it is very important for banks to keep an open vision and to fully understand what that [circular] stimulus serves"*. (CCA)

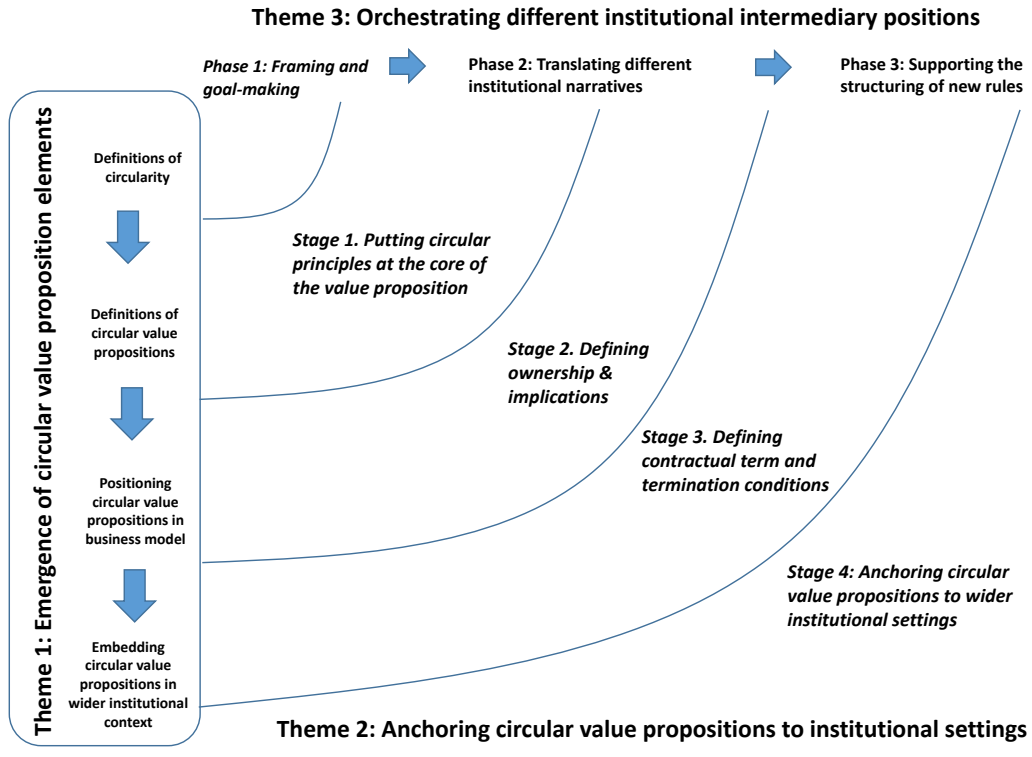
These findings indicate that definition of circular value propositions not only need novel contractual elements to be devised between involved parties, but they also shape new regulatory principles. We define this last activity of the intermediary process as supporting the structuring of new rules.

5.5. Discussion

Building on extant literature on circular business models, and by adopting the perspective of regulatory and institutional intermediary studies, we have been able to analyse the definition and development of value propositions in circular business models as a key institutional process. While existing literature mostly focuses on the taxonomy, categorization, or the role of enablers and barriers in the emergence of circular business models (Bocken *et al.*, 2014; Geissdoerfer *et al.*, 2017; Geissdoerfer *et al.*, 2018), we have used circular business models as a context in which meaningful institutional and regulatory processes are taking place. What our analysis highlights is an order characterizing the process of identification and formation of an institutional landscape in the CE (see Figure 14). In the void of (general) regulatory frameworks, rules and contractual norms, circular business models function as 'islands of rules'.

Organizations participating in projects aiming at implementing circular economy principles have to define and shape the elements of business models in this void, often through the key role of an intermediary organization. In these projects, the identification and definition of the value proposition elements is the first step in the institutional formation process (*Theme 1: Emergence of circular value proposition elements*). Moreover, while discussing the building blocks of business models, all parties are involved in intense interactions in order to make sense of their role and to adopt common terminology that will be translated in propositions and contractual norms (*Theme 2: Anchoring circular value propositions to institutional settings*). Extant literature has already stressed the relevance of framing carefully the concept of CE (Webster, 2013) and highlighted the presence of ambiguities in its definitions (Kirchherr *et al.*, 2017; Corvellec *et al.*, 2020). However, this critique has mostly addressed the need for clarity of definitions from a conceptual or academic standpoint (Morseletto, 2020). Our findings also show that ambiguities in the terminology have a role in the process of definition of the building blocks of circular business models, and even more importantly, they shape the institutional and regulatory formation processes. 'What is circular in this project' is therefore not only an issue of identity or positioning of an organization in the CE landscape, but a fundamental problem in the operationalization of its activities. The definition of a commonly understood terminology is the foundational step to define contractual frameworks, and particularly to adopt a contract template that can be used by all parties in a project and adapted as the business model elements are forged.

Figure 14. Patterns of institutional intermediation in the CE institutional formation process



Our analysis has revealed that this institutional process is in reality mixed, ambiguous and complex. The role of the intermediary is pivotal (*Theme 3: Orchestrating different institutional intermediary positions*) to create an approach that enables disentangling different frames and topics, providing clarity and an overview to the parties involved, often with different backgrounds and interests. Finally, we have identified the need for intermediaries for shaping and codification of new professional and business regulatory principles. All these orchestrating activities are important and have their own challenges.

However, translating seems to be the key essential activity that sets a successful intermediary process. Since this is the needed translation of ideas and concepts into contractual rules and elements. The mutual understanding between the company developing circular value propositions, and the partners and service providers is essential to hook their perspectives into each other. When this intermediation is not happening, the results are 'linear business with a circular touch' as we see often when looking into contracts that do not resemble circularity as intended by the business, or financial structures like lease, that are often used but are not fit for circularity.

Looking at our findings from a broader theoretical perspective, what has emerged follows quite closely the four steps of institutional field formation as identified in literature (Zietsma *et al.*, 2017). First, organisations (e.g. Circle Economy, Fairphone, building contractors) claiming to engage and practice similar principles (e.g. circular activities and value propositions) increasingly interact and form collaborative networks progressively setting boundaries. Second, while these interactions are widespread and predominantly collaborative, some networks become progressively more influential and somehow more dominant than others, indicating the presence of competing coalitions and hierarchical relations between actors (e.g. between partners in the analysed projects and between projects). Third, other complementary and somehow competing sets of knowledge and information emerge, adding to the frames informing actors operating in the field (e.g. consultants, experts and other companies operating in other sectors, such as banking, legal firms, and accounting). This has also implied the emergence of a diverse set of shared principles and practices between actors and networks of actors. Finally, despite the increased competition between actors in the field, we observe the joint effort to define a common identity, for instance looking at core values and worldviews (Davis and Marquis, 2005; Zietsma *et al.*, 2017).

5.6. Conclusions

Our study supports a novel conceptualisation of the role and functions of intermediaries in the institutional formation of rules supporting circular value propositions. This is crucial to understand how the transition into circular economy may look like in the years to come. On the one hand, some institutional intermediaries like Circle Economy, have been able to position themselves in between rule makers, and rule takers, like companies, local communities, and citizens. On the other hand, the same institutional intermediaries have been acting as rule makers, for example by codifying business practices into industry standards (e.g. rules in contracts, business models and inter-firm collaborations), subsequently used by public authorities as template and best practices to formalize rulemaking processes (Fischer and Pascucci, 2017). Sometimes, intermediaries have been identified directly by rule makers as 'arm-length organisations' to experiment new standards, supply chain and contractual arrangements, ownership and property right regimes (Domenech and Bahn-Walkowiak, 2019).

Based on our findings, the formation of CE as a novel institutional field seems highly dependent on how rulemaking and taking processes to support circular business models will be able to anchor with existing regulatory frameworks. While these processes have been mostly defined through the interaction of private and public actors, the definition of a common set of rules is still lacking (Schulz *et al.*, 2019). For instance, clear definitions of what is considered a 'circular practice', or the creation of industry standards, the definition of inter-organisational bodies to represent the interest of 'circular businesses', and more in general an agreed set of regulatory instances defining, supporting and limiting the organisational boundaries of actors operating in the CE domain, have not emerged fully (Flynn and Hacking, 2019). Instead, rulemaking and taking in the CE seem still characterised by a high level of ambiguity and complexity (Corvellec *et al.*, 2020; Cainelli *et al,* 2020). As highlighted by Scott (2014), this might indicate the still nascent nature of CE as institutional field, where processes of organisational standardization and homologation, something we can define as isomorphic pressures (DiMaggio and Powell, 1993), are still in the making. As an emergent institutional field, CE is influenced by multiple dynamics: on one hand, CE is driven by practitioners introducing new regulations and norms at business and supply chain level in institutional voids (Fischer and Pascucci, 2017). At the same time, CE is driven by large public and private organisations introducing regulations and norms at industry, region or country level (Lieder and Rashid, 2016; Hu *et al.*, 2018). In both contexts, rulemaking and taking processes, the role of institutional intermediaries, organisations operating in between institutional levels or contexts, seem to be key in the emergence of CE as a novel institutional field.

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06.

Conclusion Chapter

This dissertation is embedded in one of the major themes of our time: a needed shift to an economy that is sustainable in the long run and functions within our planetary boundaries (Brundtland, 1987; IPCC, 2014, 2021). We are not making sufficient progress in becoming climate neutral (IPCC, 2021). Our current economic rationale seems incapable of unifying economic and environmental activities in a meaningful way. The transition to a circular economy is proposed as an important part of the solution to this paradox. A circular economy is restorative by intention and design (Ellen MacArthur Foundation, 2012) and has rapidly become a leading sustainability paradigm (Geissdoerfer *et al.*, 2017). In a circular economy, businesses are the key actors. Businesses that create CBMs in CBMI processes create a value proposition and design business processes based on circular economy principles (Linder & Williander, 2017; Lüdeke-Freund *et al.*, 2019). However, implementing CE principles in new CBMs has proven challenging (Bocken, 2020; Vermunt *et al.*, 2019).

The chapters in this dissertation show that companies that attempt to implement CBMs often encounter a mismatch between certain key characteristics of CBMs and the institutional setting that is based on a linear economy rationale. Seen through the lens of *institutional analysis,* a multidisciplinary framework focussing on how the "rules of the game" of socioeconomic systems are defined (North, 1990; Ostrom, 1995; Williamson, 2000), we have seen that the current institutional setting reinforces the current economic rationale (i.e., take, make, use, waste) (Fischer & Pascucci, 2017). It favours incumbent linear logics and business models, while hampering future circular ones. It has also become clear that especially more radical CBMs, such as PaaS, encounter challenges. Considering the interplay between businesses engaging in CBM innovation, the way they deal with their institutional setting and how they, together with stakeholders and professionals, seek a fit with current institutions while at the same time shaping new ones has been at the centre of this dissertation. Moreover, enabling organisations or *institutional intermediaries* play an important role in guiding CBMI processes, functioning as translators and brokers between circular businesses on the one hand and regulators and regulatory frameworks on the other hand. Together these actors engage in the institutionalisation of new agreements and rules towards a system that enables and ultimately reinforces a circular economic rationale.

In the following section the main outcomes of four chapters are briefly summarised and related to the overall research question of this dissertation:

To what extent do circular business models fit within the current institutional setting and how does circular business model innovation forge new institutions to drive the circular economy transition?

After answering the research question in the context of the four chapters and its academic implications, managerial implications are provided, followed by directions for future research.

6.1. Summary, contribution, and relevance of chapter two

Institutional incentives in circular economy transition:
The case of material use in the Dutch textile industry

In chapter two we gained insight in circular economy taking shape in new organisational forms of inter-firm collaborations and how this stimulates the emergence of new institutions that enhance sustainability. The chapter proposes an institutional perspective into the circular economy transition that is currently lacking. An institutional perspective can substantially improve our understanding of the complexity of moving towards a circular economy when constrained by an institutional system that is aligned with the status quo of a linear economy. The formulated research question of this chapter is *how requirements for transitioning to CE create new organisational forms in inter-firm collaborations, and ultimately how they stimulate the emergence of new institutions*.

Empirical evidence, derived from cases in the Dutch textile industry, led to distinguishing two pathways to transition to a circular economy. The first pathway is called the **'status quo' (SQ) pathway** and is characterised by engaging in circular activities such as optimising up-cycling technologies and infrastructure that *further build on the current linear institutional system*.

The second pathway is the **'Product-as-a-Service (PaaS) pathway** and is characterised by a more *fundamental shift of business activities from selling products towards providing services*.

Distinguishing two pathways, one which further builds on the current institutional setting and one that implies a fundamental shift in business activities, first signals that taking an institutional perspective towards new CBMs is relevant and enables revealing tensions. Specifically, the CBMs that fall in the latter category are likely to clash with the current institutional setting.

Businesses opting for the PaaS pathway cannot merely rely on existing institutions and instead engage in **self-enforcing constraints** by reshaping ownership structures and redesigning product- and supply chain logics by managing circular cascading activities (i.e. maintenance, reusing, refurbishing, recycling). The strategic topics for CBMs, specifically *contracting, financial mechanisms and chain coordination,* are likely to differ depending on the pathway of the CBM.

Contracts being used in the circular economy will differ from their linear counterparts to create flexibility for circular activities and to enable new ways of collaboration between different stakeholders and may assume a more informal and relational connotation to allow for flexibility, collaboration, and mutual trust in the development and finetuning of circular value chain processes and structures to evolve over time. Although we expect contracting in both SQ and PaaS pathways to be of relational nature, to align stakeholders over time in a shared effort of creating circular value chains, it can be expected that a more fundamental shift of activities, and increased importance of relationships in case of the PaaS pathway leads to a more drastic impact of contracting. In such contracts parties can make specific agreements to divide roles and responsibilities to the extent that these are not provided in the current institutional setting, in legal rules and regulations. **The creation of new contracts** can be seen as a vehicle that CBMs use to forge new institutions that support circularity. This will further be discussed below in the section on chapter three (Contracts for CE).

Financial mechanisms are another key topic that especially the PaaS CBMs encounter difficulties with. Allocating and sharing risks and rewards of PaaS CBMs that imply increased supply chain collaboration and a long-term perspective is new for financiers. Whereas new financing mechanisms – such as dynamic earning models – are proposed as a solution this is currently difficult to implement due to current legislative frameworks. Moreover, the development of PaaS business models is limited due to the incompatibility with investment criteria of financial institutions. These criteria are based on the linear sales model with assets as underlying securities. PaaS models require a shift from asset-based finance towards cash flow-based finance. Regarding finance and the circular economy, PaaS models are difficult to finance in the current institutional setting. Moreover, chapter four shows that CBMs in general are likely to **struggle with financing challenges,** due to the long-term perspective of CBMs and the lack of financial frameworks for valuing the internalisation of external costs and benefits in company value.

New supply chain processes and increased *chain coordination* are another topic that distinguishes CBMs. **Long term and collaborative chain coordination** mechanisms appear particularly important to PaaS to guarantee products of the highest quality and to enable to keep these cycling (in multiple use cycles) for as long as possible and fully close material loops. Moreover, consumers play a vital role as well both during the period they use these products and in returning products to the service provider after use. Surely, only when products actually return to the chain after use, can we create a truly circular

economy. In this context CE accelerating organisations play the role of 'brokers' and liaise with several stakeholders to create circular supply chain processes. In the discussion of chapter five below the role of CE accelerating organisations as 'institutional intermediaries' is further discussed.

This chapter has shown that two pathways towards CE can be distinguished and that the CBMs following the SQ pathway are more likely to fit within the current institutional setting whereas CBMs following the PaaS pathway encounter fundamental challenges. Moreover,it seems that CBMI drives the development of new institutions regarding contracting, financial mechanisms, and chain coordination. Chapter three and four have focussed specifically on challenges respectively relating to the need for- and the role of new contracts for PaaS (chapter 3) and finance and accounting related challenges to (both PaaS and SQ) CBMs.

6.2. Summary, contribution, and relevance of chapter three

Designing a Circular Contract Template: Insights from the Fairphone-as-a-Service project

Chapter three elaborates on the role of contracts for circular economy, and more specifically on the relation between contract design and CBMI for creating PSS models. An in-depth analysis of the Fariphone-as-a-Service project has enabled defining key elements for a *Circular Service Contract Template* and specifically answering the question *'how contractual mechanisms can enable innovation processes in the design of a PSS model between service providers and clients in relation toservitisation, longevity and modularity'*. The definition of the **scope of circular services** seems to be pivotal for defining a contract template aimed at servitisation. Exactly specifying the services provided under the contractual agreement embody the *servitisation* element of the PSS value proposition. Deciding on **the tenure of the contract** impacts managing and extending the lifespan and delaying the obsolescence of products, hence providing incentives for longevity. An adjustment of the tenure has been needed to optimise *the product lifespan in multiple use cycles,* thus aligning economic and technical product lifespan, adapting termination to new optimal lifespan predictions, balancing technical performance and sustainability performance, and finally avoiding linear depreciation of products (assets) over time. Defining **risks and securities between the service provider and users** creates clarity for contract parties on rights and responsibilities in using and managing the devices – that are used for providing the services – on a modular level, - i.e. *modularity*. Managing products at a modular level enables a more detailed system in which the lifespan of independent modules allows product life extension, since only the weakest link (i.e. a broken module) needs to be replaced and not the product itself.

This research contributes to our understanding of contractual mechanisms to enable and support CBMI, especially innovative PSS models. Contractual dimensions are explicitly related to the process of configuration of a PSS model architecture. Agreements on ownership, usage right, risk allocation and managing circular value propositions are key in PSS contracts, albeit tensions surface between ownership and contractual aspects when attempting to manage circular business practices.

Designing a contract template enables translating the principles of slowing, narrowing, closing, and regenerating into circular value propositions, thereby helping to create an effective and implementable PSS model that enables circular value propositions, delivery, and capture (Bocken *et al.*, 2016; Bocken & Ritala, 2021). Through the definition of norms, rules and procedures in the contract, actors engage in key configurations of the PaaS model in detail. Configuring such new contracts in the process of CBMI can be seen as a manifestation of creating new institutions, such as contracts. These contracts are designed to function within the current legal frameworks yet they arrange specific responsibilities and activities that are not supported by the existing frameworks that thus must be formulated in contractual clauses.

A second contribution of the chapter relates to our understanding of the role of contract design for innovation processes dealing with uncertainties and unknown outcomes. Chapter three shows that conditions of uncertainty are related to new technological, organisational and contractual practices in the innovation process, as well as to the higher (institutional) level of the fit between the CBM in the broader transition from a linear status quo towards a new unknown state (i.e. a circular economy). Parties have dealt with these uncertainties by agreeing on jointly defined norms and procedures – such as agreeing on preventive and corrective maintenance schemes – rather than agreeing on overly specified tasks (Grandori & Furlotti, 2018). This finding aligns with literature on contract design for innovation in suggesting that contract design in CBMI processes tends to be procedural rather than substantive, and associational rather than operational. In short, these contracts are built upon mutual understanding, trust, and the focus on long term collaboration – with built-in flexibility for fine tuning and problem solving along the way. This conclusion aligns with and further deepens the proposition of chapter two, relating to the increased importance of relationships – and relational contracting – in case of PaaS models. Looking at contracts as (lower level) institutions created between parties, new circular contracts can be seen as manifestations of circular economy becoming increasingly institutionalised. One can imagine that with the growing number of businesses that employ – or currently develop – CBMs, the number of contracts and availability of off the shelf contractual agreements will grow as well and over time the content of these contracts will increasingly become institutionalised within law itself (i.e. in higher level institutions).

6.3. Summary, contribution, and relevance of chapter four

Finance and accounting in the circular economy

In chapter four we discussed finance and accounting concepts that pose opportunities and challenges for the circular economy transition. The chapter aims to bring relevant finance and accounting issues into circular economy and sustainability scholarship. The chapter revolves around the question *'how we can understand the differences in accounting and financial valuation between linear and circular business cases and how we can create a level playing field to assess all companies by standards aligned with the goals of a sustainable circular economy'*. An analysis of three cases shows the main finance and accounting hurdles to the circular economy transition and provides directions for overcoming current barriers to unlock finance and accounting as levers for the circular economy transition.

CBMs enable companies to create financial value without harming the planet (Bocken *et al.*, 2016). Understanding the costs and benefits of economic, environmental, and social value created with CBMs and being able to capture and report these multiple values created (Lahti *et al.*, 2018) will support decision making processes to favour creating CBMs (Dewick *et al.*, 2020). However, externalities of business activities are not sufficiently considered since their impact is barely or not at all expressed in financial terms. Due to the tendency of the financial sector to optimise financial profits (Zoltán & Süveges, 2019) while neglecting positive environmental and social impact (Naciti *et al.*, 2020), there is currently no level playing field for CBMs to thrive. This points at the mismatch of CBMs with the current finance and accounting institutions that fail to respectively recognise risk incurred and value impacted by climate change and resource scarcity.

A lack of understanding of CBM value creation and the absence of suitable investment strategies hinder recognizing and appreciating the full potential of CBMs (Aranda-Usón et al., 2019). Specific hurdles concern the relative newness of CBMs to accountants and financiers, especially the ones taking a more radical approach, such as PSS and BMs involving increased collaboration and interdependencies in the supply chain. This has also been confirmed in chapter two and chapter five. **CBMs aim to generate value over a longer time horizon** and often involve **increased control of and responsibility for products and materials.** This can impact financial ratios to be outside the 'commonly accepted brackets' and to be perceived as more risky than linear BMs. Moreover, valuation of products and materials is currently not assuming ongoing cycling as proposed in CBMs. Instead, current tax measures incentivise the rapid depreciation of products. In the circular economy transition we suggest rethinking depreciation schemes and propose to 'appreciate' the value of (residual and harvested) products and materials that can be used in ongoing cycles. For the institutional field of accounting, this could mean recalibrating core concepts such as depreciation and value.

Another piece of the puzzle of creating a level playing field is to take a closer look at the **risks of linear BMs, and the risks of not transitioning to a circular economy.** In the long run, circular economy helps to mitigate risks associated with the scarcity of materials and climate change (Durán-Romero *et al.*, 2020), which will pose an increasing threat to the continuity of businesses. Circular strategies imply being mindful about material (re) use and incentivize more optimal asset and material utilisation, and increased control over these materials. These traits of CBMs are currently new and unknown but can become risk mitigants in a system that is characterised by resource scarcity and other limiting environmental conditions. The chapter urges a shift from mainly steering on financial profits to balancing financial, environmental, and social returns and to steering on positive overall impact.[15] Moreover, risks incurred by continuing linear business should become material.[16]

[15] For more information on non financial reporting visit IFRS Foundation: https://www.ifrs.org/projects/completed-projects/2021/sustainability-reporting/consultation-paper-and-comment-letters/

[16] Current EU policy developments - i.e. the EU taxonomy and the Corporate Sustainability Reporting Directive – respond to this idea. It becomes compulsory for companies to report on sustainability, with circular economy as an explicit topic. In that regard, the concept of double materiality speaks to the fact that risks and opportunities can be material from both a financial and non-financial perspective. [Link CSRD]

Such a shift would **level the playing field** by moving from neglecting circular companies (by not valuing positive impact) and rewarding linear companies (by subsidising) and/ or not punishing them for polluting towards a levelled field where all companies adhere to a new ruleset that does rewards positive and punishes negative impact. Such a shift would be an important lever since the effect will be increasing prices of linear products (and lower value of circular companies) and lower prices of circular products (and higher value of circular companies). This will have spill over effects in all aspects of our economy.

6.4. Summary, contribution, and relevance of chapter five

Understanding the role of institutional intermediaries in the emergence of the circular economy as an institutional field

Chapter five discussed the process of institutional field formation of the circular economy. This chapter zooms out from specific institutions as presented in chapter three (legal and contracting institutions) and chapter four (frameworks and rules regulating finance- and accounting) to analyse the occurrence of circular institutions and answers the question *how we can understand the role of institutional intermediaries in the emergence of circular economy as an institutional field.* In the void of general regulatory frameworks, organisations participating in projects aiming at implementing CE principles in CBMs identify, define and shape enabling institutions, forming 'islands of rules.' The chapter presented two findings that can help us better understand the institutional field formation process in CE.

First, it uncovered how circular value proposition elements and regulatory principles can be ostensibly at odds with one another but are reconciled with the purpose of enabling CBMs. Different interpretations of circular elements (think about different potential starting points for the circular value proposition, e.g. starting new materials to build a circular product or from harvesting existing products) and different understandings due to professional backgrounds (e.g. business developer versus lawyer or accountant) have to be made explicit before they can be aligned. Making these ambiguities in interpretations and terminology explicit plays an important role in aligning and defining the building blocks of CBMs. Vice versa this enables relating these building blocks of CBMs to institutional formation processes.

A second finding relates to the role of institutional intermediaries in the process of creating the right conditions for reconciliation between different understandings and professional backgrounds and rulesets, which can be seen as a contribution to the formation of a regulatory landscape for CE. Institutional intermediaries, acting directly or indirectly in conjunction with a regulator to affect the behaviour of a target (Abbott *et al.*, 2017), play a key role in these processes. In other words, institutional intermediaries function as translators and brokers between circular businesses on the one hand and regulators and regulatory frameworks on the other hand in creating a field where CBM activities are possible.

After clarifying circular value proposition elements and implementing them in CBMs, they must become anchored in the institutional setting. This process of institutional field formation is supported by institutional intermediaries, who connect circular value

proposition elements to institutional mechanisms such as contracts, rules for defining ownership, risk and rewards and ultimately institutional frameworks such as finance and accounting. Institutional intermediaries orchestrate this iterative process of rulemaking and rule taking by framing and goal making, translating, and structuring activities that support the creation and institutionalisation of new agreements and rules.

6.5. Answer to the overall research question

Each chapter has its own role in the journey from understanding circular economy and the role of institutions (chapter two), towards focussing on the specific institutional fields contracting (chapter three) and finance and accounting (chapter four) and finally the role of institutional intermediaries in the emergence of circular economy as an institutional field (chapter five). Table 10summarises the contribution of chapters to answering the overall research question.

Table 10. Summary of chapters answers to the overall research question

Chapter	RQ part 1 - To what extent do circular business models fit within the current institutional setting?	RQ part 2 - How does circular business model innovation forge new institutions to drive the circular economy transition?
Chapter 2 - Institutional incentives in circular economy transition: The case of material use in the Dutch textile industry	SQ CBMs fit more easily with the current institutional setting whereas PaaS CBMs demand more fundamental changes to the institutional setting	PaaS BMs engage in self-enforcing constraints by reshaping ownership structures and redesigning product- and supply chain logics for managing circular cascading activities. This happens through contracting, financial mechanisms and chain coordination.
Chapter 3 - Designing a Circular Contract Template: Insights from the Fairphone-as-a-Service project	~ Agreements on ownership, usage right, risk allocation and managing circular value propositions are key in PaaS contracts ~ Tensions surface between ownership and contractual aspects when attempting to manage circular business practices	~ Configuring new contracts in the process of CBMI are a manifestation of creating new institutions ~ The content of these contracts will increasingly become institutionalised within law itself ~ Contracts for PaaS CMBs are built upon mutual understanding, trust, and the focus on long term collaboration – with built-in flexibility for fine tuning and problem solving along the way (as opposed to transactional contracting in linear economy)
Chapter 4 - Finance and accounting in the circular economy	There is currently no level playing field for CBMs to thrive, especially for more radical CBMs (e.g. PaaS). There is a mismatch between CBMs and the current finance and accounting institutions that fail to respectively recognise risk incurred and value impacted by climate change and resource scarcity.	~ There is a need to rethink depreciation schemes and propose to 'appreciate' the value of CBMs: products and materials that are (re)used in ongoing cycles. ~ The field of accounting should recalibrate core concepts such as depreciation and value. ~ The field of finance should reinterpret CBM ratios and consider linear risks in financial decision making
Chapter 5 - Understanding the role of institutional intermediaries in the emergence of the circular economy as an institutional field	There is need for institutional intermediaries to adapt the current institutional setting towards rules and norms more supportive of CBMs	~ Institutional intermediaries create the right conditions for reconciliation between different understandings and professional backgrounds and rulesets ~ They function as translators and brokers between circular businesses on the one hand and regulators and regulatory frameworks on the other hand

When embarking on this dissertation in 2016 the circular economy was just gaining traction as a scientific field. The relevance of circular economy for business and management scholars was instigated by studies that made the link between the circular economy concept and business model literature (Bocken *et al.*, 2016, 2017). Although a coherent understanding of the circular economy concept has been debated, many scholars agreed that CE necessitates a systemic shift (Kirchherr *et al.*, 2017). Being able to understand the relation between business models and CBMI on the one hand and this necessary systemic shift on the other hand has driven me towards the concepts of institutions and institutional dynamics. If the aim is to change the system, then scholars and practitioners must also engage in changing the 'rules of the game'
Being able to understand the relation between business models and CBMI on the one hand and this necessary systemic shift on the other hand has driven me towards the concept of institutions. If we aim to change the system, we must change the 'rules of the game'. Looking at economic activities and specifically CBMI from this perspective was not done before, therefore we proposed an institutional analysis lens towards the role of CBMI in the circular transition.

Although the field of institutional analysis is scattered, we defined institutions as 'the rules of the game' as defined by the socioeconomic system (North, 1990; Ostrom, 1995; Williamson, 2000). Institutions are seen as humanly devised constraints that shape interactions (North, 1990) and are key to structure incentives in human exchange (Coase, 1988; Williamson, 2000). In this literature institutions are mainly seen as constraints. The first part of the research question relates to this perspective, asking to what extent circular business models fit within the current institutional setting. The answer – in brief – is that the current institutional setting is indeed constraining CBMI. More specifically CBMs that are more fundamental – i.e. PaaS models and models that increase chain collaboration and interdependencies – encounter more difficulties than CBMs that are less radical. The latter can function within the current setting because the circular aspects of CBMs, such as recycling, are not challenging concepts of value and rules and incentives as formalised in the linear rule set. Radical CBMs however internalise environmental and social costs, therefore proposing an entirely new concept of value that is currently not aligned with, let alone incentivised in the linear rule set. Specific proof for this mismatch is provided on the topics of contracting (chapter 3) and finance and accounting (chapter 4).

Besides looking at institutions as constraints, they are very effective in providing a clear framework and boundaries that we all adhere to. Strong institutions provide clarity and safety and lower transaction costs in economic exchanges. The second part of the research question therefore looks at how new rules, that are created in CBMI processes, can become institutionalised. A clear trajectory can be observed. CBMs start with self-enforcing constraints that are embedded in the value proposition. These constraints are formulated in legal contracts between supply chain partners and clients. With the increase of CBMs and contractual agreements jurisdiction will follow and finally laws may be modified to accommodate CBMs as the new normal, while disincentivising wasteful linear BMs. A similar mechanism is observed for the fields of finance and accounting. The first CBMs must convince financiers and accountants of the value created in CBMs, while new perspectives on value and risk will slowly result in a shift in financial decision making and reporting. This process of forging new institutions is supported by institutional intermediaries, that function as translators and brokers between circular businesses on the one hand and regulators and regulatory frameworks on the other hand.

6.6. Managerial implications

Transitioning to a circular economy by creating CBMs entails important implications for businesses and their stakeholders. It has become clear that a distinction can be made between CBMI that fits within the current institutional setting and more radical CBMI such as PaaS models and other business models that lead to increased collaboration and interdependencies between supply chain partners. The latter type of CBMs is more likely to encounter challenges due to a mismatch with the current institutional ruleset, the rules of the game. At the same time, radical CBMI processes have the potential to influence the institutional setting. Companies engaging in CBMI must realise that they play an important role in shaping and piloting new value propositions, while iterating rule making and rule taking.

Self-enforcing constraints that are agreed by all stakeholders that are implemented in contractual agreements are a first step towards broader acceptance through jurisprudence and finally law making. An example of this mechanism is a relatively new contractual structure for creating PaaS models for the built environment. Jurisprudence to adhere this contractual structure in case of conflict / default serves as a proof of such new structures becoming more commonly accepted (Coalition Circular Accounting, 2020). One can expect that a vastly growing number of new contractual agreements enabling circular strategies and activities will eventually push for inclusion of such arrangements in the law.

This dissertation pinpointed the lack of understanding of CBM value creation and the absence of suitable investment strategies that recognise and appreciate the full potential of CBMs. CBMs are often perceived as risky, due to a lack of historical data. At the same time risks incurred by linear companies that fail to transition to a circular economy are downplayed or not considered at all. Businesses, financiers, and accountants must realise that circular strategies can be much needed risk mitigants in a system that is threatened by resource scarcity and climate change. A shift towards reporting on circular impact is spurred by the EU Taxonomy as part of the European green deal Sustainable Finance Package, with the Corporate Sustainability Reporting Directive (CSRD) as an important pillar. The CSRD will become effective in 2023 and requires companies to collect data on sustainability (and specifically circularity) performance and make it publicly available. The second delegated act of the EU Taxonomy[17] contains a list of economic activities that are considered circular that will help guide accountants and auditors on how sustainability can be conceptualised and measured, facilitating the task of integrating sustainability impacts into reporting practices. The CSRD will support the shift from mainly steering on financial profits to balancing financial, environmental, and social returns, i.e., positive overall impact. Making circular impact explicit in company reporting will level the playing

[17] EU Taxonomy documents can be retrieved from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

field by disclosing companies' positive- and negative impact in a standardised way. When this happens, the true value of companies with a CBM will emerge, giving them a substantial advantage over companies that fail to transition. For now, CBMs, institutional intermediaries and stakeholders must continue to stand up for their vision of new ways of circular value creation, further build their growing knowledge base and engage in CBMI processes to develop the concepts, strategies and processes that together shape the circular economy.

6.7. Directions for future research

This dissertation has used an institutional analysis perspective to further the field of circular economy. It has proven an insightful lens for understanding the dynamics of rulemaking and rule taking and ultimately provides a perspective on the relation between CBMI and a system change towards circular economy. It is however certainly not the only valuable perspective on the circular transition. Transition theory (Loorbach *et al.*, 2010) can be another valuable lens to understand the dynamics of complex systems and the opportunities, limitations, and conditions for influencing systems. Specifically looking into CBMI in 'niches' (micro level) and their influence on 'regimes' (i.e. the wider rule set on macro level) can be fruitful for better understanding the dynamics of the circular transition.

Two other directions for future research stem from the chapters on contracting and finance and accounting in the circular economy. Both topics are relatively new and underrepresented in literature. Contracting has been researched specifically for PaaS CBMs. This is a more fundamental CBM with specific contractual needs. However, the importance of circular contracting and contract templates is equally important for other CBMs. Using products and resources in ongoing cycles requires contractual agreements to clarify and agree what products or materials will be used by whom, under which conditions and under whose responsibility. An agreement about when and how this product or material will return to a supply chain again after its useful life would ideally be added as well to circular contract templates. Moreover, contracts can potentially function as securities in CBM financing.

Introducing finance and accounting frameworks as relevant levers and/or hurdles for the CBMI and viability is a key topic for future research. Relating to the field of financial accounting, the topic of valuation of CBMs, and questions concerning depreciation pose important questions. Can we move towards a framework in reporting that includes financial, environmental, and social value created? Moreover, developing meaningful frameworks for measuring sustainability indicators, and more specifically circular indicators (Saidani *et al.*, 2019), will likely become more important. In the field of finance, the concept of risk – and more specifically a realistic interpretation of both circular and linear risks and mitigants – is of key importance. This is not merely an exercise for finance scholars to calculate, but also an exercise of conceptualising the meaning of risks and securities in a world with finite resources that is threatened by climate change.

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Summary

This dissertation is embedded in one of the major themes of our time: a needed shift to an economy that is sustainable in the long run and functions within our planetary boundaries (Brundtland, 1987; IPCC, 2014, 2021). We are not making sufficient progress in becoming climate neutral (IPCC, 2021). Our current economic rationale seems incapable of unifying economic and environmental activities in a meaningful way. The transition to a circular economy (CE) is proposed as an important part of the solution to this paradox. A **circular economy** is restorative by intention and design (EMF, 2011) and has rapidly become a leading sustainability paradigm (Geissdoerfer *et al.*, 2017). In a circular economy, businesses are the key actors. Businesses that create circular business models (CBMs) in circular business model innovation (CBMI) processes create a value proposition and design business processes based on circular economy principles (Linder & Williander, 2017; Lüdeke-Freund *et al.*, 2019). However, implementing CE principles in new CBMs has proven challenging (Bocken, 2020; Vermunt *et al.*, 2019).

Businesses that attempt to implementCBMs often encounter a mismatch between certain key characteristics of CBMs and the **institutional setting** that is based on a linear economy rationale. Seen through the lens of *institutional analysis*, a multidisciplinary framework focussing on how the "rules of the game" of socioeconomic systems are defined (North, 1990; Ostrom, 1995; Williamson, 2000), we have seen thatthe current institutional setting reinforces the current economic rationale (i.e., take, make, use, waste) (Fischer & Pascucci, 2017). It favours incumbent linear logics and business models, while hampering future circular ones. This dissertation considers the dynamic of institutions in the circular economy transition and revolves around the following **overall research question:** *To what extent do circular business models fit within the current institutional setting and how does circular business model innovation forge new institutions to drive the circular economy transition*? The answer to this research question is formulated based on four chapters that each answer a specific sub question.

Chapter two provides insight in circular economy taking shape in new organisational forms of inter-firm collaborations and how this stimulates the emergence of new institutions that enhance sustainability. The chapter proposes an institutional perspective into the circular economy transition that is currently is lacking yet can improve our understanding of the complexity of moving towards a circular economy when constrained by an institutional system that is aligned with the status quo of a linear economy. The formulated research question of this chapter is *how requirements for transitioning to CE create new organizational forms in inter-firm collaborations, and ultimately how they stimulate the emergence of new institutions*. Two transition pathways are distinguished. The first pathway is called the **'status quo' (SQ) pathway** and is characterised by engaging in circular activities such as optimising up-cycling technologies and infrastructure that further build on existing current linear institutional system.

The second pathway is the **'Product-as-a-Service (PaaS) pathway** and is characterised by a more *fundamental shift of business activities from selling products towards providing services*. CBMs following the SQ pathway are more likely to fit within the current institutional setting whereas CBMs following the PaaS pathway encounter a higher number of challenges that are specifically related tocontracting, financial mechanisms and chain coordination.

Chapter three elaborates on the role of contracts for circular economy, and more specifically on the relation between contract design and CBMI for creating Product Service System(PSS) models and revolves around the question *'how contractual mechanisms can enable innovation processes in the design of a PSS model between service providers and clients in relation toservitisation, longevity and modularity'*.
The definition of the **scope of circular services** seems to be pivotal for defining a contract template aimed at servitisation. Exactly specifying the services provided under the contractual agreement embody the servitisation element of the PSS value proposition. Deciding on the **tenure of the contract** impacts managing and extending the lifespan and delaying the obsolescence of products, hence provides incentives for longevity. An adjustment of the tenure has been needed to optimize the product lifespan in multiple use cycles, thus aligning economic and technical product lifespan, adapting termination to new optimal lifespan predictions, balancing technical performance and sustainability performance, and finally avoiding linear depreciation of products (assets) over time. Defining **risks and securities between the service provider and users** creates clarity for contract parties on rights and responsibilities in using and managing the devices – that are used for providing the services – on a modular level, - i.e. modularity. Managing products at a modular level enables a more detailed system in which the lifespan of independent modules allows product life extension, since only the weakest link (i.e. a broken modules) needs to be replaced and not the product itself.
This chapter stresses contractual dimensions being explicitly related to the process of configuration of a PSS model architecture. Agreements on ownership, usage right, risk allocation and managing circular value propositions are key in PSS contracts, albeit tensions surface between ownership and contractual aspects when attempting to manage circular business practices. Moreover, conditions of uncertainty are related to new technological, organizational and contractual practices in the innovation process, as well as to the higher (institutional) level of the fit between the CBM in the broader transition from a linear status quo towards a new unknown state (i.e. a circular economy). Finally, it finds evidence for the increased importance of relationships – and relational contracting – in case of PSS models.

Chapter four concerns finance and accounting concepts that pose opportunities and challenges for the circular economy transition. The chapter aims to bring relevant finance and accounting issues into circular economy and sustainability scholarship and revolves around the question *'how we can understand the differences in accounting and financial valuation between linear and circular business cases and how we can create a level playing field to assess all companies by standards aligned with the goals of a sustainable circular economy'*. An analysis of three cases shows the main finance and accounting hurdles to the circular economy transition and provides directions for overcoming current barriers to unlock finance and accounting as levers for the circular economy transition.

Specific hurdles concern the relative newness CBMs to accountants and financiers. **CBMs aim to generate value over a longer time horizon** and often involves **increased control of- and responsibility for products and materials.** This can impact financial ratios to be outside the 'commonly accepted brackets' and to be perceived as more risky than linear BMs. Moreover, valuation of products and materials is currently not assuming ongoing cycling as proposed in CBMs. Instead, current tax measures incentivise the rapidly depreciation of products. In the circular economy transition we suggest rethinking depreciation schemes and propose to 'appreciate' the value of (residual and harvested) products and materials that can be used in ongoing cycles. For the institutional field of accounting, this could mean recalibrating core concepts such as depreciation and value. Moreover, the chapter urges taking a closer look at the **risks of linear BMs, and the risks of not transitioning to a circular economy.** In the long run, circular economy helps to mitigate risks associated with the scarcity of materials and climate change (Durán-Romero *et al.*, 2020), that will pose an increasing threat to the continuity of businesses. CBMs are currently new and unknown but can become risk mitigants in a system that is characterized by resource scarcity and other limiting environmental conditions. Finally, risks incurred by continuing linear business should be considered. Such a shift would **level the playing field** by moving from neglecting circular companies (by not valuing positive impact) and rewarding linear companies (by subsidizing) and/ or not punishing them for polluting towards a levelled field where all companies adhere to a new ruleset that does rewards positive- and punishes negative impact.

Chapter five considers the process of institutional field formation of the circular economy. This chapter zooms out from specific institutions as presented in chapter three (legal and contracting institutions) and chapter four (frameworks and rules regulating finance- and accounting) to analyse the occurrence of circular institutions and answers the question *how we can understand the role of institutional intermediaries in the emergence of circular economy as an institutional field.* In the void of general regulatory frameworks, organizations participating in projects aiming at implementing CE principles in CBMs identify, define and shape enabling institutions, forming '**islands of rules.**' The chapter presented two findings that can help us better understand the institutional field formation process in CE.

The chapter shows how circular value proposition elements and regulatory principles can be ostensibly at odds with one another but are reconciled with the purpose of enabling CBMs. Different interpretations of circular elements (think about different potential starting points for the circular value proposition, e.g. starting new materials to build a circular product or from harvesting existing products) and different understandings due to professional backgrounds (e.g. business developer versus lawyer or accountant) have to be made explicit before they can be aligned. Making these ambiguities in interpretations and terminology explicit plays an important role in aligning and defining the building blocks of CBMs. Vice versa this enables relating these building blocks of CBMs to institutional formation processes. Moreover, **institutional intermediaries function as translators and brokers** between circular businesses on the one hand and regulators and regulatory frameworks on the other hand in creating a field where CBM activities are possible, which can be seen as a contribution to the **formation of a regulatory landscape for CE.**

Being able to understand the relation between business models and CBMI on the one hand and this necessary systemic shift and institutional dynamics on the other hand was an important driver for this dissertation. If the aim is to change the system, then scholars and practitioners must also engage in changing the 'rules of the game.' Looking at economic activities and specifically CBMI from this perspective was not done before, therefore we proposed an **institutional analysis lens towards the role of CBMI in the circular transition.**

Albeit the field of institutional analysis is scattered we defined institutions as 'the rules of the game' as defined by the socioeconomic system (North, 1990; Ostrom, 1995; Williamson, 2000). Institutions are seen as humanly devised constraints that shape interactions (North, 1990) and are key to structure incentives in human exchange (Coase, 1988; Williamson, 2000). In this literature institutions are mainly seen as constraints. The first part of the research question relates to this perspective, asking to what extent circular business models fit within the current institutional setting. The answer – in brief – is that **the current institutional setting is indeed constraining CBMI.** More specifically CBMs that are more radical – i.e. PaaS models and models than increase chain collaboration and interdependencies – encounter more difficulties than CBMs that are less radical. Besides looking at institutions as constraints, they can also be very effective in providing a clear framework and boundaries that we all adhere to. Strong institutions provide clarity and safety and lower transaction costs in economic exchanges. The second part of the research question therefore looks at how new rules, that are created in CBMI processes, can become institutionalised. A clear trajectory can be observed. CBMs start with self-enforcing constraints that are embedded in the value proposition. These constraints are formulated in legal contracts between supply chain partners and clients. With the increase of CBMs and contractual agreements, the institutional setting – characterised by e.g. policies and law – will change as well. This is the process of **forging institutions for the circular economy.**

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"What we call the beginning is often the end. And to make an end is to make a beginning. The end is where we start from."
T. S. Eliot

This quote of T.S. Eliot expresses the ongoing and regenerative nature of the circular economy. At the same time, it represents my state of mind while finalising my dissertation; a dissertation that finds its origin in my amazement and deep love for our planet Earth. I am longing for an economic system that thrives within our planetary boundaries and creates well-being for all species on our planet. Would it not be great– if only in the slightest way – to be part of creating this new economy?

During the journey of this dissertation, I had the opportunity to combine theory and practice, by combining my role as a PhD candidate at Wageningen University with my role as project manager at Circle Economy and the Sustainable Finance Lab. I was able to get close to, and sometimes even involved in, creating, and implementing circular business models. Thanks to establishing close relationships and creating win-win situations, I could use data from real life projects for research purposes. This data was not collected as an outsider (e.g. interviews with respondents), but was collected as insider in the projects I was involved in. It has enabled a microscopic insight in the coming about of the circular economy. Moreover, it resulted in synergies between strengthening theory by using detailed insights from my project management activities and managing projects while using the logic and rigour of scientific concepts and methods.

During this journey I very much appreciated the support of my supervisors, colleagues, friends, and family.

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Aglaia Fischer

Completed Training and Supervision Plan

Wageningen School of Social Sciences

Aglaia Diotima Fischer
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Writing PhD researchproposal	WUR	2016-2017	6
Qualitative Data Analysis	WASS	2017	2,5
Potentials and Challenges of Circular Economy as Sustainability Strategy	Aalborg University	2018	5
AoM ONE Doctoral Consortium	AoM	2019	5
B) General research related competences			
WASS IntroductionCourse	WASS	2017	1
Publishing in Journal of Management Studies	Academy of Management Journal Seminar, RSM	2017	0,5
Qualitative Research	Academy of Management Journal Seminar, RSM	2017	0,5
Practice-oriented research into the financing of the Circular Economy in small and medium-sized enterprises	RAAK Research Consortium, Windesheim & Stenden Universities of applied science	2017-2019	2
'Financing circular business models'	Avans – 2nd Conference New Generation Business Models, Groningen	2016	1
'Financing a circular built environment'	WasteBuilt Conference, Amsterdam	2019	1
'Building a circular business model: Learnings from the journey of Fairphone-as-a-Service Community of Practice'	AoM Symposium, Boston	2019	1
'Operationalising circular business models; A Deep dive into organisational, legal & financial aspects of circular economy'	ReTraCE 4 th ESR Training School	2020	1
Paper review JCLP	Journal of Cleaner Production	2019	1

Name of the learning activity	Department/Institute	Year	ECTS*
C) Career related competences/ personal development			
Organise workshops about research implications for the managerial field	Circular Economy Finance; Holland Circular Economy week; CE Festival Nijmegen; Chaimber of Commerce; Dutch ministry of Infrastructure and Water Management; World Bank learning	2016-2020	3
Teaching in courses	WUR	2016-2019	2
Thesis & Internship supervision	WUR	2016-2020	2
Total			**34,5**

**One credit according to ECTS is on average equivalent to 28 hours of study load*

Colophon

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