

Barriers and Best Practices for the Circular Economy

SMO Promovendi – Circular Minds 2017/2018



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PREFACE

The words in this paper are not a new way of being. The circular system is not new or unique; a seed becomes a blossom that feeds the bee, that then affects the flower to become a seed.

We are created through the summation of our decisions, and this paper represents the decisions of its authors.

What is written here is a new way of thinking, not just about business, economies or systems, but about self. This paper is about the creation of self, and about our decisions to become a cause in the matter of change.

The change the world needs to see, will only be created when we decide to become the people, who can create that change.

David Katz, Founder and CEO

The Plastic Bank

INTRODUCTION

We're living in an exciting era. Rather than just another societal transition, we're going through a fundamental societal transformation. Ecologist Joanne Macy calls this period 'The Great Turning': a period wherein we change from an industrial growth society into a life sustaining system'. Macy: *"The most remarkable feature of this historical moment on Earth is not that we are on the way to destroying the world; we've actually been on the way for quite a while. It is that we are beginning to wake up, as from a millennia-long sleep, to a whole new relationship to our world, to ourselves and each other."* It is with these eyes that we have to see the rise of the Circular Economy. The Circular Economy is not just another trend in business; it's the start of a completely new economic reality. The Circular Economy is the starting point for regenerative economics; for a new business-as-usual that - first and foremost - serves life and is based upon a fundamentally new value-paradigm. The future of success in business is about doing good for all stakeholders and creating benefit; not just profit.

The Circular Economy demands next level thinking-and-doing in business, and there is no one more willing and able than the next generation of young professionals. It is therefore with great pride and pleasure that I present to you this publication of the **SMO Promovendi**. It offers fresh perspectives of a group of promising young scientists. All aspiring changemakers. It's made with love and with the best of intentions; to help the Circular Economy forward.

Enjoy!

Kees Klomp

Managing Director SMO

CHAPTER 1. CONTEXT

Bram Bet & Judith Kas

Our current linear economic system (take – make – dispose) is not sustainable. The irreversible impact of humanity on the planet is so significant that we may not be able to guarantee a high quality of life for future generations, mainly due to climate change, loss of biodiversity and changing land usage. The main causes are a large simultaneous increase of population and wealth and consumption, and economic growth in most areas around the world, which are generally accompanied with an increase in usage of resources and land and the production of waste flows (Steffen et al., 2015).

The linear economic system, which is based on an ever-increasing growth, is unable to bring these developments to a halt, and the need for another type of economic system is pressing. In recent years, a new type of economic system has gained interest, the so-called **Circular Economy**. In a circular economic system, waste flows are minimized by closing material chains as much as possible: waste or side products of one actor may provide the resources for the next. It is not focused on economic growth, but on long term ecological and social sustainability.

As SMO Promovendi, a bottom-up initiative of young scientists in the Netherlands, we aim to work on so-called 'wicked' societal challenges. Being young and bright minds, fortunate to receive excellent education, we feel that we have the need, abilities and responsibility to work towards a sustainable future. With this motivation, we develop our own vision on the circular economy, where we investigate what factors can enable or stimulate a transition to a circular economy. In our 2016 publication 'Circulaire Economie, Wat? Waarom? Hoe?' (Circular Economy, What? Why? How?) we have described, from the perspectives of many different scientific disciplines, what a circular economy actually is, why we should strive towards it and what steps may be taken to accelerate this transition. After giving an extensive introduction into the main concepts and subtleties of the circular economy, we took expertise from philosophy by explaining why we, the current generations, have the obligation to ensure a sustainable future for coming generations, not only in the western world but all over the world. Subsequently, we borrowed concepts from many different scientific disciplines - physics, chemistry, biology and complexity science - and translated these to valuable lessons for a circular economy. Also, we investigated a few specific cases in the Netherlands where these lessons are already being put into practice. Finally, we conducted interviews with stakeholders in businesses, government and education to find out what the understanding of circular economy was at the time and what opportunities they identified for transitioning toward a circular economy.

Whereas this previous publication provides an overview of the background and concept of Circular Economy itself, in this publication, we try to understand the current status of the transition to a circular economy and the necessary step to speed up the process. After all, if we, in the Netherlands, but in fact any other country, want to live up to our promises and reach the goals of the Paris agreement, we will have to make the necessary next step in becoming circular. The [Global Circularity Report](#), published in January 2018, claims that only

9.1 percent of the world's resources are cycled back into the economy after use, which puts the circular economy very high on the agenda of the World Economic Forum (WEF).

Although the big corporates are becoming more aware of the urgency of the transition, though partly for their own viability and legitimacy, they struggle with making these radical shifts in their sometimes-inert organizational structures, and within a network or chain of other businesses that are still operating in a linear system. In addition, at least in the Netherlands, circular economy is very much driven by small startups led by millennials who are relentless advocates of bringing purpose, and thereby societal and ecological impact, to the world. However, these startups, no matter how inspiring for the world, face tremendous difficulties with developing feasible business models and getting financed. Investors generally find it too risky to finance circular businesses and are either still focused on financial value in the short run, or very willing but put off by yet underdeveloped business models. Scientists, in turn, are also driven, but as we young researchers experience ourselves, bridging the gap between academia and practice is often very nontrivial. Not only are the incentives in universities mainly geared towards publishing in academic journals ("publish or perish!"), but it is also difficult to "climb out of the ivory academic tower" to find the right organisations to collaborate with and to learn to speak each other's language.

As one can imagine, material chains may be closed in many different ways, making a circular economic system a very complex network compared to the traditional linear system. As a result, making a transition from a linear to a circular economy poses a very complicated paradigm shift, demanding a lot of knowledge from the many involved stakeholders and close cooperation between them. Even though a lot of valuable scientific research and professional expertise on circular economy is available, this knowledge often does not find its way to the relevant stakeholders, leaving many opportunities to accelerate the transition to circular economy untaken.

So, in order to really get the transition to the circular economy going and bring up the circular percentage of the world, we need to overcome these barriers and have to take the necessary next step. We have seen that there are many stakeholders that share the sense of urgency, starting many circular initiatives, but what is needed to really make the step to a national or global circular economy, where everyone participates in the circular chain? What barriers need to be overcome? What is the current status of circular economy in the Netherlands? Where do we stand and what are the big challenges? And from what best practices can we learn?

In this research, we, young researchers together with 40+ interviewees, try to discover what may accelerate and up-scale a transition to a Circular Economy. More concretely, we try to identify the most important barriers that stakeholders (in the Netherlands) - academia, businesses and government - are currently facing that prevent them from operating in a circular fashion. Moreover, we want to learn from their successes, by also identifying best practices from stakeholders that have already made their leap forward into a circular system, and that have overcome barriers along the way. We summarize our findings in a clear and graphical diagram, which we intend to make continuously updated and available online. It may be found on the first page (and in more detail [here](#)).

By bundling these barriers and best practices, we aim to provide guidance, tips and tricks or just useful information for *anyone* - consumer, startup, corporate, academic or government - that has not completely climbed over the hills that stand between us and a circular economy!

Literature background & methods

We are definitely not the first ones to conduct research on the circular economy. Already, a lot of literature on the transition towards a Circular Economy exists. Rather than starting from zero, we first conducted a literature review in which we identified the main barriers to a transition to a circular economy in general. A transition to a circular economy likely involves global change, because many stakeholders have to work together. In this project, however, we specifically focus on what Dutch organizations need in order to speed up the transition to a circular economy. We therefore studied both scientific papers in international journals, as well as reports focused on the Dutch situation. Researchers of Utrecht University and Deloitte jointly conducted research into barriers to a transition to the circular economy (Kirchherr et al., 2017). They published a whitepaper that contains a summary of their most important findings which were based on surveys. These findings agree to a large extent with the outcomes of our in-depth interviews that we discuss in this publication. Therefore, we structure the remainder of this chapter around their most important findings which we complement with knowledge gained for other research papers. Then, in the next chapters, we will go in-depth and discuss the findings of our research which adds to the already existing research a more in-depth perspective.

Kirchherr et al. identified four main types of barriers to a transition to a circular economy: **cultural**, **market**, **regulatory** and **technological** issues. They conclude that **cultural barriers** are currently the most pressing. These barriers relate to a lack of awareness and/or willingness to engage with the circular economy, both on the side of the consumer and on the side of companies. For example, Statistics Netherlands (CBS) found that 38% of food waste produced in households in the Netherlands could have been avoided, mostly by composting it rather than putting it in the other waste bin. Other studies also suggest that consumers' and businesses' attitudes hamper a change towards a more sustainable future (e.g. Tanner & Kast, 2003). One possible cause of this negative attitude is a lack of knowledge on causes of environmental problems, on possible actions to solve these problems and on the environmental impact of products and services (Lane & Potter, 2007). However, even people with a positive attitude towards pro-environmental behavior often don't act upon their beliefs (the so-called 'attitude-behavior gap', see e.g. Young, Hwang, McDonald & Oates, 2010), for example because these environmentally friendly alternatives are more expensive than regular alternatives or because people do not easily deviate from what they regularly do (Klöckner, 2013).

After companies have overcome their internal cultural barriers, they face **problems with operating a circular business in a linear system** (Kirchherr et al, 2017). Due to these problems, many circular business models lack economic viability. This is for example caused by not including negative external effects in prices (Rijksoverheid, 2016), resulting into low prices of raw materials and high upfront investment costs. A specific example of problems related to the implementation of circular products in a linear system is the limited availability

to charge electric cars, making the adoption of these technologies less attractive to companies (Lane & Potter, 2007).

The third category of most pressing barriers are **regulatory barriers**. These refer to laws and regulations that slow down or even prevent the transition to a circular economy. The Dutch government has set itself goals for 2050 to reduce the extraction of resources while maintaining economic growth and safeguarding natural capital (Rijksoverheid, 2016). In a state-wide programme they have planned five interventions that help them reach those goals. They want to implement stimulating regulations to remove barriers and to make room for circular initiatives. They also plan to implement what they call 'smart market incentives'. By including externalities in prices, the transition to a circular economy is stimulated. Stimulating financial investments in circular business models is a third cornerstone of the government, just like developing the infrastructure necessary for knowledge exchange in networks. Lastly, international collaboration is on the agenda because the transition to a circular economy requires change across borders.

The last category of barriers mentioned in the paper by Kirchherr and colleagues (2017) consists of **technological barriers**. A lack of proven technologies to implement circular economy principles may slow down the transition. Related to this are the (perceived) risks associated with new technologies (Weelden, Mugge & Bakker, 2016). Although Kirchherr et al. identified this as one of the most pressing barriers, they also mention that the stakeholders they interviewed believed technological barriers were not the main barriers to the transition to the circular economy. In the whitepaper they do not clarify why they decided to include this as one of the pressing barriers while only few stakeholders view this as a problem. During our interviews we also only rarely encountered stakeholders who suffered from technological barriers.

Finally, another important barrier to the transition that is mentioned in the literature relates to the possibility to find **financing for circular products**. Whereas the value proposition of linear products is based on selling the product, circular businesses often rely on selling the use of these products. This requires a change in the way financial institutions evaluate circular business models: rather than focusing on immediate financial gains, these institutions should appreciate long-term aims and goals (ING Economics Department, 2015) and take natural capital into account (Achterberg & van Tilburg, 2016)

Methods

Based on the knowledge that we obtained from existing literature, we constructed a set of interview questions. The interviews started with general questions on the activities of the organizations and continued with more specific questions on barriers and best practices. We specifically asked the interviewees whether they were lacking knowledge and what collaborations they already had and which were still missing. The interviewees were split into three categories: stakeholders relevant for a **business-to-business (B2B)** perspective, stakeholders that could provide information about the **business-to-consumer (B2C)** perspective and organizations that we specifically asked about the **financing of circular business models**. Figure 1 shows the methods used for the research.

In the analysis phase we first explored the data to identify the five main barriers that were relevant to the stakeholders we interviewed: a lack of knowledge on the circular economy principles; lack of system integration, coordination and communication; problems related to financing circular business models; a lack of consumer awareness of the circular economy; and problems related to government support and regulations. We then analysed the interviews more thoroughly to get a clear definition of these barriers and its subcategories. In the following chapters we describe each of these barriers, we identify subcategories and we provide examples of these barriers. In addition to that, we discuss how best practices of other organizations can be of use to these organizations that face a specific barrier.

Finally, the outcomes of our research serve as input for workshops on the Circular Minds Conference 2018. Moreover, stakeholders that face certain barriers may connect on this conference with stakeholders that possess the suitable best practices!

SMO Promovendi #Circular economy

Closing the Knowledge Loop in Circular Economy! – Research Method

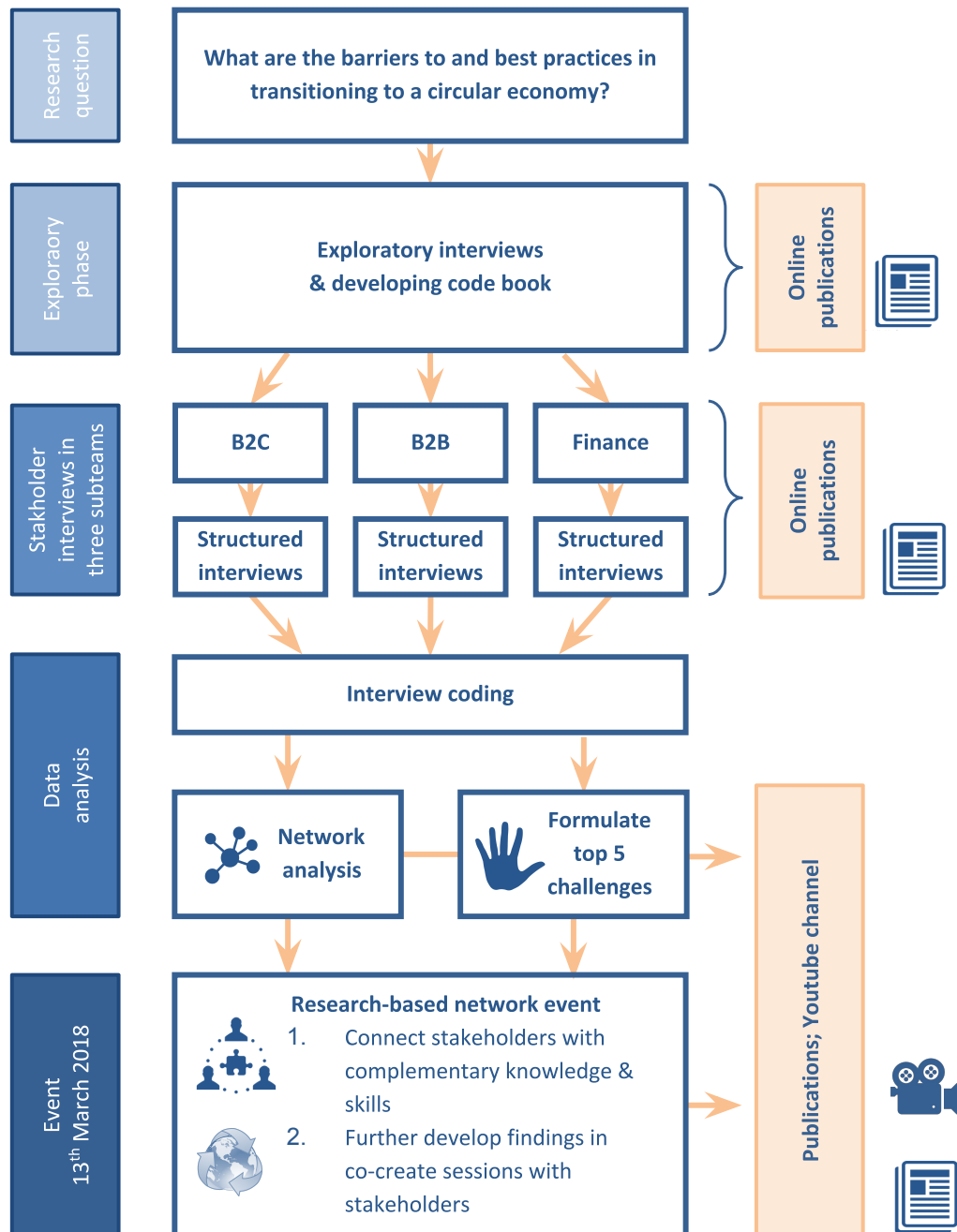


Figure 1: An overview of the interview methods that we applied. Based on existing literature and tentative interviews, interview questions were formulated. Stakeholders were selected in different sectors: business that are aimed at consumers (B2C), or at other businesses (B2B), and organizations that are relevant for financing (circular) business plans. Based on the interviews, 5 main challenges (barriers) were identified. The outcomes serve as input for the workshops on the Circular Minds Conference 2018.

CHAPTER 2. GAINING CIRCULAR KNOWLEDGE

Eduard van Ravensberg & Pritish Bose

A major problem with the transition to a circular economy is that both businesses and consumers are lacking the relevant knowledge to make this transition happen. For instance, they don't know what circular economy really is, how to implement circular practices or how and where to make consumers buy circular products or services. This chapter contains an analysis of in-depth interviews on the barrier of lacking circular economy knowledge. Lack of circular-economy knowledge can be defined as missing necessary information or skills, that may be acquired through experience or education, to work towards a circular economy.

First, an analysis is made of the different barriers/challenges concerning knowledge. Secondly, an overview is given of different best practices of interviewees that have in one way or another overcome lack-of-knowledge barrier. Finally, conclusions and recommendations are presented to help others gain knowledge of circular economy.

The knowledge barrier

For companies to be part of a transition towards the circular economy, it is necessary to have the right knowledge. They need to know how, why and what is needed to change their business from linear to circular. However, due to the novelty, complexity and disruptive nature of circular economy, people seem to lack the proper knowledge. From the analysis of the interviews, the knowledge gaps identified are categorised under five different aspects: relatability, transition, validation, product life-cycle analysis, and awareness.

a. Relatability: Theory of Circular Economy (What? Why? How?)

The term **Circular Economy (CE)** is the new buzz-word of the 21st century. As interesting and thought-provoking as it might sound, a majority of the industrial community still lacks one common systematic definition for CE. From the eyes of many individuals and organisations, CE is perceived as the next version of sustainability. Although in some ways this might be true, the underlying fact that is often ignored is that sustainability is a concept primarily used in a linear economy where waste is produced. Whereas CE, in ideal terms, is a concept of looping the economy such that output of process(es) is input for other process(es).

From the interviews it is evident that there is a general shift in the motivation among industries to know more about the CE. In the Netherlands, there has been a steady increase in the participation of organisations in events related to CE. However, some of them find the "way" of explaining the concept of CE too complex. According to a few interviewees, both the technical and economical aspect of CE should be described in a more simplified manner and in a way that gives them a clear overview of what CE entails. For example, Rob Oomen from C-Creators mentions that they *"miss the technical knowledge of CE, for instance to carry out a Life Cycle Analysis"*.

b. Transition: Putting Circular Ideas into Practice

While most stakeholders have heard of CE and can even explain in their own words what it entails, not many companies have put CE into practice. For example, for those that are willing to become circular, a key issue are the technical requirements. Changing from linear to circular, a company is suddenly confronted with new questions.

Questions they often ask themselves is: can my product be recycled or can the materials be reused? To answer these questions, one needs to know if all the materials in their products are suited for recycling or reusing. This is easier for simple products such as a wooden table than for complicated products such as a computer. The latter contains many different materials that are attached to one another. One also needs to know how to ensure a product is recycled after the end of its life cycle. For instance, a building contains many recyclable materials but after 40+ years it is hard to tell if those materials are still adequate and how they can be recycled. This could be solved if biodegradable, reusable and/or eco-friendly materials were used during the built phase, but also 'material passports' which contain information where the material came from and would indicate the health status could be of tremendous help.

Another question that stakeholders often struggle with is: Can used materials be reused in my production process? In the glass and paper industry it is common practice to use a percentage of used materials for the production of new products. However, this is not the case in other industries. Finding suitable materials involves thorough research, analysis and testing for the right functionality, quality and a steady supply. This requires a lot of knowledge and collaboration. Mark Beumer (Het Groene Brein) says for example that *"supply chain collaboration is key"* in order to produce circular products. At the moment, there are simply not enough materials being recycled or made recyclable to fulfill those requirements to conduct good research and make circular products accordingly.

c. Validation: Circular Sales

A lack of knowledge by consumers can also be an issue. Some companies that have circular products indicate that they have difficulty selling their products, especially when a market is ruled by price and a circular product is more expensive than an average product. As knowledge of circular products is missing, it is hard for companies to show what being circular adds to their product in terms of value.

The problem is two sided: on one hand, companies lack the knowledge to properly communicate with buyers, and on the other hand, buyers lack the knowledge to see the additional values that circular products have. This aspect is closely linked with communication and awareness (see chapters 3 and 5).

d. Product life-cycle analysis: from conception to implementation.

A product is termed circular when all the raw materials required to produce it can be either replenished and/or safely disposed of in the environment without any negative impacts. To do so, the complete life-cycle of the product has to be analysed to understand the stages where the recovery or disposal of the product or its parts will be most efficient. In this way

the recycled and refurbished parts of the product can be used in manufacturing new products, which can have significant impact on the cost of raw materials of the product.

The **design rules** for such a (circular) product are often referred to as **cradle-to-cradle (C2C)**. Specifically, designing a product along the lines of C2C requires industries to:

- i. **Envisage** the complete product-lifecycle.
- ii. **Design** the product such that (parts of) it can be easily recovered or disposed.
- iii. **Implement** the production process which is again circular in nature.

A major concern of product-based industries is that they find it difficult to envisage the complete product life-cycle. They find it difficult to look beyond their own organisation and consider the entire chain. A related challenge is given by Thijs Maartens of the Cradle to Cradle Product Innovation Institute in relation to Cradle to Cradle (C2C) and CE. He states that *"C2C is a design problem, not a resource problem"*. So the problem is to change the current production infrastructure to meet the guidelines of CE/C2C, i.e., the design and implementation steps.

"C2C is a design problem, not a resource problem"
- Thijs Maartens, Cradle Product Innovation Institute

e. Awareness: the reason why

Some companies are simply missing a reason to become part of a circular economy. The primary reason for circular economy advocates is intrinsic motivation: the realization and belief that we need to do better for the environment and for society. But for critics, who do not have intrinsic motivation, it is difficult to look at CE from a business perspective; they find it hard to see commercial value in being better for the environment and society. They lack knowledge on the possible benefits that being part of a circular economy can bring them. Overall it seems that for many companies it is difficult to turn the concept of CE into a working business model.

Best practices and suggestions from the field

A lack of knowledge about the intricacies of transitioning to a circular business model is indeed a substantial barrier that most businesses are facing. However, there are those who have found ways to, to a great extent if not completely, incorporate a business model that will pave the way towards a successful transition. These best practices have been categorised in two types: knowledge of the product and knowledge of the process.

a. Knowledge of the product

People are hesitant to take the first step. However, once you get started a lot can become clearer along the way. This is proven by some of the circular companies that exist today. These companies make a transition possible because they have a lot of knowhow about their products. By properly informing and educating people in the organisation, a way to

implement CE can be found. Many of the innovations we have today were deemed impossible in the past. But with time, patience and effort they were made a reality.

Deventer Profielen has proven this by researching and adopting a completely new mix of raw materials for their product. They have revolutionised the traditional PVC-based rubber that is used in manufacturing windows and door sealings into eco-friendly and biodegradable polymer-based rubber. On their way to achieve this commendable feat, they motivated their suppliers to provide these customised raw materials at approximately the same costs as the traditional materials. According to Deventer Profielen, the first step towards a circular product is to find biodegradable, reusable and/or eco-friendly alternatives to existing raw materials of the product. Needless to say, this step requires extensive research and in some cases close collaboration with academia.

b. Knowledge of the process

An important aspect of a circular business model is to have a process that *ideally* does not generate waste. With present technology, imagining the possibility of such a process tests the depths of our practicality. However, in a more realistic notion, a process might be designed to recover as much waste as possible to be reused while the rest can be disposed-off safely into the environment. Using renewable energy sources to power the production facilities is yet another step towards making the process more circular.

One such best practise was found while interviewing Miscancell B.V. The process used by them to extract cellulose from *miscanthus* is very sustainable in the sense that they have found the market for all the by-products produced during the extraction. Currently, they are aiming towards zero-waste distillation facility. Moreover, the plant miscanthus was chosen because of their ability to absorb a large amount of CO₂ from the atmosphere (approx. 50 tonnes of CO₂ per hectare per year).

Conclusions

Incorporating a circular business model is, arguably, a task that requires all stakeholders in a value chain to understand the importance of transitioning from a linear business model to a circular one. This understanding stems from gathering knowledge about what CE is and how to get there. Businesses have the drive and passion to make CE a reality and they are taking efforts by attending workshops, organising events, making sub communities to share their experiences and learn from others.

As is true for any change, this transition also comes with many challenges that are to be overcome. There is a knowledge gap which is causing a hindrance to the industries in their transition. Organisations involved in educating industries about CE are coming up with novel ways to simplify the concepts, but somewhere the industries feel the need for more practical examples. Confidence in an innovation comes when one sees the concepts being successfully applied. Validation plays a vital role in the transition phase. Even then, the challenge lies in the varied nature of businesses. One can argue that the methods applied successfully to one organisation will have different degree of success when applied to another.

Challenges, however, are meant to be overcome. Interviews have shown an increasing interest within both large corporates and start-ups towards realising the transition to CE. Companies like *Deventer Profielen* and *Miscancell B.V.* are one of the many who have already made advancements in their leap towards CE. New technological advancements and product design techniques, which are more efficient and increase the product-life cycle, will help product-based companies to design new business models. Bridging the gap between academia and corporate will help more and more organisations to help them gain confidence and design business models which are more robust and green. Designing a viable business model will then help them garner the support of more investors thereby taking us one step closer to realising our dream.

CHAPTER 3. CHANGING THE SYSTEM: COMMUNICATION, COORDINATION AND INTEGRATION

Bram Bet, Joris Broere & Judith Kas

A transition to a circular economy involves many different partners and has an impact on society as a whole. One motivated actor is not enough to make a change - the whole production, supply and consumption chain needs to be involved and collaborations between chain partners are required. This chapter covers issues related to integration in the system: to what difficulties and opportunities does the complexity of a (change towards a) circular economy lead? What are barriers to this transition? And how have may certain stakeholders have overcome these problems? These issues relate to the second barrier mentioned in the white paper by Kirchherr and colleagues (2017): **market barriers**. We interviewed start-ups and other businesses, consultancy firms, government and several non-profits and experts about this topic.

Barriers posed by the system

Many of the stakeholders that we interviewed indicated that there is a lack of communication and coordination between chain partners, sectors and between producers and consumers. A product can only be circular if the entire supply chain is circular. Many circular companies have to operate in chain where the other (supply) chain partners still work in a linear system. This can be due to a lack of awareness or knowledge at chain partners, technological reasons or simply that the market is not viable. Based on the interviews, we identified a number of reasons for this lack of communication and coordination, and more general, of integration in the system.

a. Circular principles in an old linear system

Firstly, many of the stakeholders we interviewed indicated that a reason why coordination is a barrier to a transition to a circular economy is that individuals, businesses and governments are all used to operate and make decisions in a linear system. Implementing circular principles in the old linear system leads to problems. For example, Chantal Engelen from Kromkommer says: *"An issue is that these new businesses function in a way that is totally different from traditional businesses, but these differences are not necessarily reflected in lower costs. These new businesses thus have to find other ways to compete with existing businesses. However, existing chain partners are not used to this. The new businesses operate in a new way, but in the old order, which leads to inefficiency."* However, there are large interests in maintaining the current situation and shifting to a new paradigm simply takes time.

"New businesses operate in a new way, but in the old order, which leads to inefficiency" - Chantal Engelen, Kromkommer

b. Need for transparency

Another reason why the transition is hampered is that transparency and collaboration between chain partners, sectors and consumers is not always attractive to individual organizations from a logistics and marketing point of view. Sharing information, data and ideas is perceived as high risk. As long as the (monetary) value of implementing the circular concept is not clear, it is not attractive to take the risk. Thijs Maartens from C2C Certified says: *"It would be good if we could make a map of all circular initiatives. This would help us understand where we stand and will help different systems to move to circularity. To be able to take the next step, there needs to be a coherent value proposition of CE and alignment of what companies are doing, research and governmental guidelines."* Other stakeholders mention that there is a lack of successful examples of circular projects that other organisations can learn from.

c. Complex concept

A third issue that is related to the previous one is that circular economy is a complex concept that is not easy to understand, communicate and implement. An essential element of the concept of circular economy is to minimize waste products: for instance by making the output of one process is used as input for the next process. This requires that products are collected and reused or recycled when they are not used anymore. Depending on the type of product, taking back products is complicated. A relevant question that arises is who should be responsible for taking back and recycling the product and materials. Dennis Kamst (Klooker) does not think this is necessarily a task for a single company, but that this is subject to a societal discussion.

Production and consumption of products are spread out over many countries, so changing supply chains requires collaborations with many different actors. For example, Mariska van Dalen, who works for consultancy and engineering company Bilfinger Tebodin NL, told that if they work with country-specific clients, it depends on the strategy of the head office if innovation is approved, which makes it sometimes difficult to close value chains local. To get a grip on the process as a whole, many stakeholders have to be involved. And as Debbie Appleton from Turntoo states it: *"the more actors involved, the slower the process"*.

Best practices and suggestions from the field

These reasons for a lack of coordination seem substantial or even hard to overcome. However, the frontrunners that are already paving the way towards a circular business have valuable knowledge to make the transition. From our interviews, we identified a few major categories of existing knowledge that the circular actors bring into practice, and the best practices that follow from these.

a. Supply chain knowledge

Firstly, many businesses that offer a product which is produced in a circular chain have a thorough understanding of these supply chains and their (potential) role in it. From this knowledge of the supply chains in the relevant or related sectors, both in the traditional (linear) and a potential circular case, opportunities can be discovered to close the chain or to branch off a side stream of materials to be reused. For instance, the founders of

Kromkommer already had experience with, and knowledge of, the supply chain in the food market. From this knowledge they could identify the waste stream of oddly shaped vegetables and fruits, offering a way to prevent food wastage as well as a business strategy. Also, the C2C Certified institute indicated that they had the knowledge of ways to use reuse or recycle materials.

b. Circular network

Secondly, many of the interviewed parties mentioned that they had the knowledge or experience to engage or bring together partners in a circular network. Obviously, a (system of) circular chain(s) involves more parties that interact in a more complex way than in the traditional linear chain. To bring these together, all parties must be on the same wavelength and share a sense of urgency to make a transition to a circular economy. This might need the help of an external party, according to het Groene Brein: *"Supply chain collaboration is key and you need an independent facilitator/ manager to implement this."* Also, the Circular Valley/C-Creators mention that they take up this role and helping businesses by *"connecting them to housing corporations, the municipality and banks to resolve their issues"*. According to Bilfinger Tebodin, the important thing is to get the people on the table that actually make the decisions, especially budget holders.

c. Share knowledge

Finally, many of the stakeholders mention that it is very important to share their knowledge and best practices. There is a major need for knowledge-sharing platforms or network organizations, according to Klimaatverbond Nederland. This is also acknowledged by Bilfinger Tebodin, who value the communication of best practices to be learned from by other parties. Moreover, as the Delta Development Group mentions, the bad practices might be even more useful *"since they are universal, while the good practices are bounded by specific case conditions"*.

Conclusions: solving barriers with best practices

We have seen that circular businesses experience major barriers trying to operate in mainly linear systems. Common problems are the communication and communication between different stakeholders in the supply chain, making an integration in the system difficult. However, at the same time new (third party) actors are entering the market that are specialized in solving these types of problems. A good example is 'het Groene Brein', who help facilitating circular supply chains. Moreover, there are many examples of knowledge sharing and network platforms like 'het Gelders Energieakkoord'. Finally, also the government is showing ambition with initiatives like 'het Grondstoffen akkoord'.

CHAPTER 4. UNDERSTANDING THE VALUE OF CIRCULAR BUSINESS MODELS

Sandra van der Lee

What does it mean to develop a circular economy on a practical level for both businesses and the financial industry? Many circular businesses struggle either with their business model or with getting the value of their business across to investors. After all, financial value is not the main aim of the circular entrepreneur. A part of our exploratory interviews was focused on financing circular business models. The semi-structured interviews we have conducted have been analysed on current problems with financing the circular business models, both as a barrier not yet broken through and as a challenge to overcome through best practices. In this chapter different barriers related to financing circular business models are identified and some best practices are described.

The barrier of financing circular business models

Circular businesses are often dependent on external financing. Therefore, to find investment it is important to have a strong business model. Circular businesses need to show financial performance to attract financiers, but without initial investment it is difficult to develop a track record to prove this. In order to understand this barrier and how investors and startups can become stronger actors in the transition towards the circular economy, we need to find out and understand how startups present their circular business models and how financiers perceive these unique businesses.

Many of the interviewed stakeholders believe that circular business models have a disadvantage over linear models. The financial system is considered conservative and not ready for the transition to a circular economy. For start-ups, the difficulty of finding finance falls into three categories: (a) creating a clear value proposition, (b) lack of track records and (c) need of new financial products. Changes are needed both on the side of circular businesses and the financial industry to make a transition to a circular economy possible.

a. Clear Value Proposition

Start-ups highlight the difficulties of creating a solid and viable business case as the primary barrier to realising their circular business plans. According to dr. Bocken (TU Delft) and CE expert Christiaan Kraaijenhagen, a clear value proposition for circular business models is needed. A typical value proposition describes the benefits that customers can expect from the products and services (Osterwalder, Pigneur, Bernarda and Smith, 2014).

Tools to create a value proposition tend to focus on just one dimension of the **triple bottom line**: financial profits, environment or social impact. According to Bocken, a triple value proposition is needed in which all three dimensions are incorporated. Therefore, a shift from a customer focus to a full stakeholder network to include the wider society and environment is needed. In existing literature, different attempts are already made to include these three dimensions but in more knowledge is needed how these concepts work in practice (Bocken, Short, Rana and Evans, 2013). This becomes particularly clear when one takes into account

that currently the majority of the customers is only interested in the financial benefits of a product or service.

b. Lack of track records

It is not easy to measure the comparative advantage that most circular businesses have over linear alternatives, because it is based on predictions. Very often, the total costs over the whole life cycle of a circular product or service are not known. Linear business models are focused on financial performance through creating profits and maximise short return on investment. In contrast, circular business models focus on circular design, optimal use, value recovery, network organisation or a combination of these categories (Achterberg, Hinfelaar, and Bocken, 2016) with a comparative advantage mainly based on future resource prices and residual resource value. Maximizing profit is not their main gain and the return on investment is not maximised on the time period.

The financial industry considers circular business models as high risk because of the lack of track records and uncertainties about the future value of materials and resources. Investments are done based on traditional principles of minimizing risk and maximizing return. According to Circle Economy, investors are looking for "hypergrowth" instead of stable businesses with a slow return on investment. In addition, Bert Kornet of the Dutch Ministry of Infrastructure and Water Management explained in an interview that circular business models cannot always compete with linear business models. If all external effects (e.g. environmental pollution and carbon emissions) of using raw materials would be taken into account, circular business models could become much more competitive.

c. Need for new financial products

The circular business model has an impact on the cost and revenue structure of the business. The flows of money in the circular economy are different than in the linear economy, and the financial industry is proving by their product offering, not to be ready for this change. According to expert Arthur ten Wolde (MVO Nederland), financial actors are currently struggling "*to understand and evaluate the business stance of a circular proposition*". An interesting example is the "Product-as-a-Service" business model which has a different cash flow structure than the traditional business model. In case of Product-as-a-Service models, a shift takes place from ownership to use, this directly impacts the cost structure of the company but also the financing requirements. The cost structure is different in comparison to traditional products because besides constant costs of service delivery (manufacturing and installation), costs for repair and maintenance during the use phase may arise. Predicting the costs of this last category is difficult which creates uncertainties and makes the business model less attractive for financiers. Aglaia Fischer (Sustainable Finance Lab) stated that The Dutch financial system is conservative and therefore these kind of business models are difficult.

Het Groene Brein explained that: "*instead of a one-time transaction, a supplier in most circular models engages in a long-term relationship with a client and keeps the responsibility for products and related resources*". This responsibility is key and challenges the financial industry to find new financial products offerings suited for these new cost and revenue structure. New financial products are needed to finance the ownership of products for a

longer time than in a linear model, as revenues are based on “use” and on multiple payments during the lifespan of a product. These new financial products require more emphasis on the optimization of cash flows, because they create a longer lasting financial relationship with clients (ING Economics Department, 2015).

Best practices and suggestions from the field

a. Education

A triple bottom line approach is needed to create a unique kind of value proposition: the **Triple Value Proposition**. Currently, the value proposition is focused on the customers and the majority of this group is interested in the financial benefits of the product or service. The different cost and revenue structure of circular business models makes it necessary to create a secure and stable cash flow through contracts and this is only possible when customers understand the benefits of this longer lasting financial relationship (e.g. not having to maintain or repair a product). Education will be key in creating this consumer awareness (see chapter 5). Besides that, a wider range of stakeholder interests need to be considered, with aim of embedding circularity into business processes (Bocken, Short, Rana and Evans, 2014). Caroline van Leenders, transition manager of Rijksdienst voor Ondernemend Nederland (RVO) brings people leading in the transition together in Communities of Practice (CoP) to share knowledge within the group but also to give advice to the outside world.

b. Changing the way models are assessed

Changing risks due to resource scarcity should change the way the financial sector assesses new types of business models. Whereas linear business explains why the benefits for the customer outweigh the costs, the Dutch Ministry of Infrastructure and Water Management suggests *“circular businesses need to emphasize that investing in their business now, at the beginning of the transition, is a big investment opportunity”*. According to Circle Economy, financiers should base their assessment on *“long-term metrics, define long-term objectives and incentivize the entire investment chain to focus on these factors”* (Achterberg & van Tilburg, 2016). Frido Kraanen (director sustainability, PGGM) suggests an internal training for banks to understand investments in circular business models.

“Circular businesses need to emphasize that investing in their business now, at the beginning of the transition, is a big investment opportunity”

- Bert Kornet, Ministry of Infrastructure and water management

c. Different financiers

Although different banks expressed interest in supporting and financing the circular economy (ABN AMRO 2015; ING 2016; MVO Nederland 2016; Rabobank 2015) actual investment is limited. According to Frido Kraanen (PGGM) the access to finance should be increased with private-public initiatives. Different players and forms of capital will be needed

to finance circular business models. Both experts Arthur ten Wolde and Frido Kraanen are missing a level playing field and suggest that the government should intervene with taxes.

One of the best practices in the field is Kromkommer, the company successfully used crowdfunding. A benefit of crowdfunding is that the environmental benefits of circular business models as well as economic returns are taken into account. Although financing a circular business from personal equity is not possible for every startup, both Tulper and Dopper are successful examples of this practice. The founder of Tulper explained his reasons for this decision by saying: *"before I started, I talked with a lot of people and organisations; the conclusion was that the procedure for finding investment is way too long and complicated"*.

Conclusions

In order to create a financial system that is supportive towards the transition of the circular economy, change is needed from both circular businesses and the financial industry. Businesses need to present their business model in a way that makes the financial benefits of their business in the future clear. For the financial industry, a change is needed in the way risks are evaluated. Assessing circular business models requires different risk models and evaluation methods to estimate future value of resources and residuals. More knowledge needs to be gained about the differences in assessing risks and opportunities of linear and circular business models. Long-term metrics and objectives should be part of this new kind of assessment. Accordingly, new financial products need to be offered taken into account the longer financial relationship with customers of circular businesses. A Triple Value Proposition could be part of creating an understanding about the importance of contracts with a longer financial relationship.

CHAPTER 5. BREAKING THROUGH MENTAL BARRIERS

Eline Leising & Thijmen Nuninga

How are consumers participating in the transition to a Circular Economy? Are they the driving forces, or just not...yet? If circular businesses want to reach their goals, naturally consumers must be on board. The need for and lack of awareness and action (also see Rijksoverheid, 2016) on the side of the consumer was one of the recurring themes in the in-depth interviews with Kromkommer, Tebodin, Delta Development Group, C2C Certified, Food Cabinet, Miscancell, Circular Change and Dopper. A lack of awareness is defined as the (perceived) need for breaking through an established way of thinking in order for consumers to change their purchasing preferences to circular alternatives.

In this chapter, we first set out the barriers identified by different types of stakeholders (par. 2), then proceed to the best practices offered in the field (par. 3), and we conclude with recommendations to improve consumer awareness about the circular economy and circular products.

The communication barrier

For a business to succeed, it is crucial that its message is heard by potential customers. Whereas for most linear businesses this means explaining the advantages for the consumer as outweighing the costs of the product or service, for circular businesses this generally means explaining how their business model is circular and why that is important. Getting that last message across, however, has proven not be an easy task.

Most business interviewed, whether (un)successful start-up, successful start-up, scale-up or corporate indicate that one of the great barriers in transitioning to a Circular Economy is reaching consumers (e.g. Wastewachters, Klooker, Miscancell, Dopper).

For start-ups the lack of awareness, generally speaking, falls into two categories:

- (a) the circular component is not perceived as (sufficiently) valuable or
- (b) the circular business model invokes scepticism regarding feasibility.

Scale-ups have generally tackled both (a) and (b) for their target audience, but struggle to reach beyond that audience. In scaling up, companies encounter the first of the two barriers again.

a. Circularity is not perceived as valuable per se

Entrepreneurs and knowledge partners alike attribute the fact that the circular business model is not seen as a valuable aspect of the product or service itself by a consumer with a conservative mindset. This conservative mindset has many faces.

First, circular products are often less attractive compared to their linear alternatives, for example because choice is still limited or because people are afraid the quality of this products is lower. This is a problem for all circular businesses together, as well as a problem

that individual businesses face. The problem that all businesses together face is that it is difficult to cater to the idiosyncratic preferences of consumers: there simply are less circular alternatives (both indicated by Instock). The problem for an individual business is that since consumers are reluctant to switch, a circular product will need to be 'better' or 'easier to use' than the linear alternative for it to work (Circular Valley). But consumers are afraid the quality is less. Combine that with the fact that 'waste' currently still has a negative image (as noted by Wastewatchers) and the circular business has a tough message to sell.

Second, as indicated by Het Groene Brein, consumers use familiar products in a familiar way. For instance, although the sharing economy may work for certain product types (e.g. drilling machines), for other product types people will want to keep ownership because they like to keep the ease of the ownership (e.g. clothing and other fast-moving consumer goods). As Triandis (1980) argued and Ouelette and Wood (1998) agreed, if certain behaviour becomes a habit, the influence of intentions becomes weaker.

Third, Klooker pointed out, even if consumers recognize some value of circular products, that they often do not have the time and energy to discover how to consume more sustainable, causing consumers to stick to what they know. And even if they are willing to put some time and energy into it, the concept of the circular economy is contested. To some extent, Turntoo argues, it even has been the victim of inflation. Many companies use the term loosely, sometimes even for 'greenwashing'. Certification labels could remedy this, but currently there are so many certification labels with their own standards, that this is not very helpful either. This may result in making the task of communicating the message to consumers more difficult.

b. Circularity invokes scepticism about feasibility

Unlike linear business models, circular business models often automatically meet a certain degree of scepticism about their feasibility. This is closely linked to the conservative mind-set identified above. In a different context, Maurits Groen described politicians as not being leaders but followers. That statement is closely linked to the more generally expressed problem that consumers are reluctant to commit fully (e.g. by Waste4me): they first want to see something work before they adapt their behaviour and purchasing patterns. Of course, certain linear businesses may face similar scepticism. After all: they are start-ups and often cannot identify any past experience with the particular business. The problem for circular businesses, however, is that there is no one else to point to either. As Instock indicates, there simply are not enough successful circular business models to use as examples

Best practices and suggestions from the field

As difficult as communicating the message of the circular economy to consumers may be, some businesses certainly do succeed. Based on the interviews we have identified four categories of best practices: (a) building a community, (b) using the right strategy, (c) leading by example, proving feasibility and (d) facilitating the dialogue about Circular Economy.

a. Building a community

One of the best practices in the field is community building. Kromkommer, for instance, created a community around their product by telling their story the lost fruits and vegetables in overproduction to their target group. In getting a focussed message across to a targeted group, a start-up is thus able to create a primary customer base. Other stakeholders, such as WasteWatchers and Turntoo, also indicate that focussing on an audience that is willing and committed helps the business to succeed in early stages. Building a community thus means identifying the right target group for your product or service.

b. Using the right strategy around a target product

Another seemingly successful practice is, somewhat obviously, lightening the consumer's load in switching to a circular model. Consultants, advisors, and entrepreneurs alike indicate that if the product is simply easier or more fun to use, consumers will be far more willing to switch. Two suggestions for strategies are worth mentioning explicitly: start with relatable things and keep it simple. The first ties in nicely with Kromkommer's community building, although instead of identifying the right people, this concerns the preceding step of selecting the right product. Building a community is much easier when the product is more relatable, such as in the case of Dopper. The second relates to the alternative proposed. Even if there is a community for the product and the product is relatable, if it is very difficult to use in practice (for instance due to a burdensome recycling scheme), consumers will likely save themselves the hassle and stick to the linear alternative. Hence, businesses are encouraged to use the game approach and make products easy and fun to use and reuse.

c. Proving feasibility to consumer: leading by example

The skepticism around circular businesses and circular business models as identified in paragraph 2 can be overcome by showing that it's possible. Circular start-ups can become living example of the feasibility of alternative business models. In the Circular Valley in Hoofddorp this concept is implemented by showing real life inspiration from circular projects around. Circular Valley accelerates the transition to the circular economy in the metropolitan area of Amsterdam by means of research and circular pilots. They also have different programs to support circular initiatives and circular startups with funding and coaching.

d. Facilitating the dialogue about CE

A final best practice in overcoming the conservative mindset is facilitating a dialogue about the urgency of the circular economy and the value of circular business (models). Here, role play games can offer support, as investigated by researchers from Wageningen University. The role play game helped to shift the perspective and started the dialogue between participants. Games help to better understand the position of others. This is especially interesting for the Circular Economy, because a shift to a more circular economy requires a shift in the way people interact. Organizations will have to share information, data and ideas, and although it has a positive result for society, it involves a risk for the individual organizations. This change requires a dialogue between stakeholders and games may help to start this dialogue.

Conclusions and suggestions: as the business changes, so must its communication

Businesses proposing a circular business model faces the challenge of (a) convincing consumers of the value of their products as circular products, and (b) eradicating scepticism about the feasibility of their plan.

For start-ups, one of the most promising tactics in the field is Kromkommer's community building. Not all products will have their own fan-base, of course, but focussing on an audience that is willing and committed helps the business to succeed in early stages. Using social media groups and targeted advertising, the business is enabled to reach those who already think positively about circular businesses. Since those thinking positively about the circular economy are more willing to consider a change and a small set-back in convenience, they are the most promising candidates to become the first customers.

Once that core audience has been reached and the business started, however, the challenge is to reach a broader audience. This is considerably more difficult. After all, for the broader audience both challenges very much remain. The upshot of only trying to reach this audience *after* the community has been built and the company has begun production or service provision is that it is now possible to point to past experience as proof of feasibility. Consumers may not be leaders, but the broader audience does not need to be.

The general challenge that, in the end, consumers want ease of use and diversity in supply is particularly pressing in reaching a broader audience. The fact that there now is a community that values this product highly may change the mindset of the broader audience, too. It is likely, however, that this audience will remain conservative and unwilling to change nonetheless. This remains a challenge the entire field faces, although there are suggestions for improvement.

It seems that keeping the use (and reuse) of the product simple and fun is of key importance in reaching everyone. Of course that means that complex recycling schemes are best avoided. We argue, however, that it can also be interpreted positively as an encouragement to seek to add another component that consumers find valuable. For instance, recycling products might be more fun if recycling is turned into a competitive game with other consumers. Products themselves might be made more appealing simply by focussing on making their appeal more luxurious. Adding such components might make the circular product more appealing even though the product itself cannot be improved beyond its linear alternative. Thus, this circular problem might have a circular solution: if the product itself can no longer improve, its by-products must.

CHAPTER 6. REGULATIONS AND GOVERNMENT SUPPORT

Anas Hassan, Yuxin Wang, Zhizhen Wang & Bram Bet

From a government's perspective, new regulations and investments are required in order to provide a sustainable economic future. On the national level, the Dutch government developed the government-wide programme for a Circular Economy by 2050, with the objective of a 50% reduction in the use of primary raw materials (minerals, fossil and metals) by 2030 i.e., utilise raw materials with much greater efficiency (e.g. via recycling). With this objective for the use of raw materials, the Netherlands sets its ambitions at a level adopted in comparable countries (A Circular Economy in the Netherlands by 2050, sep 2016).

In order to achieve such a goal, many barriers and obstacles need to be overcome, and new rules and regulations need to be set. Through new regulations and policies that focus on recovery and reuse of resources, governments can create the environment to limit waste and disposal or stimulate and accelerate decisions to move in this direction, in this way boosting the transition towards a circular economy. Moreover, governments can tackle most of the barriers (by offering subsidies, developing cooperative partnership, utilising procurement etc.) that hinder the transition towards a circular economy (A Circular Economy in the Netherlands by 2050, sep-2016). In this chapter, we discuss governmental policies and regulation that specifically stimulate or hamper circular practices through various policy schemes (e.g. subsidies, tax reduction, etc.), at local, national or international levels.

Regulation as a barrier for the transition

From our interviews with the 40+ stakeholders, two main barriers regarding regulations and government support were clearly standing out, namely a) a lack of regulations of policies that mention CE in particular, often due to a lack of knowledge of Circular Economy; and b) that the current regulations do not fully comply with requirements for circular systems. Below, we will elaborate on these two main barriers.

Apart from these two main barriers, a few other barriers were mentioned, such as a lack of governmental funding for circular initiatives; low or no interest in circular economy by governmental bodies; a lack of communication between local, provincial and national governments and the lack of legal obligations in participating in circular agreements (e.g. the energy agreement).

a. Lack of regulation or policy mentioning CE in particular

Bureaucratic procedures have been forming the biggest hindrance for a transition towards a circular economy, as mentioned by Waste4Me, who partnered with the Defense ministry as a launching customer. Government regulations should be rewritten to favour circularity, but these new regulations are lagging behind. For instance, Kromkommer points out that EU regulations on food production put too much emphasis on the appearance of the product, resulting in large waste streams of potentially edible food. Moreover, C2C Certified explains that the current regulations focus mostly on reusing materials and not necessarily on material health. Finally, Maurits Groen states that politicians will mainly look at what is feasible

and going on at the moment but will not take new initiatives: *"they are not leaders but followers"*.

b. Current regulations do not fully comply with requirements for circular systems

One of the main problems (as mentioned by the Dutch ministry of Infrastructure and Water Management) is that many official procedures or regulations, such as accountancy regulations, are tailored to a linear model in which, for instance, property (i.e. the product) passes to the consumer. If property remains with the business, or it is in the hands of another business, it is difficult to show within the traditional reference frame how this business plan works financially. Another example, pointed out by Waste4Me, is that getting site permits to build and operate an energy plant is quite a challenge in the Netherlands. Finally, we see examples in the field of energy and resources, where the fossil fuel prices are too low and the carbon emission does not get taxed, effectively almost subsidizing the fossil fuels. In this way, there is never a level playing field for circular initiatives to enter, states Klimaatverbond.

Best practices and suggestions from the field

From all the interviews that we conducted, only a single best practice surfaced that can be pursued from a governmental perspective: government programs that facilitate and promote circular initiatives. This best practice was put forward by the Circle Economy. Using the Defense Ministry as a launching customer, as done by Waste4Me, is a creative development of a government program to promote a circular initiative.

Conclusions and suggestions

From the main barriers that we identified from the interviews, it is apparent that the barriers mentioned most in the interviews relate in one way or another to a perceived lack of regulation or policies either mentioning CE or setting compliance requirements.

The interesting finding is that the barriers are in a sense connected to other categories. For example, lack of regulation or policy mentioning CE is connected to knowledge and awareness of CE amongst regulators. Consumers' level of knowledge and awareness translates into the level of awareness and knowledge the regulators have. With more data and interviews, we can have a better picture of the correlations between these categories and potentially discover the root cause of these barriers.

As for compliance requirements for circular systems, we cannot simply change all regulation because businesses call for it. Should regulations comply with requirements for circular systems? Or should circular systems comply with regulations requirements? The conclusion should lie on the dynamics between the two. Circular systems place new and involving requirements for regulations and policies. At the same time, cost-benefit analysis should be done to evaluate the change of regulations and policies. Here, the main question is to see how we can smoothen the transition to a circular economy, then surely the regulations must comply with circular systems first. This is not to say that circular businesses can ignore regulations, but that is a different debate altogether.

Successful experiences can be shared and used as the basis to inspire practical regulation/governmental support schemes. The Ministry of the Environment has a lot of programs in place and is really trying to make this work. The value of these programs is definitely confirmed by Circle Economy, however, most of the stakeholders do not seem to have been reached, as they all mentioned lack of regulation. The best practices (or best practices that are about to come to fruition) are their continued efforts to involve all stakeholders in the CE-model.

In general, a lot of stakeholders mentioned governmental regulation as a barrier, however, most stakeholders are not enough aware of government support. Regulations often follow policies, and policies are just the start to look at circularity. This indeed means that a lot of regulations will need time to be adapted to circularity. Since there is almost no best practice, the best way for policy or regulations to support circularity is to give circular initiatives the freedom to experiment. Based on their experiences, policies should be changed accordingly.

NEXT STEP IN THE CIRCULAR ECONOMY?

Judith Kas

What is the next step in the transition to a circular economy? What factors impede this transition and what best practices are already in place? How can we use existing knowledge to overcome these barriers? To take the next step in the transition from a linear to a circular economy, these are questions that need to be addressed. In this research we explored these questions to discover what accelerates a transition to a Circular Economy.

We learned that a lot of the knowledge that some stakeholders are lacking is actually the expertise of others and that barriers that obstruct a change in some organisations have already been overcome by others. To accelerate the transition, coordination and collaboration is necessary, both within and outside production chains.

Based on more than 40 in-depth interviews with circular businesses, knowledge institutes, governments, consultants, investors, network institutes and foundations, we identified the five most pressing barriers for a transition to a circular economy. In the first edition of SMO Promovendi the questions *what is a circular economy, why do we need it and how do we make the transition to a circular economy* were addressed. We now take the next step. We investigated where we are standing at the moment and what is necessary to move forward.

From the interviews it is evident that there is a general shift in the motivation among industries to know more about the circular economy. However, there are still many questions about **how to put this knowledge into practice**. By properly informing and educating people in the organization a way to implement circular economy can be found: many of the innovations we have today were deemed impossible in the past. Bridging the gap between academia and the corporate world will help more and more organizations to help them gain confidence and design business models which are more robust and green.

Because knowledge on circular products is missing, it is hard for companies to show what being circular adds to their product in terms of value. Entrepreneurs and knowledge partners alike stress the fact that the circular business model is not seen as a valuable aspect of the product or service itself to a **conservative mindset of the consumer**. Consumers are reluctant to commit fully: they first want to see something work before they adapt their behavior and purchasing patterns. Showing that the transition is possible can help to overcome this problem. Successful circular startups can become living example of the feasibility of alternative business models. Other ways to make consumers more willing to switch are community building, facilitating a dialogue about the urgency about the circular economy or engaging them with the end product of recycled material, and making the product simply easier or more fun to use.

Having thorough knowledge of the concept of circular economy and its implementation is not the only condition for success. Individuals, businesses and governments are all used to operate and make decisions in a linear system. **Implementing circular principles in the old linear system leads** to problems, but there are large interests in maintaining the status quo. Transparency and collaboration between chain partners, sectors and consumers is not always attractive to individual organizations from a logistics and marketing point of view.

Although this problem will remain when stakeholders are not willing to make a change, the number of stakeholders indicating that they have knowledge and experience with bringing partners together (more than 10) is promising.

In this publication we address a variety of organizations in different growth phases, of which startups were a large and important group. These startups highlight the **difficulties of creating a solid and viable business case** as the primary barrier to realizing their circular business plans. The financial industry considers circular business models as high risk because of the lack of track records and uncertainties about the future value of materials and resources. Investors are looking for “hyper growth” instead of stable businesses with a slow return on investment. A triple value proposition is needed in which all three dimensions (financial profits, environment and social impact) are incorporated. Changing risks due to resource scarcity should change the way the financial industry assesses new types of business models. New financial products are needed to finance the ownership of products for a longer time than in a linear model, as revenues are based on “use” and on multiple payments during the lifespan of a product.

Lastly, a lot of stakeholders mentioned **governmental regulation** as a barrier. Regulations often follow policies, and policies are just the start to look at circularity. Just as for circular businesses, governments can learn from and be inspired by successful examples of circular initiatives. Based on experiences and experiments, policies should be changed accordingly.

We have learned that although there are still considerable barriers to a transition to a circular economy, more and more organizations decide to take the plunge. With the increasing number of organizations engaging with the concept, knowledge of and experience with implementing the circular economy quickly rises. Knowledge exchange and close collaboration are key to the transition to the circular economy: many of the barriers that stakeholders face today have already been overcome by others yesterday. We believe a transition to a circular economy will be a transition through people. But for that transition to happen, people will need to connect.

The current take-make-dispose system is not sustainable. A transition to a **Circular Economy** is necessary. Circular businesses face considerable **barriers**. Circular economy is a complex concept, making it difficult to show the **added value** to consumers & financiers. To convince them, businesses should build a **community**, and circular products should be **simple** and **fun** to use. More **knowledge** of circular processes and products is needed, governments should **promote** circular initiatives, and financial institutions need to assess risks in a different way. Many of the **innovations** we have today were **deemed impossible** in the past. Others have already overcome these barriers, or have relevant **knowledge** or **expertise**. Knowledge sharing and collaboration come with certain risks. But we believe this is **key** to this transition. We, **young scientists**, believe that a transition to a Circular Economy will be a **transition through people**. For this transition to happen, people will need to **C O N N E C T**

LIST OF INTERVIEWEES

Organisation

Kromkommer
Ministerie van Infrastructuur en Waterstaat
CosWeCare
Circular Valley / C-Creators
EPEA NL
Tebodin

Delta Development Group

Houthoff Buruma
Het Groene Brein
Turntoo
C2C Certified
Wastewatchers
Food Cabinet
Klooker
Self-employed
Maurits Groen
Instock
Klimaatverbond
Gelders Energie akkoord
Circle Economy
Tulper
Baby2Cradle
Waste4Me
Natural Media Experts
Polytential
Wearever
Miscancell
Bureau Albatros
SGS Search
Clean Fuels
TU Delft, Homie
PGGM
De Groene Zaak
Circular Change
Sustainable Finance Lab
Dopper

Interviewee

Chantal Engelen
Bert Kornet
Patricia Jansen
Rob Oomen
Hein van Tuijl
Mariska van Dalen
Owen Zachariasse & Eline de Leeuw
Dolf de Jong
Mark Beumer
Debbie Appleton
Thijs Maartens
Thomas Luttkhold
Cas van Kleef
Dennis Kamst
Jasper de Lange
WakaWaka (among others)
Simone Wortel
Thijs de la Court

Elisa Achterberg
Richard Gabriel
Ingrid Sloots
Vincent Toepoel
Jim Bowes
Yuri van Engelshoven
Desmond van den Heuvel
Marcel van de Peppel
Jan Theunissen
Jeroen Kanselaar

Nancy Bocken
Frido Kraanen
Arthur ten Walde
Cristiaan Kraijenhagen
Aglaia Fischer
Merijn Everaarts

Dutch Awearness
NVP
ABN AMRO
Ministry of Environment and Infrastructure
NuoValente

Iris van Wanrooij
Felix Zwart
Hein Brekelmans
Andre Rodenburg
Jeroen Hinfelaar

SMO PROMOVENDI



Bram Bet

Bram Bet obtained his PhD in Theoretical Physics at Utrecht University in January 2018, which involved biological and non-organic swimming and 'surfing' particles of micrometer sizes, which he investigates through computer calculations of the fluid flows. In addition to physics, Bram has a broad social interest and likes to work together with PhD students from other disciplines in order to gain insights, an essential approach to realise a circular economy. Together with Monique de Ritter and Daphne Truijens, he has been part of the core team responsible for setting up the SMO Promovendi Lab 'Circular Minds' from the start. With this Lab, Bram wants to make an active contribution in creating a vision of young scientists on open problems concerning circular economy.



Judith Kas

Judith Kas is a PhD Candidate at the Sociology department at Utrecht University. She studies the social and institutional conditions under which the remarkable level of trust observed in the sharing economy can emerge, alongside the further social implications of these exchanges. Judith obtained both her BSc and MSc degree from Wageningen University, where she studied how consumers can be stimulated to make more environmentally friendly choices. Judith joined SMO Promovendi because she enjoys working on an applied, socially relevant topic in a multidisciplinary team.



Daphne Truijens

Daphne Truijens is part of the management team of SMO and initiator and coordinator of SMO Promovendi. She does a PhD at the Erasmus University Rotterdam on Philosophy and Economics. Daphne has a great passion for 'scientific valorisation'; the use of scientific knowledge for economic and societal purposes. SMO Promovendi offers young scientists the opportunity to make a great impact on society. By actively engaging in dialogue with stakeholders and working together with partners from the government and industry on projects, scientists discover and develop the added value of their academic knowledge and skills in practice. The Circular Minds project at SMO Promovendi, of which this publication is a part, is a good example of how a multidisciplinary group of scientists is working on a crucial social issue and help to speed up the circular economy in the Netherlands!



Sandra van der Lee

Sandra has a Msc. degree in Industrial Ecology – a double degree between Leiden University and TU Delft. In her graduation project she explored the possibilities of blockchain technology into the development of circular products. Besides that, she has an interest in entrepreneurship and followed the Climate KIC master programme. Sandra is part for SMO Promovendi for the second year and focused this year on financing circular business models.



Joris Broere

Joris Broere is a PhD candidate in sociology at Utrecht University. During his PhD he researches how collaboration patterns arise from complex social interaction structures. In doing so, he works closely with the physics department of Utrecht University and investigates how models and insights from complexity theory and physics can contribute to the understanding of social systems. An interdisciplinary approach will be crucial in a transition to a more circular economy, because this transition must take place in different sub-areas at the same time. At SMO Promovendi he wants to promote interdisciplinary cooperation and work towards a sustainable future.



Eline Leising

Eline works as a strategy consultant at RebelGroup on circular economy in amongst other the waste and recycling sector. Eline has a Msc. degree in Industrial Ecology – a double degree between Leiden University and TU Delft. In her graduation project she looked into the contribution of supply chain collaboration to a circular built environment. Eline previously worked as a researcher at the Faculty of Technology, Policy and Management of TU Delft.



Thijmen Nuninga

Thijmen is a PhD Fellow at Leiden Law School. He has studied in Utrecht (bachelor, master), Cambridge (exchange) and Oxford (master). He has worked as a student clerk for a Dutch district court and as legal assistant for a large Dutch law firm. Thijmen is currently teaching private law and writing his PhD on the private law remedies for wrongdoing at Leiden University. All these activities have been focused on duties parties owe each other in the present day. His work at SMO Promovendi allows him to focus on matters closer to his heart: the duties people and companies owe future generations.



Pritish Bose

Pritish Bose is pursuing his MSc in Mechanical Engineering at TU Delft. Specialising in Transport Engineering and Logistics, his graduation project involves improving the production process of heavy steel structure and simulate the construction process. He has a bachelor's in mechanical engineering from SRM University, India, and has sales & marketing experience in bulk material transport industry. He strongly believes that transport and logistics of materials will play an important role in a circular economy.



Eduard van Ravensberg

During his master Urban Environmental Management, Eduard got inspired by Circular Economy and Cradle to Cradle in particular. Since then, it has been his ambition to work with organisations and products with the goal to achieve a complete circular-economic world where we use healthy and reusable materials. Being part of SMO puts him together with like-minded people; as a team we have a bigger chance to realise our ambition.



Emanuele Di Francesco

Emanuele has a background in economics (Utrecht University) and philosophy & economics (Erasmus University Rotterdam) . He aspires to be a critical thinker able to shape the debate regarding the direction of our economy and society. A first step in this direction has been to join SMO Promovendi in January 2017, where he performed an extensive series of interviews with inspirational thinkers and practitioners in the circular economy. He is providing his contribution by ideating and organizing the World's first Dragons' Den entirely dedicated to the circular economy.



Yuxin Wang

Yuxin Wang is a PhD candidate in the section of Information and Communication Technology at the Faculty of Technology, Policy and Management of Delft University of Technology in the Netherlands. She received her bachelor's degree from Beijing Institute of Technology in China and master's degree of Economics from Duke University in the United States. Her current research is a sub-project of Supply Chain Control and Compliance (SAtIN) funded by the Netherlands Organisation for Scientific Research (NWO).



Anas Hassan

Anas M. Hassan received his B.Sc. degree in Applied Earth Sciences and his M.Sc. degree in Petroleum Engineering from Delft University of Technology (TU Delft), The Netherlands, specializing in Reservoir Engineering & Enhanced Oil Recovery (EOR) methods. Currently, Hassan is conducting a research(s) on the applications and field implementation of cutting edge technology (i.e., RFID Technology & Internet of Things IOT) in Chemical-based Enhanced Oil Recovery (cEOR) in combination with other concept(s) such as Exergy Analysis and Circular Economy to increase yield and efficiency recovery process and reduce costs and environmental impacts.



Farzam Fanitabasi

Farzam Fanitabasi is a PhD candidate at the faculty of Technology, Policy and Management (TPM) of Delft University of Technology (TU Delft). He obtained my M.Sc. from Sharif University of Technology (Iran) in 2015 and have been at TU Delft from May 2016. His research interests include (but not limited to): Distributed Machine Learning and Data Analytics; IoT Middleware for Data Integration and Representation; Fog Computing for Geo-Spatial and Temporal Hierarchical Distributed Environments; Statistical Traffic Analysis, Reshaping and Rerouting.



Zhizhen Wang

Zhizhen is a PhD candidate at the Biotechnology Department of TU Delft, after obtaining her two Msc. degree in Environmental Engineering and Energy Management. In her current research project, Zhizhen explores the social aspects of sustainability in the context of biobased economy, as well as the role of our society in the advancement of sustainable technologies. Looking forward, circular economy and sustainability share many similarities, she is eager to see how the reinforcement of one and other will sparkle insightful solutions. Together with other teammates, Zhizhen is playing a part in the SMO Promovendi CE Lab "Circular Minds" event, which aims to generate innovative ideas with a stakeholder-participatory approach.

LITERATURE

- ABN AMRO. (2015). Circular Economy Guide.
- Achterberg, E., Hinfelaar, J., & Bocken, N. (2016). Master Circular Business with the Value Hill. Circle Economy.
- Achterberg, E., & Tilburg, R. van. (2016). 6 guidelines to empower financial decision-making in the Circular Economy. Circle Economy.
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–56.
- Bocken, N., Short, S., Rana, P., & Evans, S. (2013). A value mapping tool for sustainable business modelling. *Corporate Governance: The International Journal of Business in Society*, 13(5), 482–497.
- ING Economics Department. (2015). Rethinking finance in a circular economy: Financial implications of circular business models.
- Kirchherr, J., Hekkert, M., Bour, R., Huibrechtse-Truijens, A., Kostense-Smit, E., & Muller, J. (2017). Breaking the Barriers to the Circular Economy.
- Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change*, 23(5), 1028–1038.
- Lane, B., & Potter, S. (2007). The adoption of cleaner vehicles in the UK: exploring the consumer attitude–action gap. *Journal of Cleaner Production*, 15(11–12), 1085–1092.
- Ministerie van Infrastructuur en Milieu & Ministerie van Economische Zaken. (2016). Nederland Circulair in 2050.
- MVO Nederland. (2016). Verklaring Banken Circulaire Economie.
- Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A., & Papadakos, T. (2014). Value proposition design: how to create products and services customers want.
- Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, 124(1), 54–74.
- Stegeman, H. (2015). De potentie van de circulaire economie. Rabobank.
- Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Folke, C. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.

- Tanner, C., & Wölfling Kast, S. (2003). Promoting sustainable consumption: Determinants of green purchases by Swiss consumers. *Psychology & Marketing*, 20(10), 883–902.
- Triandis, H. C. (1979). Values, attitudes, and interpersonal behavior. In *Nebraska Symposium on Motivation* (pp. 195–259).
- van Weelden, E., Mugge, R., & Bakker, C. (2016). Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. *Journal of Cleaner Production*, 113, 743–754.
- Young, W., Hwang, K., McDonald, S., & Oates, C. J. (2009). Sustainable consumption: green consumer behaviour when purchasing products. *Sustainable Development*, 18(1), n/a-n/a.