Circular Economy in the Textile Industry

Transition theory in start-ups in the textile industry

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Summary

The textile industry is, after oil, the second most polluting industry in the world. Multinationals have inhabited the business concept 'fast-fashion,' producing clothing continuously and control the global textile industry. Circular Economy (CE) is a new approach that alters the production process and could reduce the use of resources. Various governments, multinationals, and start-ups are working with the concept of CE. This study analyses the transition toward a circular economy in the global and in the Dutch textile industry. For this research, Dutch start-ups are interviewed, the current textile industry is analyzed by a literature review.

This study applied transition theory (TT) to reveal the current status of the circular economy in the Dutch textile industry and to observe if TT provides a satisfactory theoretical framework to study this. The Multi-level Perspective (MPL) is used to determine the activities on the niche, regime and landscape levels. The assessed barriers on those levels are used to gain insight into the obstacles start-ups face to become circular, by carrying out semi-structured interviews with start-ups and analyzing literature on the current global textile industry. The transition pathways start-ups are in is analyzed to determine in which phase the transition towards a circular economy is in, both for the Dutch textile industry, as for the global textile industry. The global textile industry is a very powerful and non-transparent industry, and start-ups face many challenges in an attempt to enter the market. The lack of comprehensive environmental rules and non-transparency in this industry prevents structural changes in the infrastructure of the regime. Despite global advancement in CE, and without consumers demanding change from fast fashion and the lack of global compliance rules, the industry is unlikely to move towards CE. Regarding the current transition phase, the Dutch textile industry is in between the take-off and the acceleration phases, because of the supportive Dutch environment as stimulating factor of CE. The global textile industry is in the take-off phase, multinationals have heard of the concept of CE however because of the complexities of the entire system, a shift towards the acceleration phase is unlikely to occur shortly. Recommendations that would encourage a move towards CE are global environmental enforcement laws, transparency obligations about company infrastructure, and creating financial resources for start-ups for successfully business growth. TT is found to be relatively suitable to explore the transition in the textile industry towards CE. However, the industry might be too global and complex to detect structural changes in the regime.

This study contributes to knowledge about socio-technical transitions, identifies barriers and opportunities for start-ups to become circular and reveals in which development phase both the global and the Dutch textile industry currently is. Recommendations for change toward CE are global environmental enforcement laws, obligations to be transparent about their infrastructure and creating financial resources for start-ups to extend their businesses successfully.

Keywords: circular economy, textile industry, start-ups, socio-technological systems, barriers, transition theory, pathways.

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List of acronyms

AEB	Amsterdam Economic Board
BAU	Business- as-usual
CO_2	Carbon dioxide
CE	Circular Economy
DA	Dutch Awearness
EMAF	Ellen Mac Arthur Foundation
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LVMH	Louis Vuitton Moët Hennessy
MVO	Maatschappelijk Verantwoord Ondernemen
SNM	Strategic Niche Management
TM	Transition Management
TT	Transition Theory
UN	United Nations

Preface and acknowledgments

When I started this thesis, I wanted to obtain more knowledge about circular economy, and the textile industry. I was shocked by the size of this industry and the associated effects it has on the environment. Nevertheless, I learned a lot about this complex industry and the concept of CE. I would like to thank Kris van Koppen and Judith van Leeuwen who guided and provided me with knowledge in this thesis. I am very thankful for the people who participated in the interviews I have conducted for this research as they provided me with inside knowledge.

1. Introduction

Except for oil, the textile industry is the most polluting industry globally (Malik, Akhtar, & Grohmann, 2014). It is also one of the biggest industries globally, the estimated number of employees in 2015 was around 60 million (Malik et al., 2014). The characteristics of this global industry are competitiveness and the constant need to update clothes to the demands of the consumer. This business model 'fast fashion' has resulted in a continuous cycle of producing clothes and then inviting customers to visit stores often based on the maxim 'Here Today, Gone Tomorrow.' The short life-cycle and therefore higher profit margins reflect the business model of fashion retailers (Bhardwaj & Fairhurst, 2010). As a result, the production of textile is increasing; the textile industry is responsible for about 10% of world CO_2 emissions (IPCC, 2014). Various harmful substances and a significant amount of water are used in the textile manufacturing process. For example, it costs about 7,000 liters of water to produce one pair of jeans. To counteract these disastrous consequences, various ideas on changing the production cycle of clothing are emerging. One of these is the notion of a Circular Economy (CE). (Braungart, McDonough, & Bollinger, 2007; Ellen MacArthur Foundation, 2013; Stahel, 2010).

This new approach to the economy is one that is expected to lead us to a stable society in the future (Ghisellini, Cialani, & Ulgiati, 2014; Zhijun & Nailing, 2007). An important aspect of CE is that it emphasizes the consumer's responsibility as well as the producers' responsibility (Zhijun & Nailing, 2007). CE is often seen as a sophisticated approach to waste management. However, CE is not a 'more of the same' approach but requires a comprehensive and broad view of how CE functions in society. CE looks at the entire life cycle of a process, starting from the design stage, before considering the stage of the product and the actors participating in the cycle, with the ultimate goal of implementing a 'closed-loop 'cycle. CE has been designed to achieve and understand new patterns and to help stabilize society with little, or zero, material, energy and environmental costs in a sustainable manner (Ghisellini, Cialani, & Ulgiati, 2014). Various foundations, start-ups, governments and multinationals have recognized the need to shift towards a more sustainable economy, with CE being an attractive option.

1.1 Specific environmental implications of climate change

Our current economic model has had a significant impact on our ecosystems (Malik et al., 2014). Different business models and ways of conducting business is required to minimize environmental damage. The most profound environmental harm, in general, is the depletion of resources including minerals such as lithium, nickel, copper, and fossil fuels (IPCC, 2014). The increase of these environmental impacts, from the extraction and use of resources – also leads to a further increase in weather extremes, such as droughts, floods, and rising sea levels. Moreover, disposal of these materials results in hazardous waste (IPCC, 2014).

Roughly 78% of the total Green House Gas emissions are CO_2 emissions from fossil fuels combustion and industrial processes. Globally, the two primary drivers of the increase in CO_2 emissions from fossil

fuel combustion are economic growth and population growth (IPCC, 2014). Without additional mitigation, and thief the business-as-usual approach continues, the global mean surface temperature is predicted to increase 3,7°C to 4,8°C in 2100 when compared to pre-industrial levels (1850 -1900) (IPCC, 2014). The upper limit of change in temperature is estimated to be roughly 2°C; exceeding this limit will probably have severe impacts on ecological systems, human health, and societies (high confidence -IPCC, 2014). Any delay in mitigation efforts between now and 2030 will increase the difficulty of transitions to a longer-term emission level that would maintain the temperature change below this 2°C limit. Also, the options that are consistent with maintaining this 2°C limit degree is likely to reduce (IPCC,2014). The UN projected that in 2050 the world population will reach 9,7 billion people (UN, 2015). Africa is expected to have the highest population growth between 2015 and 2050; more than 28 African countries is predicted to double their population (UN,2015).

This population increase will put growing pressure on social stability, the environment, economy, and government, especially in poorer countries. Garcia-Olivares & Solé defined social security as a society which can remain in a stable position with a low likelihood of becoming an unstable society (2015). The production of textile, produced in textile mills, is often done in third-world countries and the implications of climate change are most noticeable in those countries. Other factors in addition to population growth that contribute to pressure on social stability are freshwater degradation, land degradation, food production and climate change.

The Netherlands has an aspiration to become a world leader in CE. Only recently a 'Circular Valley' was opened, just outside of Amsterdam. The Dutch government wants to increase their knowledge relating to CE and bring CE to the market. The government has recently developed a plan to implement and accelerate CE in the Dutch society, by opening 'the Valley' and starting 'Nederland Circulair' a platform where organizations, institutions, and business can discuss and learn about CE.

By using transition theory (TT), this research aims to ascertain where CE stands in the Dutch and global textile industry. In addition to TT, the barriers that businesses in the textile industry may encounter in an effort to be more 'circular,' are explored. The research is carried out in the Netherlands, where the concept of CE has become relatively well known. Worldwide, the Netherlands can be seen as a precursor; developing and accelerating CE in the Netherlands. The Dutch (economic) environment has generated a significant amount of start-ups implementing CE, which are operating in the textile industry.

1.1.1 Schools of thought of CE

The concept of CE is the result of different schools of thought. The notion of CE was first introduced in the late 1970's. Walter Stahel, together with Braungart and McDonough, are the founding fathers of CE (Braungart et al., 2007; Stahel, 2010). Stahel developed the term '*performance economy';* he worked on a closed loop economy (CE) and aimed at creating a closed loop approach to production processes (Stahel, 2010). Stahel thereby formulated his vision of a closed loop economy and examined the impact of this model on waste prevention, job creation, resource savings and economic competitiveness (Ellen MacArthur Foundation, 2013).

Braungart and McDonough developed the concept of 'cradle to cradle' (Braungart et al., 2007). The main idea behind this is that all the materials included in the commercial and industrial processes are nutrients. Those nutrients can be either technical or biological. Cradle-to-Cradle has two main tenets: designing for effectiveness in products and increasing efficiency by reducing the negative impacts of commerce. The concept should be seen as biological 'flows' where product components can be recycled continuously and reutilized as technical and biological nutrients. CE is linked to other concepts such as Biomimicry, (Benyus, 1997), Industrial Ecology (Lifset & Graedel, 2002), natural capitalism (Lovins, 2013), regenerative design (Cole, 2012) and the Blue Economy system approach (Pauli & Corbis, 2010).

1.1.2 Principles

The Ellen MacArthur Foundation (EMAF) tries to accelerate CE and has developed different principles to define CE, those principles are used as guidelines in this research. An overview is given in figure 1. Companies that have joined include Google, H&M, Nike, and Philips (Morlet et al., 2016). Ellen MacArthur, set up the EMAF and is the CEO of the Trustees of EMAF.

The first principle, *'designing out waste',* strives to eliminate waste. Both the biological and the technical components are reused, in order to extract the highest possible value. Biological non-toxic components can be composted; technical human-made components, such as polymers (nylon and polyester), are specifically designed for re-use, with minimal energy input and high-value outcome. A tight circle of product and components defines the CE. The second principle is *'build resilience through 'diversity,'* resilience in natural systems is ensured through adapting to the environment in a variety of ways. Globalization, along with other factors, has led to a uniform society. As a result, systems have grown unstable. Through increasing diversity, resilience is increased as well (Braungart et al., 2007). The third principle is: '*rely on energy from renewable* resources'. This helps to decrease dependency on resources, to mitigate the effects of CO_2 increase and to ensure the resilience of a system (Ellen MacArthur Foundation, 2013). The fourth is '*think in systems'.* This entails thinking how one part of a system relates to other partrs and constitute the whole. The interrelatedness and connectedness of parts must be taken into account in system thinking. Another important aspect in CE are the presence of feedback loops, non-linear loops. The fifth and final principle is '*waste is food'.* A distinction is made between durable and consumable components of products. Consumable products are non-toxic nutrients that can be returned to the biosphere. Durable products, such as engines or computers, are made of metals or plastic and thus unsuitable for the biosphere. As an alternative, they must be designed for reuse. Up-cycling is also a possibility, which entails improvements in quality, with a longer lifespan envisaged for the product as a result (Ellen MacArthur Foundation, 2013).

One of the most important pillars of CE is the state of 'ownership'. CE challenges those who follow its principles to rethink the concept of property, and focuses on products that are leased to consumers instead of owned by them. For example, when a product is broken the product is returned to the producer who then will repair it. In this way, the producer is challenged to produce a product that can be repaired; instead of discarding the whole product, parts are replaced. In production terms, this means that the quality of the materials must be as high as possible. Otherwise, the producer incurs higher costs than profit. Product design is thus a very important step in CE, because at an early stage the product can be designed in a way that will maintain its value.

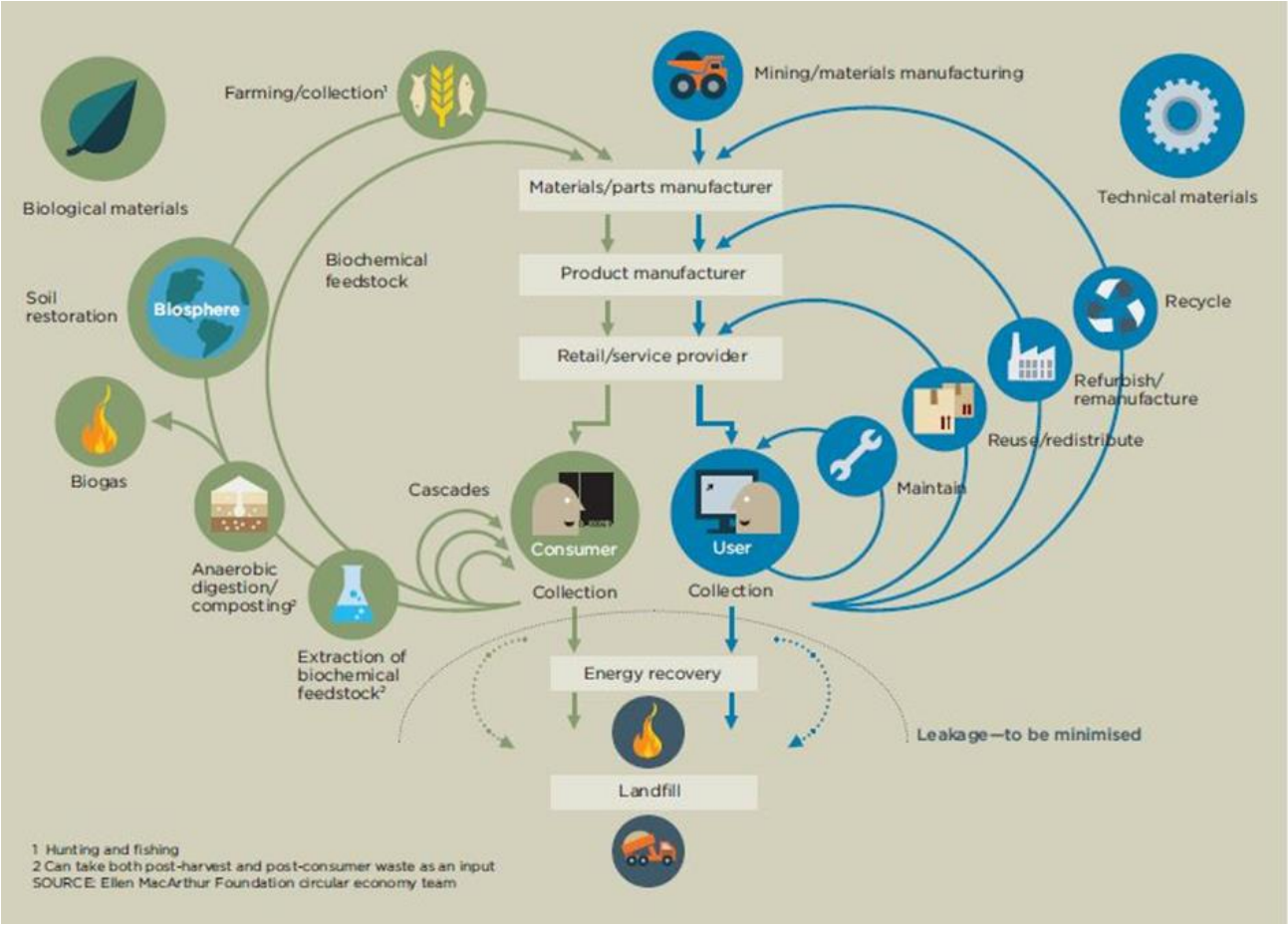

Figure 1. Resource flows in CE. Source: EMAF (2013)

1.1.3 Benefits of moving towards a CE approach

McKinsey and the EMAF have investigated the advantages of moving towards a CE approach (Ellen MacArthur Foundation, 2015). For businesses, the economic growth and forecast are often of greater concern than the environmental benefits that result from CE. The EMAF estimates an economic benefit of €1.8 trillion (for 2030) from moving towards a CE in Europe only. Resource productivity in Europe could grow by up to 3% a year, with a €0.6 trillion resource benefit by 2030 for Europe's economies, and roughly €1.2 trillion for externalities, the unexpected concequence of (economic) activities affecting a third party (EllenMacArthur, 2013). Although growth is not CE's primary objective, it is important for companies to include possible growth rates in order to attract business interest.

Circular economy has the potential to enhance job growth, generated as a result of new jobs in fields of design and services, such as 'circular skills and knowledge', return logistics and recycling. CE is estimated to add up to roughly 2 million jobs in Europe (Zero Waste Europe, 2015). According to a report supported by TNO, CE in the Netherlands will create 54,000 jobs annually (Bastein, Roelofs, Rietveld, & Hoogendoorn, 2013).

Finally, the environmental advantages of implementing CE have been estimated by the Club of Rome (2015). For example in Sweden, according to the Club of Rome, a combined implementation of increased energy efficiency and the use of renewable energy could reduce CO_2 emissions by 70% (The Club of Rome, Wijkman, & Skanberg, 2015).

1.2 Textile industry and Circular Economy

In this research, the current economy is seen as the regime level because of the dominace of actors, established belief systems and rules in the Business-As-Usual (BAU). Within the textile industry, the regime consists of multinationals dominating the industry. The multinationals have consolidated power, define the infrastructure, and are the main players in the sector, with little room for outside influence. For the textile industry to become circular, the whole infrastructure and supply chain must be changed and made circular.

Start-ups have developed some interesting 'out of the box' innovations, all of them different to the conventional economic models, resulting in businesses with an ultimate goal of closed-loop product cycles. These changes are happening at the niche level, a level with less organized actors and a variety of beliefs and rules. An example of a niche innovation is a start-up recycling its clothes up to eight times (Dutch Awareness, 2016). At MUD Jeans, for instance, the business model is focused on leasing a pair of jeans, instead of owning the resource. The resourece belongs to the company and therefore, it the product will be repaired for the customer instead of replaced by a new pair. DyeCoo, a company that makes clothes out of plastic, provides a further example; they additionally use compressed $CO_2$to dye clothes (DyeCoo, 2016). They provide a 'library' of clothing, where, through paying a monthly fee, rent clothes and bring them back so consumers can switch between items instead of purchase them definitively. Recently, multinationals are implementing a circular economy approach, including H&M and Nike, two of the latest global partners to the EMAF. Nike, for example, developed a shoe line made out of re-used plastics. The degree of implementation of CE in textile multinationals is examined in this research.

A significant amount of 'grey literature,' non-scientific papers, has been developed by organizations such as the EMAF. CE has drawn a lot of activity; initiatives have been set up to implement CE, circular business plans have been drawn up by Shell, Heineken, and Unilever. However, there are few scientific papers to support the transition towards CE and that reveal the obstacles businesses face in the light of a sociological transition.

This research will analyse in depth the shift towards CE, in the Dutch textile industry and the global textile industry, using transition theory. Two important concepts in this study are transformation paths

and the barriers that companies encounter in attempting to become circular. Those concepts are first examined individually. Subsequently, the compatibility of those concepts is examined to determine if specific barriers can be related to transition paths.

This research may also provide insights for businesses and organizations in the Dutch and global textile industries, which are transitioning towards CE. This study will investigate two regimes. Firstly, Dutch start-ups transitioning towards CE, with current developments in the Dutch environment regime taken into account. The other regime that is investigated is the global textile industry. The explanation as to why those concepts are seen as regime developments is explained in the theoretical chapter.

The main research question is:

How is transition theory contributing to garnering further insight into the transition of start-ups in the textile industry, both in the Netherlands and globally, towards a circular economy?

Sub-questions:

- What are the characteristics of the textile industry regarding transition theory?
- What are the barriers Dutch start-ups in the textile industry face in shifting towards a CE in relation to transition theory?
- What are the opportunities for start-ups and multinationals in the textile industry in transitioning towards CE?
- In which phase in the transition theory can CE in the textile industry be placed?
- To what extent can both multinationals and start-ups contribute to the shift in the textile industries towards CE?

2. Methodology

In this research, a literature study has been used, and semi-structured interviews have been carried out. The interviews are recorded, transcripted and coded with the program Atlas.Ti (See Appendix A).

2.1 Literature Study

This study uses a document analysis to gather information, covering primary, secondary and tertiary literature. Also, grey literature is included in this research due to the limited scientific research that is done on this topic. Grey literature consists of document types that are produced at all levels, such as government, businesses, and industry- reports. Those documents are not controlled by commercial publishers, whereas publishing for commercial purposes was not the primary goal (Schembri, 2007). Also, information from organizational (and commercial) websites is used for this research.

Keywords used in the search for literature for this research are listed below (Table 1). These words are used in combination with each other. There is made use of Scopus, Google Scholar, Science Direct.

Table 1. Keywords and inclusion criteria

Keywords:	**Inclusion criteria:**
1. Circular economy 2. Business values 3. Transition Theory 4. Transition management 5. Strategic Niche Management 6. Consumer values 7. Obstacles 8. Environmental management 9. Climate change 10. Resource depletion 11. Linear economy 12. Multilevel Perspective 13. Apparel industry 14. Barriers in start-ups 15. Opportunities in start-ups	primary, secondary, tertiary, grey literature, organizations (commercial) websites Grey literature: Ellen MacArthur, various reports (annual, sustainability) from textile businesses, websites Sources: Scopus, Science Direct, Google Scholar

2.2 Semi-structured interviews

Next, to literature research, qualitative data is gathered by holding ten semi-structured interviews collect data from the major players in the Dutch textile industry regarding CE. Those interviews are all held in the Netherlands, five with start-ups in the textile industry to gather information about the opportunities and barriers to becoming circular. Moreover, five with Dutch organizations active in CE, such as knowledge institutions or consultancies, or advise companies to become circular. The original research plan of this thesis was to include also multinationals in the interviews to obtain knowledge in reasons to engage in CE from the current system as well. However, they did not want to participate by giving interviews in this research (The multinationals contacted were: Nike, H&M, G-Star).

Therefore, the research is focussed mainly on start-ups, annual reports of the multinationals are used for gathering data (Louis Vuitton Moët Hennessy, Nike, Inditex).

In general, semi- structured interviews have not a fixed set of questions but can vary depending on the interviewee (Miles, J., Gilbert, 2005) A set of topics that had to be covered were set up, but the questions varied between the participants. The reason why semi-structured interviews are carried out is because this style can find out the 'why' of concepts and practices for participants. There is room to ask in-depth questions, and to continue on the response of the participants. Also, the interviewer can adapt questions to a certain business or person who most likely has different knowledge, the interview is very flexible in this way (Miles, J., Gilbert, 2005. Therefore, semi-structured interviews are suitable for this research. All of the interviews are recorded, a transcript has been made and coded in the program ATLAS.ti

2.3 Start-ups and organizations interviewed

All of the start-ups and organizations have worked with CE in some way, varying from developing circular business models to consultancies that try to accelerate CE in businesses. An overview of all the interviewed organizations and start-ups is given below and shown in Table 2.

Start-ups:

MUD Jeans aims at 'leasing jeans,' instead of owning the product. The Interview took place via Skype, with various other interviewers. As they got many requests for interviews, MUD Jeans decided to schedule the meeting in this setting. The complete interview took about 50 minutes, where I asked four questions. Some of the items on the questionnire lists were raised by other participants of the Skype interview. The quality of the recorded Skype interview was, unfortunately, low.

Wintervacht creates jackets from second-hand blankets. The interview took place in Amsterdam at the workplace of Wintervacht with one of the founders of Wintervacht and took about 50 minutes.

Dutch Awearness creates workwear that can be recycled up to eight times. The interview was held in Nijmegen at the office of Dutch Awearness with the communication manager of Dutch Awareness. The interview took about 45 minutes.

Kuyichi is a brand that sells clothes made from certified organic cotton and recycled garments. They also sell brands in their two stores that are working with organic cotton. The interview took place in Utrecht with an employee of Kuyichi and took about 50 minutes.

DyeCoo is a technological start-up that dyes clothes with pressured CO_2 instead of water and works with a reduced number of chemicals compared to dying methods in the textile regime. The interview took place in a café nearby Utrecht Central Station with an employee that works partly for DyeCoo and partly for Netherlands Water Partnership.

Interviewed organizations:

MVO Nederland is an independent expertise and network organization on Corporate Social Responsibility founded by the Dutch Ministry of Economic Affairs.

Amsterdam Economic Board is an independent body that stimulates innovation and cooperation between businesses, research institutions, and government.

Kirkman Company is a consultancy company that enables transformations of organizations; it is currently focusing on shifting their clients towards CE.

Circle Economy is a social enterprise, organized as cooperation, aiming at accelerating the scalable and practical implementation of circular economy

Circular Economy Booster is a company that helps start-ups in boosting their sustainable and innovative businesses ideas to achieve a better future with CE.

Table 2. Overview interviewed organisations and businesses

Start-ups	Overarching organisations
MUD Jeans	MVO Nederland
Wintervacht	Stichting Maatschappij en Ondernemen
DutchAwearness	Amsterdam Economic Board
Kuyichi	Kirkman Company
DyeCoo	Circle Economy

3. Theoretical Framework

In this section, the applied conceptual frameworks are discussed. Important to take in mind is that there are two important theoretical concepts, transition theory and barriers for businesses to engage in environmental activities. The first one discussed below is transition theory which functions as an umbrella to discuss transition-related concepts. The barriers for businesses are discussed as a second theoretical concept, and these two concepts are linked together in the last section.

3. 1 Introduction

Transition Theory (TT) is used in this research to study the development of businesses in the textile industry towards CE; the main focus lies on start-ups transitioning towards CE in the Dutch textile industry. Transition theory emphasizes the complexity of societal systems with lock-ins and interrelatedness of subsystems. It aims at understanding socio-technical change, often 'radical change,' which is the change that exceeds the current regime. Transitions often have a time-scale of about 20 – 25 years. TT builds on the literature of (Grin, Rotmans, & Schot, 2010; Rotmans, J., Kemp, R., Geels, 2001; Schot & Geels, 2008). In TT there is the belief that any transition towards another system requires a systematic change not only at the economic level but also at a societal level (Renswoude, Wolde, & Joustra, 2015). Societal Transitions aim at understanding shifts in societal functions, behavior, and technologies in a broad sense.

The societal environment in which Dutch start-ups have developed their business is studied, in combination with the global textile industry to understand the dynamics between them. The Multilevel Perspective (MPL) is used to gain understanding in different levels that are interacting with each other. Those levels are respectively the landscape,the regime and the niche level (Hofman, P.S., Elzen, B.E., Geels, 2004) Thereare two systems identified where the primary interactions occur; the first system is the Dutch environment in which start-ups develop their ideas. The second regime is the global textile industry, specified on textile multinationals. The regime actors are identified as the multinationals because of the dominant actors and power they have in the textile industry. The start-ups are defined as niche innovations, developing novelties outside the regime. Defining the start-up as niches in both regimes is possible because the textile industry is incredibly global.

The typology of socio-technical pathways is used to track the transition path to determine the relevant interactions and developments on every level (Geels and Schot, 2007). Those four pathways look at sociotechnical innovations about surrounding institutions and dominant actors. By determining the pathways the Dutch start-ups are following, the specific underlying structures, infrastructures, behavior and lock-ins for each pathway might be determined and can add insight in future transitions. The explored dynamics of transition paths might give understanding into the opportunities and barriers in the shift towards CE and can tackle specific problems in advance.

Transition theory in combination with transition pathways is applied to the stages of transitions, developed by (Rogers, 1995). With this framework, the current phase of Rogers diffusion line of the

textile industry in the Netherlands toward CE is determined, as is the phase in which the emergence of CE in the global textile industry is.

In this chapter, the most important concepts of transition theory in this research are explained. TT must be seen as the overarching umbrella where all other theories can be fitted in. Society is based on different sociotechnical systems, the origin of sociotechnical systems as is explained in Section 3.3.1. At the heart of TT lies the integration with various levels of society, this is called the Multi-Level Perspective (MLP, section,3.2.2.).The MPL is linked to transitional phases that innovations can take to change the current system and to detect which phases of transitions are developed. (Section 3.2.3.). The fundamental interactions in transitional pathways between actors and characteristics for each specific start-up are determined. These pathways indicate how niche innovations interact with the regime and vice versa. (Section 3.3.) After that, there is examined how transitions can be managed, if they can be steered (Section 3.4.), with specific attention to the development of niche innovations because this research examines start-ups (niche innovations).(Section 3.5.) After that, the link with businesses and transition theories will be made to see whether the path transitions take will come with specific barriers and opportunities for each specific path (Section 3.6). Identifying those interactions and interlinkages with levels might reveal in which phase CE currently is and in which direction it is developing. Lastly, the opportunities for businesses to engage in environmental activities are discussed (Section 3.7).

3.2 Concepts in Transition Theory

In transition theory system thinking is key. The basic idea of transition theory is that changes in society happen in an organic and evolutionary way on a timeline of about 20 -25 years. (Kemp & Loorbach, 2006). According to Rotmans et al**.,** *'a transition is a gradual process of societal change in which society or an important subsystem of society structurally changes.'* (p.8, 2000) . Transitions are linked to ecosystem services because of the interrelatedness of all variables (Kemp & Loorbach, 2006; Rotmans, J ., Kemp, R., Geels, 2001). System thinking is important in transition theory, the dynamics between developments that both reinforce and sustain a system are not a result of single variables but a result of various variables such as the economy, technology institutions, culture and ecology (Kemp & Loorbach, 2006).

3.2.1 Socio-technological systems

Transition theory works with sociotechnical systems, the role of technology is proposed as ongoing, complex and mundane. It relates directly to the users of technology. Therefore a socio-technological system is proposed as a display where the circular economy and the textile branch are both embedded in.

A sociotechnical system is described by Leo Marx (1997). He used an example of a railroad to go into detail in the range of interdependencies of technology and their scale. To illustrate this, he uses a case of a train, stressing the importance of the presence of a physical object for a railway. The first train was built in 1814, but only with the introduction of iron rails in 1820, the railway could be used.

Other objects were needed as well, such as bridges, stations, and signals. To develop those objects, a diverse set of skilled workers had to develop those skills for maintenance, construction, and repair. Specialists had to work with telegraphy and railroad engineering. Those systems became even more complex as in America, investors in railroads with capital were needed to build infrastructures on such an extensive scale. Framing on an institutional level of the railroad system became a necessity, as time zones and track gauges were standardized. Different types of organization and technology - knowledge, practice, and objects – result in a sociotechnical system. Leo Marx saw technology as a mode of social organization (Marx, 1997).

Next, to the importance of interrelatedness, timing is of great importance for transitions. De Landa (1997) describes in his book why the Industrial Revolution did not take place in Cologne, Germany in the fifteenth century. Coal and mining systems were present on a large scale, two important factors for the Industrial Revolution to start in England. He concludes that the presence of only technological artifacts was not sufficient enough to make huge transitions in society. The increase in England in population together with the systematic increase in knowledge, institutions, expert labor and processes fuelled the British Industry to keep up with their production (De Landa, 1997). Niche innovations only will not make a transition happen, actors in the regime and beliefs in the landscape must be willing to change too.

Technology is given a prominent place in transition theory because new technologies are seen as new developments occurring in niches interfering with the regime. Circular economy is partly regarded as a technology (innovation). Therefore the relation between sociology and technology is explained, as it also includes social groups and their interactions. Technology is seen as multiple things; it is defined by Matthewman (p.12, 2012) as objects (virtual or actual), activities, knowledge, modes of organization and sociotechnical systems.

In short, technology cannot be separated from the social environment it is embedded in. A systemic focus, including infrastructure, history, cultural beliefs, social interest and division of power creates a sociotechnical system. Therefore this research concentrates less on CE as purely a new economic system, but more at the broader societal processes and levels.

3.2.2 Multi-Level Perspective

As mentioned above, TT focuses on the interdependency of societal systems, subsystems, and institutions. Those interdependencies have constituted various lock-ins that limit the development of innovations. Stable systems have general accepted rules and beliefs among actors. Through cognitive, normative and regulative institutions, stability and cohesion are constituted and reinforced (Geels 2005a). Those institutions are called a regime. A regime has a shared set of beliefs, user practices, infrastructure and is the dominant system with dominant actors (Rotmans et al. 2001). Regime players often focus on stabilizing the regime and maintaining their power, keeping innovations that could harm the regime outside. Transitions require a shift in the system by innovations, because of the lack of the dominant institutions those transitions often occur outside the regime. Those outside

actors are operating in the niche, a level characterized by no shared belief system or institutions, this is where often radical change starts.

Niches and regimes have similar kind of structures. However, they can fluctuate heavily in stability and size. Similarities are the 'character of organizational fields, which is a community of interacting people (Geels & Schot, 2007). Regimes have quite a stable and large community, niches, on the other hand, have a smaller and more unstable community. What they have in common are a set of shared rules for coordinated action. However, this set of rules differs for regimes and niches. In the latter, the common rules are not set and unclear, whereas regime rules are stable and precise. Those rules could be three kinds of rules; regulative such as regulations and laws; normative such as behavioral norms and values and cognitive standards such as problem definitions and innovation agendas. Those sets of rules are conceptualizing a model of agency. Actors are assumed to act rational and strategical, trying to achieve their goals within their shared beliefs system. Cognitive rules give limits to actors by limited opportunities and time (bounded rationality). Those rules could be normative or role relationships and play a role in decision making because agents are encapsulated in social networks and fixed structures.

To understand sociotechnical change Hofman & Geels (2004) introduce the Multi-Level Perspective (MLP) to understand transitions on different levels of society. MLP is used to describe changes as alignments, outcomes between developments at multiple levels of society. In other words, it aims at giving insights on what levels of society change is happening (Rotmans, J ., Kemp, R., Geels, 2001).

The MLP is used because it argues that transitions are the result of interactions between processes at three levels. These levels where changes occur are; niche innovations at a micro-level, sociotechnical regimes at the mesolevel and sociotechnical landscape at the macro-level. The relation between those levels is shown in a very simplified figure, see figure 2. All three levels interact with each other:

I. Technological niche: an 'experimentation room,' niches form on the micro-level where radical novelties emerge. Niches are seen as protected areas where novelties (innovations, technological systems,) are protected against mainstream markets. Niche developments are often carried by dedicated but small actor networks. The perception of niche players and the size support networks are both influenced by the broader regime and landscape level and its developments (Geels & Schot, 2007). Activities on circular economy could be classified as a niche innovation occurring at the micro level (See 3.6)
II. Sociotechnical regime: – all the institutions, values, norms, infrastructures that are inhabited by the dominant multi-actor network. A socio-technological regime captures the broader societal community and the alignments of their activities, views, and rules (F. W. Geels & Schot, 2007). Sociologist, engineers, and policy-makers contribute to the development of new technological patterns. Sociotechnical regimes have the ability to stabilize existing pathways; regulations and standards, patterns and fixed ways of working, infrastructures and competencies. The dominant actors in this system are defined as multinationals. It is researched if CE in the textile industry could develop over time as the 'new' regime. Important

to stress is the presence of two regimes in this research. The Dutch regime, with its dominant actors and belief system in which the start-ups are seen as niche innovations; The global textile regime, where the Dutch textile start-ups are a niche innovation.

III. The socio-technical landscape is an environment standing 'above' the regime level and niche level. The landscape consists of broad cultural patterns, macro political developments, and macroeconomics. The rate of change of landscapes is often decades (slow). The current economy worldwide is seen as the landscape, occurring on the macro level.

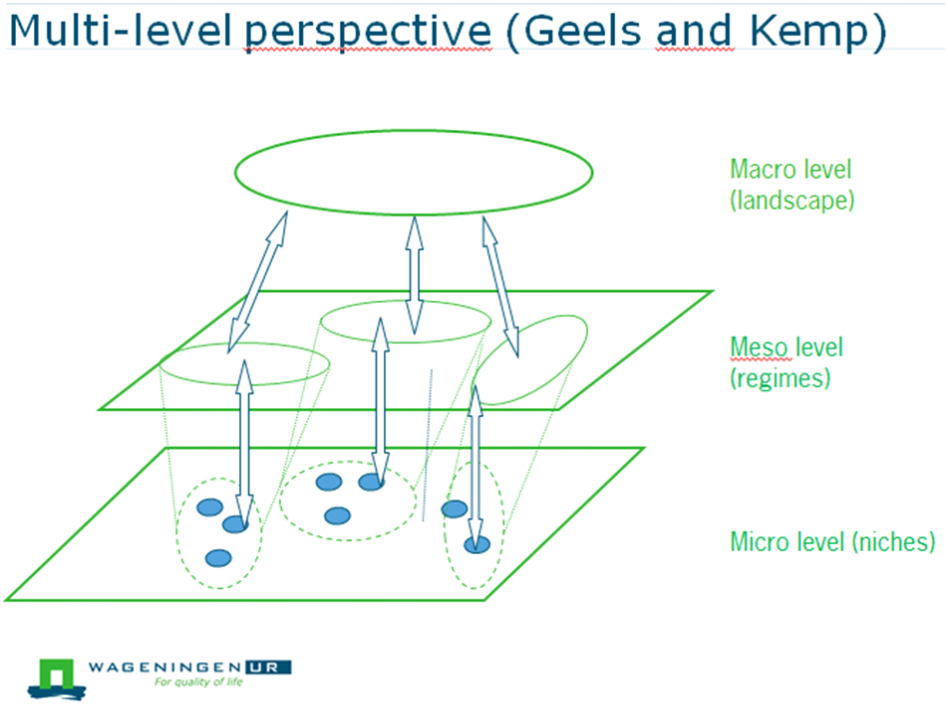

Figure 2. Multi-Level Perspective on transitions. Source: Geels and Kemp (2002)

The shift of a regime is possible due to two processes: a. There is a change in a selection of pressures and b. The availability and coordination of resources to respond to pressures inside and outside the regime(Geels & Schot, 2007). Pressures are defined as economic pressures, such as taxes, charges, and regulations (Smith et al.,2005). Other forces affecting the 'landscape' could be the rise of consumer culture and demographic shifts, and niche innovations that are pressuring the landscape from 'below.'

These niches are not (yet) institutionalized in the regime (Smith, Stirling, & Berkhout, 2005). It is not likely that the system will change without any of those above-elaborated pressures (Smith et al., 2005). The landscape is here seen as one of the 'pressures' on the regime. However, Geels and Schot (2007) argue that landscapes must not be seen as forces interfering with the regime, but that landscapes and niches should be kept apart, as different variables that can interfere with the regime. This research focuses not on the question if the current landscape is influenced by niche innovations.

Obstacles occurring in society are expected while all levels are interacting in the MLP. These barriers can be revealed while using transition theories and MPL. Important to take into account is that the

differences in the niche and the regime are already existing obstacles in itself, as their differences show the barriers to go from one level to another.

Concluding, niches and regimes have variable structures and have to different degrees a shared set of cognitive, regulative and normative rules. Niches are characterized by unstable institutions and small groups of actors. Regimes are characterized by large groups of dominant actors and stable institutions. Interactions happen on all levels, the focus of this research lies on the regime interacting with the niche and vice versa.

3.2.3 Multi-phase concept

The multi-level concept is extended by the idea of the multiphase concept. The innovation diffusion curve by (Rogers, 1995) is used to give insight in transition phases. In a society a change is gradual, transitions must be seen as shifts from one dominant system to another, although transitions develop in general in a non-linear way. In the multi-phase concept, it is assumed a steady state goes, in theory, from equilibrium to equilibrium through a pathway consisting of four different paths (See Fig 2.). In general, there are four different phases acknowledged in transition theory:

1. In the pre-development phase, individuals are experimenting with change on the micro level. Experimenting happens in small unorganized groups, with no clear rules or shared belief systems/infrastructures. Little to none of those activities is visible on the system levels (meso and macro-level). On the regime level, little change is apparent, individuals experimenting in niches are seen as small individuals or groups of actors experimenting with the CE.

2. By the take-off phase, processes of change are building up, and innovations are rapidly developing in niches. Those shifts can be noted at the system level because of the different reinforcement practices. More actors, not only the small initiators but also the actors active in the dominant sector, the regime, have heard of the innovation defined in this research as circular economy.

3. The acceleration phase occurs when structural changes occur on the system, the regime level. When a niche enters the regime, the innovation(s) could spread rapidly, pressuring the current institutions of the regime. Change is visible now and could be noted on the cultural, political, institutional, ecological and economic level (meso level). In this research, it would mean that CE becomes the dominant system in the textile industry and the characteristics of the current industry are becoming less visible. It will be investigated in this research if this is the case in the textile industry. The speed of change is accelerated by different actors on various institutions and organizations in the dominant system.

4. In the final stabilization- phase, an equilibrium is reached (at the macro level), and the speed of change has settled down (Rotmans, J ., Kemp, R., Geels, 2001). When this level has been reached for the circular economy, it would mean that the dominant system (current economy) is now completely taken over by circular economy and CE is the new dominant actor network with shared institutions, rules, and beliefs.

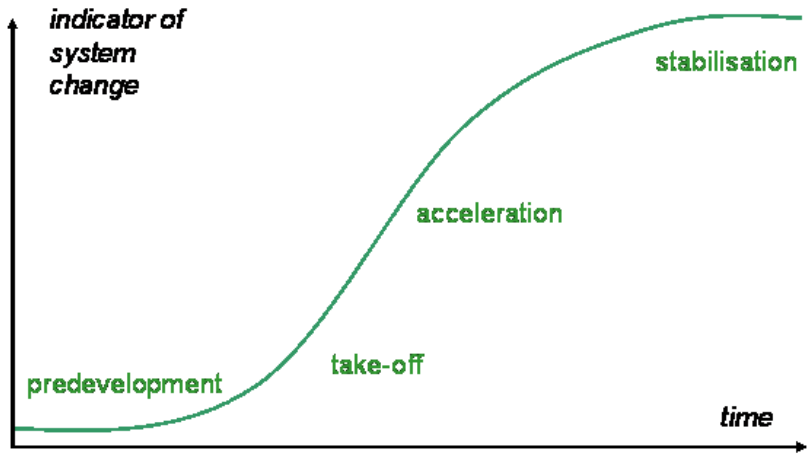

Figure 3. Phases of socio-technical change. Source: Rotmans (2001)

3.3 Transition pathways

To understand the dynamics of the transition phases, Geels have developed four transition pathways. All following a different transition path with characteristic dynamics between the landscape, regime and, niche. Various criteria have been used to distinguish the dynamics that innovations can have with the regime and landscape. Those measures have led to four pathways of interaction with the niche, regime, and landscape by Geels & Schot (2007) The first criteria is the 'timing of interaction,' as different schedules inside the MLP at the various levels of interactions can have different outcomes. The second criterion is the 'nature of the interaction,' niche innovations seem to have the nature to have disruptive relationships with the regime. However, they can also have a reinforcing influence in the regime through pressure. When niche innovations aim to replace the regime, they have a competitive relationship. A symbiotic relationship is if niches are recognized as valuable for the regime and are added to the regime. With those concepts, Geels and Schot (2007) have developed four pathways.

1. *Transformation path*: If there is pressure in the landscape at a moment when niche innovators are not entirely developed, actors in the regime respond by adjusting the direction of innovation developments and paths. Because niche changes are not fully developed yet, they cannot replace regime innovation. The landscape can only change if actors from the system act upon those changes, examples are activists or entrepreneurs who have the potential to create alternative technologies. Niche innovations are used in the regime through cumulative adjustments. Thus, the regime-actors can stay in the regime and can import knowledge and innovation from niches. This pathway could best be seen as niche-innovations adding to the existing regime, not disrupting the regime.

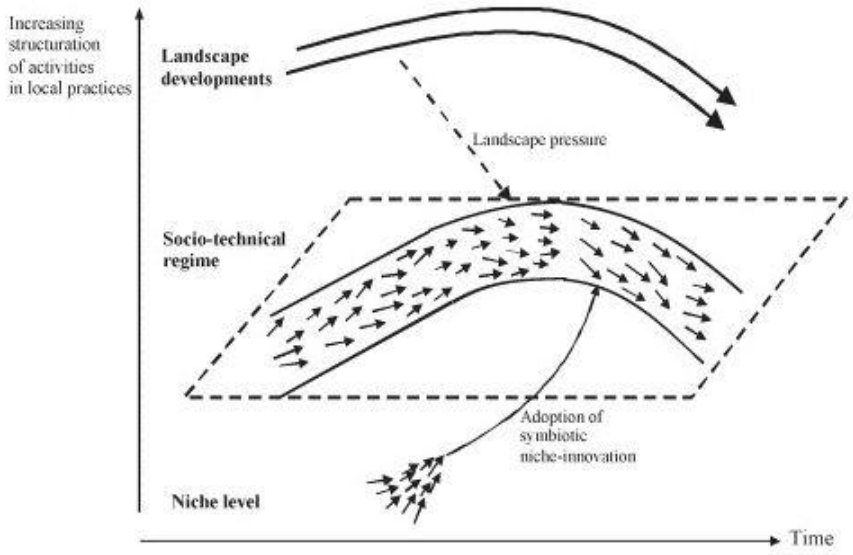

Figure 4. Transformation path. Source: Geels and Schot (2007)

2. De-alignment and re-alignment path: If landscape change is sudden, then regime actors are likely to lose trust in the regime. This lack of confidence leads to de-alignment in the regime if there is no well-developed niche development to fill in the newly created space. It will create a vacuum in the regime and creates space for many niche events to develop simultaneously, to co-exist and to compete to one another. The guiding rules, user preferences and regulations in the regime become unstable and uncertain (Grin t al., 2010). Simultaneous developing niches are competing with other niches. Resulting in a longer period of co-existence, competition for resources and attention and experimentation (Grin et al., 2010). Eventually, the regime becomes stable, and in theory, one niche innovation becomes dominant. The dominant niche will lead to the core of re-alignment and re-institutionalisation in the new regime (Grin et al., 2005).

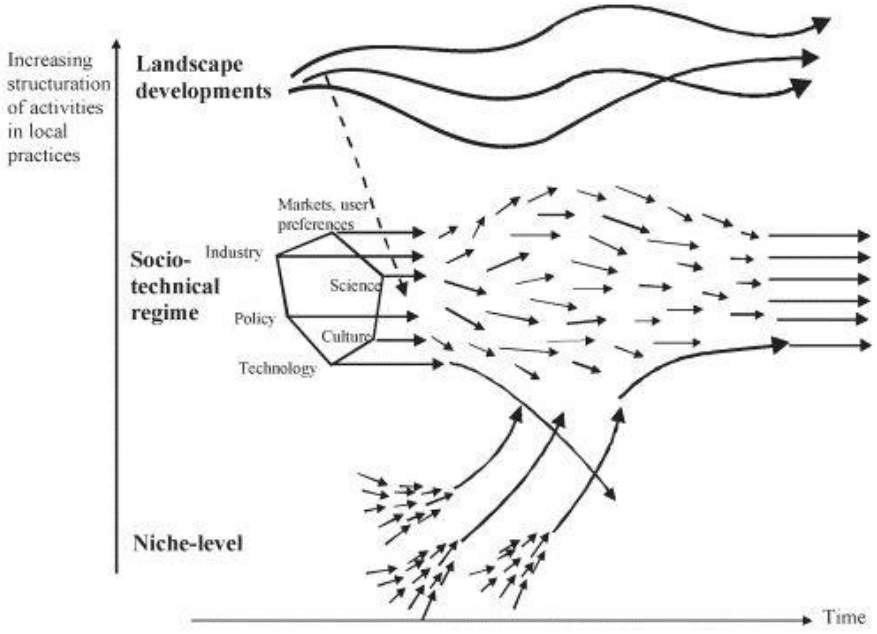

Figure 5. De-alignment and re-alignment path. Source: Geels and Schot (2007)

3. Technological substitution path: This path will happen if there is a sudden change or large shock in the landscape, and the niche development is sufficiently enough developed, it can replace the regime by breaking 'through.' The change can lead to a window of opportunity for niche innovations, and niche innovations can take advantage of the gap if they have built strength from within. This is a difference with the previous de- and realignment path) (Grin et al., 2010). These innovations will enter the regime markets and actors in the regime respond by investing in improvements in the current regime and not in the niche developments. New technologies can push out the existing ones leading to wider system changes. Therefore this way has a technology-push-character (Grin et al., 2010). This path is mostly studied in businesses and technology management. The path, without the sudden change, will remain stable as it is in the so-called Reproduction path. However, it has the potential to become a technological substitution path when this sudden change happens. As this route often happens in businesses (Geels, 2007).

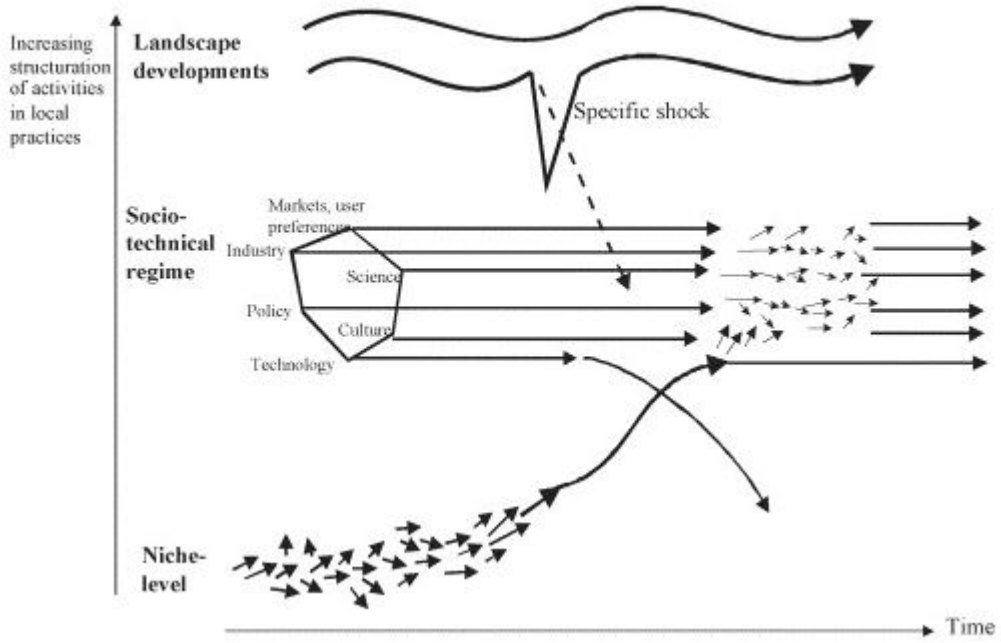

Figure 6. De-alignment and re-alignment path. Source: Geels and Schot (2007)

4. Reconfiguration pathway: This pathway is characterized by innovations developed in a symbiotic way, independent from each other. They trigger innovation step by step (subsequently) and enhance further adjustments in the regime. If the developed niches have similarities with the regime, these innovative components added to the existing regime. Until now it still looks like the transformation path. However, an exchange of old and new technologies can change the regimes: such as changes in beliefs, user practices, and perceptions. Characterizing for this pathway is the interplay with multiple innovations in technology from different professional fields, it can modify the regime and eventually the landscape over time. The transition in this path is not caused by one single innovation but by sequences of multiple changes. Because one innovation cannot create a breakthrough, it is the series of multiple innovations that can cause a change in landscape (Grin et al., 2010). The reconfiguration pathway is characterized by innovations existing and co-developments in different areas (agriculture, retailing, hospitals) (Grin et al., 2010).

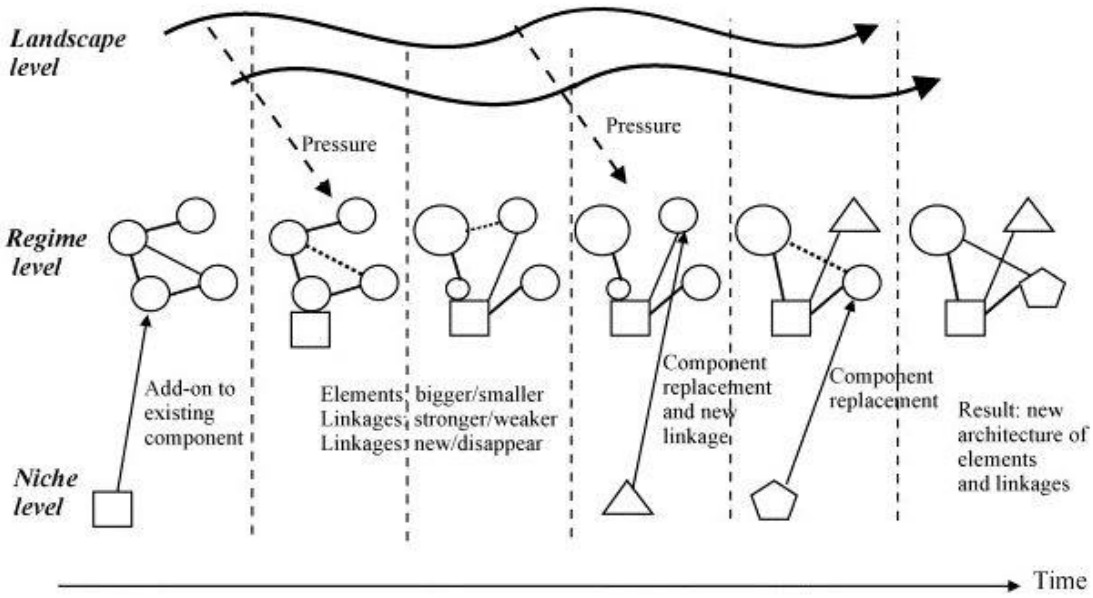

Figure 7. Reconfiguration pathway. Source: Geels and Schot (2007)

5. Different pathways

The pathway they did not explicitly distinguish is the 'Reproduction path.' In this path niche innovations are present, but have a minimal chance to alter the regime. Within the regime, small changes from the niche can be adopted such as, investing in new product development or engaging in take-overs. Still, the regime remains stable, and these internal processes can eventually strengthen the regime (Geels & Schot, 2007).

An extra pathway (Grin et al., 2010) introduced is the 'Mixed pathway' to stress that pathways can be non-deterministic. The pathways can be a mix of all above-described pathways and may come not in the pure form as described above (Grin et al., 2010). However, in this research, there is made use of the four pathways described above are used to distinguish some core elements, focus points and actors in the attempt to create clarity.

3.3.1 Chosen pathways

In the analytical chapter, it has come forward that the Transformation and the Reconfiguration pathway are followed by start-ups. The most important concepts and their implications regarding the niche, regime and landscape and corresponding actors, type of interactions and keywords in two pathways have been crystallized in the table below (Table 3).

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Table 3. Combined Transformation pathway and reconfiguration pathway. Adapted from Grin (2010) and Geels (2007)

Level	Transformation pathway	Reconfiguration pathway
Socio-technical landscape level:	Moderate pressure on the regime for a transition	Landscape has no role in this pathway / Landscape has moderate pressure on the regime
Socio-technical regime level:	Responds by modifying the direction of the development paths and innovation activities	Innovations trigger further adjustments in the basic architecture of the regime
Niche innovation level:	Potential niche innovations are not sufficiently developed yet	Innovation at the niche level have symbiotic relations with the regime and are eventually adopted by the regime to solve local problems
Keywords:	Outside pressure, institutional power struggles, negotiations, adjustment of regime rules.	Cumulative component changes because of economic and functional reasons. Followed by new combinations, changing interpretations, and new practices
Actors:	Regime actors and outside (social groups)	Regime actors and suppliers
Type of interactions:	Outsiders voice criticism; Incumbent actors adjust regime rules (goals, guiding principles, search heuristics)	Regime actors adopt component-innovations, developed by new suppliers. Competition between new and old suppliers

3.4 Steering of a transition

Steering a transition is done by actors who are part of the change. However, steering a sociotechnical system (STS) in general is hard. Transitions are never caused by one-time events, which can change the system radically, but it can be accelerated by those events (Kemp & Loorbach, 2006). Examples are the Chernobyl disaster and the oil crisis, those events can shift the system more radically, and new paradigms are formed, but they cannot cause a transition. To illustrate this an example of an oil tanker is used. Steering must be done miles in advance, and even then, shifts in direction are minor. However, in contradiction to the oil tanker, STS have not one captain (actor) in charge but various players. It consists of uniform components, and system boundaries are not clear but vague. TM focuses on steering on a systemic level, and change the 'condition' of a system (Rotmans, J ., Kemp, R., Geels, 2001). TM aims at leaving room for selection mechanisms and innovation. According to Kemp & Loorbach, (2006), various types of steering mechanisms exist, however, it is extremely hard

to exactly repeat an already occurred transition because of the numerous variables of a particular transition.

Concluding, TM does not work with predefined outcomes by practicing planning and control, but with leading principle(s), in this research the leading principle is CE. Reasons, why TM does not work with specified outcomes, is that problems may be eventually not as severe as thought, or the goals have changed over time, and system innovations turned out to be enough. Those leading principles are chosen by society and through a political process (Kemp & Loorbach, 2006). The inclusion or exclusion of relevant actors is a point of discussion in transition management, i.e. which actors in society can make this decision.

3.5 Strategic Niche Management

The importance of niche developments is emphasized in transition theory due to the importance of innovations influencing the regime and vice versa. The core of Strategic Niche Management aims at facilitating sustainable innovation by creating protected spaces that allow experimentation and nurturing with co-evolution of technologies at the micro level, regulating practices and user practices (Schot & Geels, 2008). The central assumption of SNM is that technological variation is directed to some extent, and not blind. Actors try to shape development and selection processes of innovation in niches. Niches are suitable not only for the development of, new design and testing of technology but also for broader societal issues, such as the circular economy (Schot & Geels, 2008).

The development of niches can be seen on two levels simultaneously; on the level of local practices and the global practices. Sequencing local practices can add up to the emergence of global niche practices (Schot & Geels, 2008). Local actors must support sequential practices because the innovation of one small-scale development can push other local events forwards. Often cognitive rules are unstable and diffuse, for example, expectations that are used as guidance for the elaboration of these projects (Schot & Geels, 2008).

If learning processes at the local level are becoming stable, there might be a slowly follow up on the global scale. The local projects then functioned as test beds for new ideas and out-of-the-box thinking. Only the strong niche developments have a chance to become stable and specific and eventually might be implemented in the global niche. The Netherlands is aiming for this to happen, as they want to sell the concept of CE to other countries (considering know-how, business models, systems, etc. (MVO Nederland, 2016). Essential for a niche to succeed is that the movement towards the regime happens in a protected space, where there is a mutual and shared understanding of the norms and rules (for example dominant designs) (F. Geels & Raven, 2006; Schot & Geels, 2008).

Societal groups and users can devote their resources and time to the development of a niche. Governments can be very useful in creating niches by subsidizing and nurturing innovations which are not (yet) profitable (Schot & Geels, 2008). Niches are attractive for governments because changes can become important in the future for realizing collective and societal goals (Schot & Geels, 2008). The central problem of many developments is the single focus on optimizing one aspect, therefore, for

a circular economy to be integrated into society, all aspects of society must be taken into account. In the case of textile industries, this is the whole supply chain of the textile industry.

The connection with SNM and the four pathways of Geels is important to take in mind as SNM focuses on which processes determine successful niche development. The steering of SNM focuses not on a top-down governmental steering, but endogenous steering, from within. Non-governmental organizations, environmental movements, and individual actors are all building up the circular economy through collective enactment. In the Netherlands however, CE is steered by the government as well. This is relevant to the discussion as the Netherlands can be seen as a niche development in itself compared to the world.

In sum, SNM stresses the importance of a protected space for niches to develop; niche developments can happen both on the local and global level and, external factors are as important as the niche innovation itself for a successful development of a niche outside the protected area.

3.6 Barriers to change businesses towards environmental engagement

The first theoretical concept in this research is transition theories as is discussed above. The second theoretical concept addressed in this section is: barriers for businesses to engage in environmental activities in this research defined as CE. A literature research for Small and Medium sized enterprises (SME's) is carried out to investigate those barriers, they have been categorized in internal barriers and external barriers, the categories are explained further below. The cases in this research have all implemented CE in some way in their business.

3.6.1. introduction

Shifting towards a circular economy is not only beneficial for reducing CO2 emissions, but it is also estimated that the shift towards CE in the built environment, food and mobile sector could reduce emissions by 48% in 2030. Also for enterprises and organizations moving towards CE could result in a 3% resource productivity growth in 2030 for Europe (Bastein et al., 2013). Thus, switching to a circular economy is of relevance for businesses. The reason behind combining the concept of transition theory and barriers for businesses to shift to CE is to see whether specific restrictions can be linked to the pathways the cases are 'following.' The hypothesis in this research is that specific pathways may be related to specific barriers, this can prove to be important for preparing SME's who follow similar patterns which shift toward CE. However, scientific research on combining transition pathways and corresponding barriers is very limited, and this study will try to combine those two concepts. First, the existing business models for CE are introduced then the internal and external barriers for companies to engage in environmental activities are identified.

3.6.2 Business design for CE

Businesses starting with a circular design in mind have an advantage in the design of their infrastructure compared to (big) companies altering the infrastructure later on. In CE the design of a product is of importance early in the development process (Bocken et al., 2016). Once product

specifications have been made, adjustments in the infrastructure, supply chain, and processes are harder to change.

A strategy for reducing resources is extending the utilization of a product; then the process uses fewer resources. The design of long-life products is aiming at reducing resources by slowing resource loops. This design refers to 'attachment and trust' because the product will increase feelings of love and likability for the product, due to the extended usability of a product (Bocken, Bakker, & Pauw, 2016). CE design also aims for 'reliability and durability,' because the product is made for a long time-span and will (most likely) not experience failure.

Another identified business model is the design for a product-life extension; this is a second strategy to slow down the resource loop. It includes the introduction of services to extend the lifespan of a product. Design for maintenance and repair of a product – this entails the ability of a service to fix the product back to a perfect condition. Maintenance is the inclusion of services, checks, and updates. Design for 'upgradability and adaptability' is a model that can continue being useful by adapting to future applications for the product and can adapt to innovations (Bocken et al., 2016). The design for 'Standardization and compatibility' is about creating a product where parts can be used for products, other than the originally designed product. The last design is for 'dis- and reassembly,' this entails that parts of a product can be decoupled and reassembled quite easy (Bocken et al., 2016).

3.6.3 General barriers

General biggest obstacles for all companies to comply with green activities are; a). Vested interests of the company, b). Lack of cultural acceptance that ownership by the user is not required (Renswoude et al., 2015). This goes together with consumerism, built in Western societies and seeping in other communities (Kumar et al., 2005). c). The dependence of companies on external suppliers is also an important barrier for all businesses (Hobson, 2015). In the literature, different restrictions for changing environmental activities in businesses are found. 'Environmental activities' is defined in this research as CE implemented in companies the textile industry. However, it should be taken in mind that the barriers found were not focussing mainly on start-ups transitioning towards CE. Barriers to change towards an environmental business approach in start-ups in the textile industry are studied to give insights into obstacles and opportunities for this branch.

Internal Barriers

There is made a distinction between internal and external barriers, the first assessed barriers are internal and have been categorized as follows: technical barriers, operational barriers, financial and knowledge and information barriers. The categories are explained below:

Technical barriers: SME's have found hindering barriers in a lack of infrastructure to shift their linear business towards a circular one. Linear practices dominate the infrastructure in the regime, keeping the infrastructure locked-in (Rizos et al., 2016). Achieving a shift towards CE is hard to organize without a proper infrastructure or the willingness to do so (Renswoude et al., 2015) Another technical barrier is that products are often made from various materials, this decreases the ability to

extract resources from products. A significant barrier is the lack of standardization, without normalization, some product operations, such as the use of a recycle-machine, will cost too much for some SME's (Kuma et al., 2005).

Operational barriers: Accounting systems that deal with linear economies; often those accounting companies are large and have a robust infrastructure). Another important functional barrier is the amount of stock or lack of inventory available for maintenance due to consumers with unpredictable needs (Kuo, Hsin-Yi, Huang, Hu, & Ching Shu, 2010). Also, processing times for remanufacturing and repair operations are highly variable (Toffel, 2004).

Financial barriers: A lack of capital is one of the most frequently named barriers in the literature for SME's to shift towards a circular technology (Rizos et al., 2016; Trianni & Cagno, 2012). The investment costs for changing an infrastructure is often named which high upfront costs; when implementing CE the costs do not flow directly back because they put in the cycle (Preston, 2012; Rizos et al., 2016). Another obstacle is increased costs due to a lack of access to components in stock (Kuo et al., 2010). The return and collection activities are also costly, as is the system for customers to comply to this activity. Monitoring the resource flows and updating the product's lifecycle of a product is expensive, and some businesses see production services as a threat to their own business (Kang & Wimmer, 2008; Mont, 2002). Another significant financial risk is that companies have a greater financial risk when they are entering a market that is uncertain for them (Preston, 2012). The lack of access to sources of funding, finding new methods of financing green innovations is also a significant barrier, as starting a company is difficult without the necessary funding to do so.

Knowledge and information barriers: Lack of capabilities and information is mentioned as a barrier for start-ups, as they often lack knowledge about the current infrastructure of the regime, or have a lack of capacities in developing new technologies or more practical activities. Examples are skills in online marketing or sales (Rizos et al., 2016). Another barrier is the lack of knowledge about the benefits of shifting towards a CE (Rizos et al., 2016).

Barriers: External

Market: An important barrier is a fear of information sharing between companies due to the competitive nature of industries with traditional markets (Kumar et al., 2005). Convincing the consumer about the new business cycle or vision is another external market barrier. Often users are used to the BAU in enterprises, and it is hard to convince them to do otherwise, customers need to have a 'willingness to pay' a higher price for sustainable clothing (Renswoude et al., 2015).

Society: A societal barrier for SME's to engage in environmental activities is the lack of awareness about environmental issues of consumers (Min,H. Galle, 1997). Customers do not recognize CE is the way forward; customers see BAU as the 'right path' and do not see any incentives to change. Another barrier is the idea of the abundance of materials in society; this is connected with the notion of consumerism in Western and developing in non-Western countries (Kumar et al., 2005).

Cooperations and coordination within supply chain: Within the supply chain of SME's, several barriers were found. The dependence of companies on external suppliers is an important barrier for all businesses (Hobson, 2015). The willingness to be dependent on others is often accompanied by a lack of, or low levels of trust between companies (Preston, 2012). For CE to succeed full transparency for all cooperating companies is needed to ensure a closed circle. Finding partners in both supply and demand; finding partners who are willing to be about their supply chain and want to cooperate are reported as an obstacle (van Buren, Demmers, van der Heijden, & Witlox, 2016). The lack of resources and support is an important barrier for compliance to environmental engagement. Often companies are using a short-time frame for their business and want to increase their profit. SME's have reported little influence on the engagement of external stakeholders on circular practices (Rizos *et al., 2015).*

Infrastructure: a reported external barrier for SME's regarding the current infrastructure, is the lack of support for recovery after engaging in environmental activities (Renswoude et al., 2015).

Policy and regulations: The role of legislation and regulation is essential for the environmental performance of SME's (Renswoude et al., 2015). Command-and-control, however, is not an incentive for pro-active environmental activities, although it will help to reduce the environmental impact (Studer, Welford, & Hills, 2006). Many companies are not aware of the added value of engaging in environmental activities and prefer to wait until legislation is implemented, especially among SME's this attitude is present (Studer et al., 2006).

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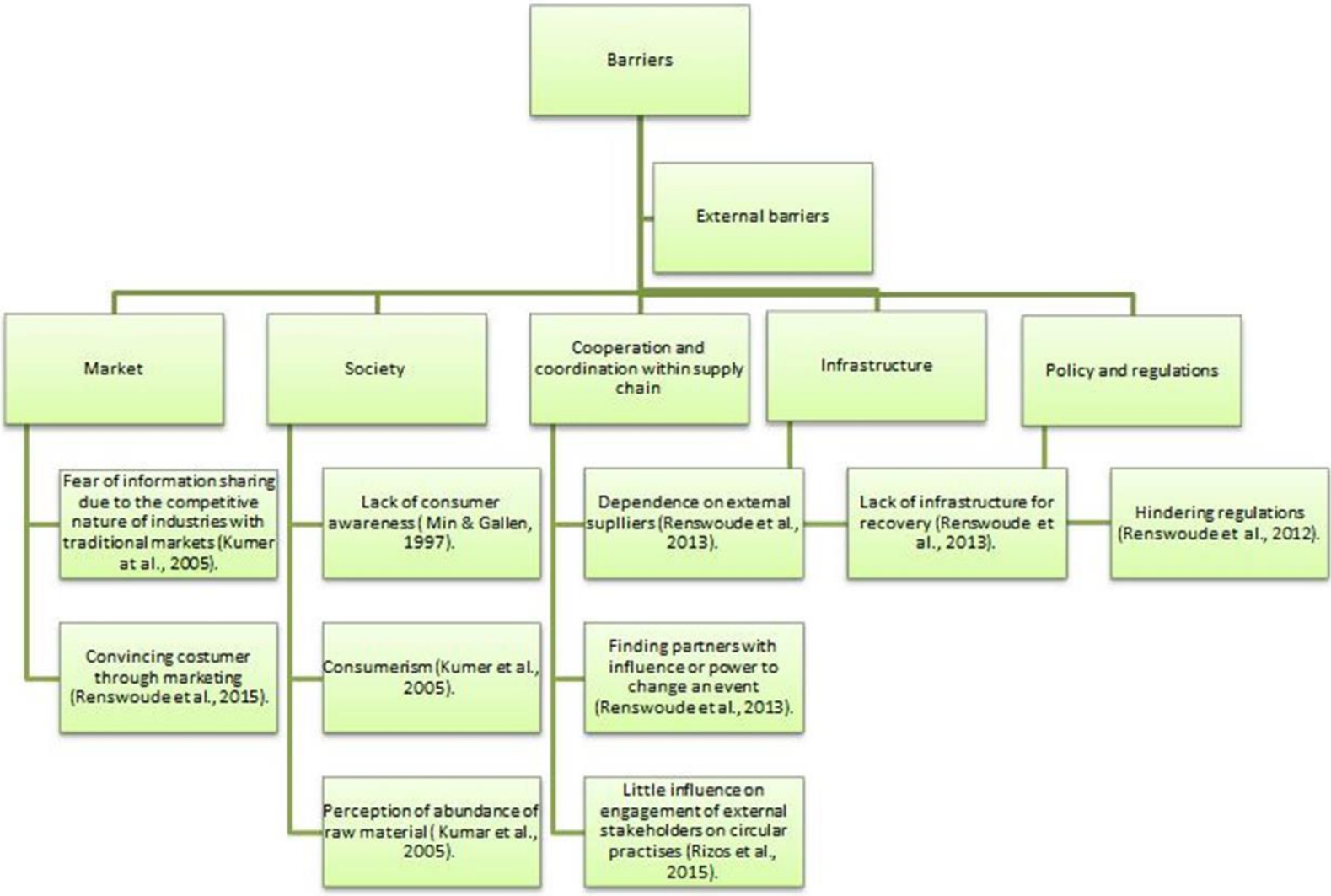

Figure 8. External Barriers to engage in environmental activities

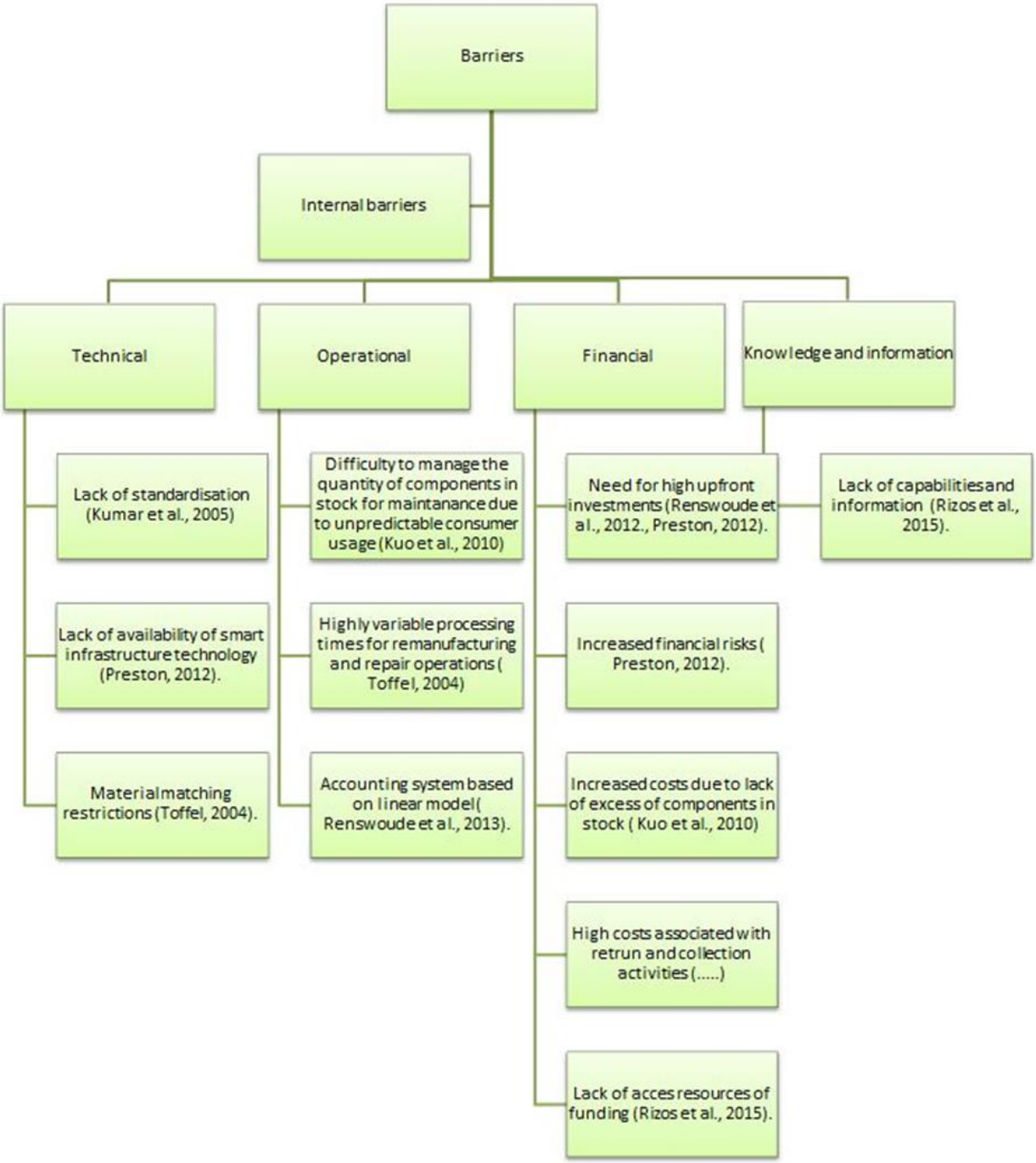

Figure 9. Internal barriers to engage in environmental activities

3.7 Opportunities for businesses to engage in environmental activities

Next, to the above-discussed barriers, different opportunities for businesses to participate in environmental activities have been identified. Identifying these opportunities add insight in the reason why companies are willing to shift towards a more sustainable approach.

The primary reasons for businesses to participate are an enhanced reputation and competitive advantage regarding other activities (Studer et al., 2006). However, especially in start-ups, many initiatives have been developed from personal concern with the environment and the realization that society cannot continue the way the current economy works. The importance of personal interest in the transition towards CE is also suggested in a case study (Petts, Herd, Gerrard, Horne, & Wiley, 1999). Enhanced employee engagement in environmental activities has the power to alter the business's vision and is acknowledged by his staff as an implementation and policy 'champion' of environmental issues (Studer et al., 2006). The CEO and manager must also be aware of the benefits of the proposed changes because their attitude and willingness to adapt to 'green measures' are an important variable to realize change (Rizos et al., 2015).

If companies see added business value, it will help them to perform better at their core business. Also, if consumer demands are facing towards an environmental engagement, businesses are more willing to consider participation (Studer et al., 2006). Participation is seen too in multinationals in the textile industry as the recent consumer demands a more environmental 'conscious' approach. Examples of customers' increased preferences in participation are displayed in the initiatives of sustainable fashion bloggers, H&M has responded to his by creating 'conscious clothing' line at H&M. Companies with more visible environmental engagement in their brands are higher valued by consumers than those who do not show or are not engaged at all (Seock, Yoo-Kyoung; Norton, 2007). Large companies, with more resources, often participate in environmental activities comparing to SME's. According to Walker, Di Sisto, & McBain, (2008) SME's are less exposed to public pressure, unlike large enterprises. On the contrary, in this research, it has come forward that start-ups are actively engaging in online social media and focus most of their marketing on social media (MUDJeans, 2016). Also, a lot of the SME's are demanded to be visible online, either in environmental reports demanded by consumers or consumers asking questions on social media and they seek attention for their products via social media.

In short, the main reasons to engage in environmental activities for SME's found in the literature seems to be the added business value and competitive advantage it generates to participate in environmental activities. Multinationals are often more exposed in the media, and this can be both beneficial and adverse for them regarding their environmental engagement.

4. The current situation in the textile industry

This section elaborates on the current dynamics in the textile industry to reveal the characteristics of the regime. Three textile multinationals are investigated more closely to create a specific overview of the sector. After that, the environmental impacts and environment-specific rules in place are investigated. of the textile industry are discussed.

4.1 Introduction

It is important to understand the dynamics of the global textile industry to understand the environment Dutch start-ups are operating in because of the direct and indirect influence of the current textile industry on them. Therefore, this section explores how the global textile industry works and how the infrastructure and supply chain looks like. The regime is of great importance in transition theory because it is the level where the dominant actor networks and institutions are concentrated. The regime consists of dominant actors and institutions in the global textile sector , defined as textile multinationals, as is explained in this chapter.

4.2 The regime level – the textile industry

4.2.1 Introduction

In this section, the dynamics of the regime in the textile industry is researched. The apparel industry is an estimated 3,000 $ trillion industry (Fashion United, 2015). The textile sector has the biggest production and output and is after agriculture, the most polluting industry (Malik, Akhtar, & Grohmann, 2014). In 2015, about 60 to 75 million people were considered to be employed in the textile, footwear and clothing sector. The industry is growing, for comparison, in 2000 about 20 million people were working in this branch (Stotz, Kane, & Statistics, 2015). The data is slightly troubled, because of many unregistered workers in this industry. For comparison, Global Fashion Statistics have come up with 26.5 million workers in 2000, compared to 57,8 million workers in 2014(Fashion Institute, 2016). An important issue of discussing are the working conditions of people working in the factories in Third World Countries. This research is not the place to go too deep into this, however, some important aspects are discussed briefly below.

Working hours for people working in the (sewing) factory are long, the salary is often insufficient to sustain their families, and the working environment is hazardous, mainly because the production process requires various chemicals. People are often low-educated and therefore, are easy to replace. Therefore they have a tendency to ‘overdo’ in the manufacturing process, for example, putting too many chemicals, because there is no room for failure as their families often rely on those jobs (Interview DyeCoo, 2016). The principle ‘right first time' is an important principle in those factories, an example: if an order of 10 million black tops goes wrong i.e. not all black tops are the same black, the factory needs to re-do it at their expenses. Therefore there is much pressure on the people working in the plants **(**Interview DyeCoo, 2016).

The top garment producing countries in 2011 were respectively; China, Bangladesh, and India. The top 3 importing regions or countries, were respectively EU-28 (38%), US (20%) and Japan (no % available) (Stotz et al., 2015). The key players in the supply chain are the multinationals including their fashion and textile designers, retailers, and manufacturers. The US and Europe have outsourced the production process in low-wage countries, where the supply chain is demand driven and quite flexible (Bhardwaj, 2010).

4.2.2 The garment supply chain

The garment supply chain has many actors of various sizes and operational differences. Differences exist between the production stages, but also exist between the competitors at the same stage. Those differences must be taken into consideration, as the value chain increases from the raw material stage to the finished garments with a value addition of 300 – 400% (Giri & Shankar Rai, 2013). There are many big and small players in this field, either organized or unorganized. All of them can engage in different supply chains at the same time which results in a highly complex and dynamic supply chain where transparency is hard to manage (Giri & Shankar Rai, 2013; Malik, Akhtar, & Grohmann, 2014). The garment supply chain consists of the following stages: fiber and yarn production, fabrication, garment, distribution and retailing (Giri & Shankar Rai, 2013).

I. Fiber production: the fiber is the raw material to create all kinds of garment products. There are natural or human-made fibers, synthetic fibers. Natural fibers can be produced in agricultural firms, such as linen, cotton, bamboo, jute or it can be animal fibers such as wool, silk, fur (Sen & Reddy, 2011). Human-made fibers are produced from petroleum, castor oil, and coal and can include nylon, acrylic, polyester (Giri & Shankar Rai, 2013).

II. Yarning/Spinning: the fibers are turned into yarns in spinning mills, this is a mechanical process where they are twisted together and are produced in all kinds of varieties. Dying of the yarn is also done in this step.

III. Fabric production: this process consists of weaving and knitting and the non-woven process, where the woven fabrics are interlaced by two threads. This stage consists of two parts; the organized part and the unorganized part. The organized part has mechanically, and technological mills; the unorganized sector has small knitters and weavers who work at handlooms primarily in household businesses, knitting machines, and power looms (Chandra, 2005).

IV. Garment production: this process includes designing, cutting, stitching and finishing the product. Various companies forecast the customer needs and future markets. Companies often have their designers or can outsource it to other design houses. Often the cutting and stitching are done in the garment production and manufacturing companies. If the stitching process was outsourced by the garment production, the clothes are sent back to the manufacturing companies where the product is prepared for the finishing process, including cleaning, packaging and distributed through the logistics and network system in place (Giri & Shankar Rai, 2013).

V. Retailing: there exist a market for retailers, where different retailers are specialized in clothing and related merchandise from one company, often those retailers are owned or franchised by the garment company (for example Zara). There are also department stores; those are larger retailers who have a broad range of assortments of products.

The coordination between the market and consumer needs is crucial in the supply chain. The higher the synchronization between those two the better the company performs in this industry (Giri & Shankar Rai, 2013). Companies, like Zara, Primark and H&M are excellent at responding to consumer and market needs. This explains to a large extent the success of these enterprises (Bhardwaj & Fairhurst, 2010).

4.2.3 Transparency in textile sector

Transparency in this industry is uncommon, H&M is one of the few multinationals that has given insight into their supply chain. On their website, H&M has stated that by making their supply chain transparent, hopefully, other companies in the industry will be inspired and follow their lead. This statement reflects the unwillingness of the regime to give insight into their supply chain. As H&M is stating; *"We hope that this step will further contribute to increased transparency and sustainability in our entire industry*" (H&M, 2016).

Three factors are contributing to non-transparency in this sector; the first is the complexity of the manufacturing infrastructure. Factories are often contracted and not owned by textile manufacturers. Therefore, insight into working conditions at the particular factory is hard to obtain. The second factor is that a textile owner can contract or own one or more factories without informing the client. Because there are so many textile factories, the competition between companies is high; a big order can quickly go to another factory that offers lower prices and can deliver faster (Interview DyeCoo, 2016). The third factor is the complexity of the supply chain of the global textile industry; a single multinational has already a very complicated infrastructure. For example, H&M works with manufacturing factories, processing plants, and second tier suppliers (fabric and yarn mills). To give an indication of the size of their industry, in Bangladesh only there are 877 manufacturing and 431 processing factories that H&M works with (H&M, 2016) Next, to Bangladesh, they have factories in 30 other countries with China and India as biggest suppliers. The infrastructure to inspect those plants multiple times a year to check whether the manufacturers comply with the regulation is not in place.

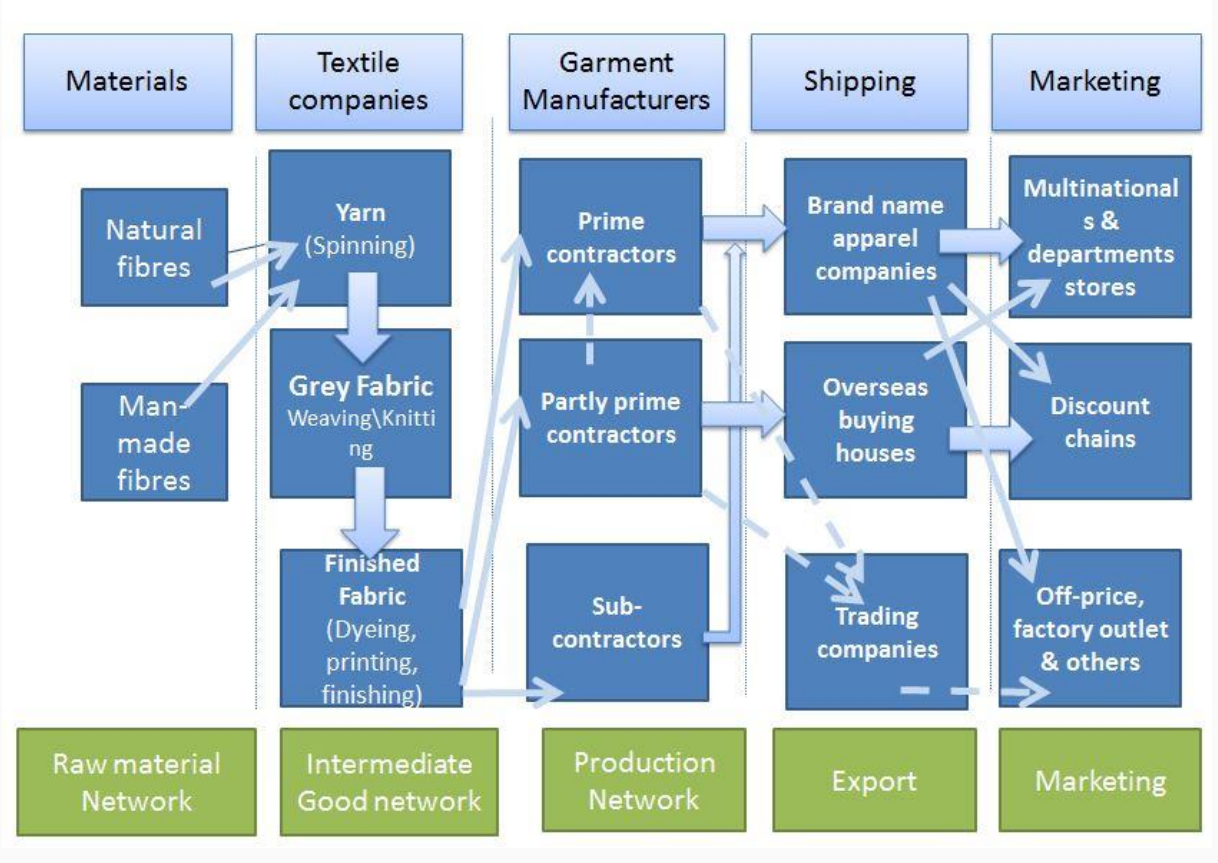

Figure 10. Overview supply chain textile industry

4.2.4 Fast fashion

The dynamics of the fashion apparel industry has rapidly changed in the last 20 years, such as the growth in demand, the increase in fashion seasons with mass-production of short -cycle clothing, and structural shifts in the supply chain (Bhardwaj & Fairhurst, 2010).

The growing demand for clothing is partly responsible for the in France developed concept 'fast fashion'. Initially to anticipate to the need of teenage and adolescent women to have trendy, relatively inexpensive and short-cycle clothing (Doeringer & Crean, 2006). Multinationals as Inditex (owner of i.e. ZARA) are responding to this concept and are focused on producing as fast and as cheap as possible, in line with the 'latest trends' as this is what the consumer demands (Interview Kuyichi, 2016). This business model is non-sustainable as the concept 'fast fashion' is focused on producing low quality for the lowest price and cannot be manufactured in a sustainable manner (Interview Kuyichi, 2016). Asking a few more euro's for clothing will not solve the problem, because of the infrastructure of this industry. All the stakeholders in the supply chain want to earn money, and this is not likely to end up in the hands of the employees working in the factories but probably get 'lost' underway (Interview Kuyichi,2016). Still, most people want clothes which are beautiful on them, fit comfortable and are inexpensive (Interview DyeCoo, 2016). Moreover, all of those business models are shaped into this way of thinking, *"Because why would you adapt your business model if it works so well"* (Interview DyeCoo, 2016 p. 29). Multinationals have a business model that pays off and have few incentives to change their model.

The key to managing fast fashion is to identify consumers preferences and develop clothing that is popular with fashion bloggers, markets, and designers. Fast fashion is not designed as *haute couture,* but more or less copied from designs of haute couture and produced in different colors, materials, and sizes. Resulting in a supply chain that can deal with the low costs and have a high flexibility, and therefore, deliver the product with high speed to the market (Bhardwaj & Fairhurst, 2010). The time-span for an item of 'fast fashion,' is around a month or less. Samples can come off the designer table in less than a day, market testing products are produced in less than a week, and it can end up in stores within a month. The supply can be regulated easily, as the demand is decreasing the production can be halted fast (Bhardwaj & Fairhurst, 2010).

4.2.5 Sense of sustainability among customers

Consumers, in general, do not have knowledge of the outcomes of the production in the apparel industry (Bhaduri, 2011). However, more consumers are asking questions and oppose themselves against the garment industry (Interview Kuyichi, 2016; Mintel, 2009). Especially the group of consumers between the age of 18 -25 is concerned about the impact on the Earth of practices such as the apparel industry (Williams & Page, 2011).The value 'transparency' is becoming more important, especially for consumers in the age of 18-34. They are the most engaged in sustainability and environmental issues. 73% of those consumer group says that brands fail in taking corporate responsibility regarding sustainability and society (Seock, Yoo-Kyoung; Norton, 2007). One of the key ways for businesses to respond to this is developing a 'value-based business,' which includes developing and designing business models that enable them to produce and consume more sustainable. According to the Cotton Incorporated Environment Survey, over half of all consumers (57%) state that 'sustainability' is of influence on the purchase in textile, 23% of the consumers 'always or usually' purchases only sustainable-labeled clothes (Sitra & Circle Economy, 2015). This group of consumers are seen as frontrunners and are therefore highly valued by companies. This group especially is empowered by knowledge, increasing their awareness about 'green 'market products, environmental and social issues (Seock, Yoo-Kyoung; Norton, 2007).

Their awareness about sustainability is in contradiction with the trend of 'fast fashion,' this consumers group is roughly the same as the group of consumers concerned about the environment. This can explain to a certain extent the environmental engagement of multinationals. Examples are the use of organic cotton in stores of Zara or the development of the 'conscious clothing' line at H&M (Inditex - Annual Report, 2015). The market is responding to the views of this group consumers. The bigger picture is that other 'movements' such as eating less meat, growing vegetables, thinking about the impact the clothing industry has, all contribute to the sense of sustainability among consumers. The question is of the evolvement of the Western landscape has influenced the regime. However, this is not explored in this research.

Often designers are not aware of the negative environmental impacts their industry has (Interview DyeCoo, 2016). *"For example, a stretchy shirt with black and white stripes, the chance that there goes something wrong in the production process is bigger and the more details and prints the bigger those chances are"* (Interview DyeCoo, p. 4, 2016). Next to the amount of prints and details on clothing, the

darkest and deepest colors have the most impact on the environment, due to the number chemicals and water that is used to make the color (Interview DyeCoo, 2016). "*The designer of H&M is just sitting in a corner designing that everyone should wear black next season, and then it is all black next season again"* (Interview DyeCoo, paragraph 45, 2016). Designers are often not well educated on the impact the textile industry has on the environment. However, in the past years in design schools in the Netherlands, more attention is given to questions where resources come from, and how they are obtained (Interview Circle Economy, 2016; Interview Wintervacht, 2016).

Being corporately responsible in a sustainable manner generates about 35 – 50 % more positive media attention compared to companies without the focus on being corporately responsible (Sitra & Circle Economy, 2015). Therefore, some brands are accused of 'greenwashing' their products, actively labeling products as sustainably produced while the products are not certified by a third party as such.

Concluding, entering the textile market is extremely hard for newcomers, this came across several times in this research (Interview DyeCoo, 2016; Interview Kuyichi, 2016; Interview Circle Economy; Interview Dutch Awearness,2016). The multinationals are so big, have access to many resources, have the right connections both in the manufacturing as the designing part and have improved their supply chain to the extent that every part of the process is as optimal as possible (Interview Circle Economy, Interview Kuyichi, 2016). The industry is tightening itself because it seems there is no way out of this production process. Partly this is due to the needs of the customer demanding 'fast fashion' and the business model regime players applying this model.

4.3 Three largest companies in the Apparel Industry

To understand the dynamics of the global textile regime, three large textile companies are researched. This industry has many global dynamics that affect the national industries.

To give insight into the global dynamics, there is taken a closer look at the three largest companies in the textile industry. The first one is conglomerate Moët Hennessy-Louis Vuitton (LVMH); is has 41,6 $ billion in sales company and 1,7$ billion in profits. The second one is Nike; it has more than $32 billion in sales. The third is Inditex – short for Industria de Diseno Textil; having over $ 20 million in net sales, owner of various brands where ZARA the most well-known is (Forbes, 2016 – accessed at 06 09 2016)

I. **LVMH** is a French luxury conglomerate. The company has several luxury brands such as Dior, Louis Vuitton, and Fendi. It does also have other 'luxury lifestyle' brands such as sailing yachts (Royal van Lent) and champagne (Moët). Insight in their contracted manufacturer's factories and specific countries where their products are not available or at least hard to find.

   In 2008 they established a Code of Conduct *that "states its requirements in matters of social responsibility, the environment and the fight against corruption*" (LVMH, 2015 p. 35). They explain that every collaboration with every partner should comply with this code. The partners are not

displayed, nor the countries and numbers of factories their products are produced in. In 2014 they joined Sedex, a non-profit organization that promotes responsible and ethical improvements in the supply chain.

II. **NIKE, Inc.** is the second biggest company in the apparel industry. Nike is an American sports-athletic brand, and in 2015 it had 931 stores worldwide. About 94% of Nike's income originates from the Nike brand; the remaining 6% is from the brand Converse, a subsidiary of Nike. Nike sells both clothing and footwear, where the latter generates about 64% of Nike's total income (NIKE Inc., 2015). For clothing production, they are provided by about 408 apparel factories, which are located in 39 countries, whereas the largest apparel factory was responsible for 11% of the total fiscal Nike apparel production (NIKE Inc., 2015a). Those factories are in China, Vietnam, Sri Lanka, Thailand, Indonesia, Malaysia, and Cambodia. In 2015, the top five contract apparel manufacturers accounted for 36% of the Nike apparel production. The biggest contract with a manufacturer is responsible for more than 10% of the clothing production. Materials used are a synthetic rubber, plastic compounds, foam cushioning materials, natural and synthetic leather, nylon, polyester, canvas and polyurethane films used to make the Air-Sole cushioning components (NIKE Inc., 2015b). Natural and synthetic fabrics and threads, virgin and recycled, are the principal material used in their apparel products. The raw materials are available and bought by independent contractors and suppliers for manufacturing the footwear, apparel and equipment products in the country where manufacturing takes place. According to their annual report of 2015 *"NIKE's independent contract manufacturers and suppliers have thus far experienced little difficulty in satisfying raw material requirements for the production of our products." (NIKE, INC. 2015 Annual Report, p 67).* Nike works with hundreds of companies located outside the US, and they have made an agreement of compliance with manufacturers about those standards. A failure of those standards could harm their products and their business, as they point out in their annual report (NIKE Inc., 2015a). For both the footwear and apparel production, there was no list of manufacturing companies available.

III. **Inditex** is the third largest company in the apparel industry; they own very well-known brands such as ZARA, Pull&Bear, and Bershka. In 2015, they had a total of 7,013 stores worldwide in 88 markets and online in 29 markets(Inditex - Annual Report, 2015). Their net profit was 2,882 million euro in 2015, and 330 new stores opened in that year. About 152,854 employees work for them, excluded all the workers in the manufacturing companies (Inditex - Annual Report, 2015). They have a total number of 6,298 factories, the biggest of them are manufacturing (4,136) and fabric (658). About one-third of their factories is located in Asia (2,252), one-third is located in the European Union (2,086) and the rest is located in Non-EU countries, Africa and America (Inditex - Annual Report, 2015). As is shown in figure 11. Inditex works together with 1,725 suppliers from all over the world. They aim at transparency and have a very extensive annual report where they explain and give insight in results of their audits. They have a compliance program to ensure that labor conditions comply with the Inditex Code of Conduct for Manufacturers and Suppliers and with international standards. Before vendors can enter the supply chain, the suppliers are

assessed with a pre-assessment audit. In 2015 around 2,703 pre-assessments were carried out on potential factories and suppliers, with an outcome of 88% positive. Once the suppliers are entered the supply chain, they are held responsible for complying with the Code of Conduct (Inditex - Annual Report, 2015). The aim of the Compliance Programme is to ensure that labor conditions comply with international standards and Inditex's Code of Conduct for Manufacturers and Suppliers. A first assessment takes place before the vendor has entered the supply chain with a pre-assessment audit. In 2015, some 2,703 pre-assessment audits were performed on potential suppliers and factories, of which 88% had a positive outcome. This first filter allows only manufacturers that comply with the standards established in the Code of Conduct to enter the supply chain. From the moment they entered Inditex's supply chain, they assume responsibility for complying with the Code of Conduct. In 2015 about 2,886 audits took place both carried out by internal and external auditors, 16% more audits than in 2014. About 42% of those reviews was in compliance with their Code of Conduct, 46% was just below their code of conduct, and the remaining 12% was either audits in progress or severe results of the checks (Inditex - Annual Report, 2015).

The Inditex supply chain in 2015 (*)

Geographic area	Suppliers with purchases in 2014	Suppliers not used in 2015	New suppliers in 2015	Suppliers with purchases in 2015
Africa	135	25	20	130
America	80	27	21	74
Asia	759	156	233	836
Europe (non-EU)	160	34	59	185
European Union	491	74	83	500
Total	**1,625**	**316**	**416**	**1,725**

(*) Suppliers of fashion items, mainly clothing, footwear and accessories, with a production for Inditex of over 20,000 units/year. Suppliers with smaller production account for 0.37% of the total production.

Figure 11. Overview Inditex supply chain. Source: Annual Report Inditex (2015)

4.4 Recent developments in regime on sustainability

The current activities on CE of regime actors are investigated, to see is whether those multinationals in the regime are currently affiliated with the concept of CE. This is done for respectively LVMH, Nike and Inditex.

I. To start with the LVMH. The LVMH organized in 2014 the Green Week, the largest annual conference on European environmental policy, with a primary focus on Circular Economy. They have environmental programs such as LIFE and LEED to compensate for their flights to deliver products at their stores, and they have zero emission buildings (LVMH, 2015).
II. Nike is currently affiliated with the EMAF; they joined in 2016. '*Nike will accelerate its innovation efforts toward a closed-loop future by joining other influential companies and emerging innovators working on the shift to an economy that is restorative and regenerative*

by design' as their press release mentioned in spring 2016 (Nike Inc., 2016). Nikes, Chief Sustainability Officer and VP and Innovation Accelerator at NIKE, Hannah Jones sees sustainable innovation as an 'engine' for future growth and wants to use innovation as a catalyst for the way they do business. *"As part of our growth strategy, we have set a vision for a low-carbon, closed-loop future, and we fundamentally believe the transition from linear to circular business models will accelerate our ability to create the future of performance products for the athlete,"*. (Nike Inc., 2016).

III. Inditex wants to reuse their garment with as little modifications as possible to create greater value. Also, they want to reuse sub products from discarded clothes to recycle and obtain products with the same or higher value. Incineration is their second last option for energy production (Sustainable Report Inditex, 2015). Inditex is familiar with CE, as they launched a 'Closing the loop project' in 2015 as part of their end-of-life strategy. In this project, they aim for reuse and recycling of Inditex garments by collaborating with social entities, technologist, textile manufacturers and recycling companies. With this project, they want to ensure that 'no used textile item ends up in landfill' (Inditex Sustainability Report, 2015). They also want to work with universities to reach this aim. In their Zara stores in Spain, the United Kingdom, The Netherlands, Sweden and Denmark, they carried out a pilot project to collect footwear, clothing, and accessories and donated this to non-profit partners, such as the Red Cross (Inditex Sustainability Report, 2015). In 2015, thi added up to the collection of 5,7 tonnes from stores and 37 tonnes from offices and logistic centres (Inditex Sustainability Report, 2015). According to the Organic Cotton Market Report, Inditex commitment to use more sustainable materials has led to an 318% increase of organic cotton used since 2014 (Organic Cotton Market Report, 2015). Organic cotton is grown with a reduced use of pesticides and fertilizers trying to lessen the impact on the environment. A third party certificates organic producers to make sure they only use methods that are allowed in producing organic cotton. India, China, Turkey, Tanzania and the US produce about 97% of all organic cotton, with India as biggest producer growing 74% of the total organic cotton globally (States et al., 2015). About 0,7% of the global cotton area is used for the production of organic cotton. The production of organic cotton increased 15% to 25% in 2015, compared to 2014, and the global sales of organic cotton rose by 10 % in 2013 in relation to 2012. Inditex supports the development of textile recycling technology for the creation of new raw materials. For example, they started a cooperation with Lenzing, an Austrian producer of the plant-based sustainable textile fiber TENCEL®. They aim to raise 3,000 tons of textile waste to enable Lenzing to produce this fiber (Inditex - Annual Report, 2015) TENCEL® is a new product made from a dissolved wood pulp and is a 100% sustainable resource as it is entirely biodegradable. The material is wood and comes from tree nurseries and received the EU quality label FSC.

4.5 Environmental impacts of the apparel industry

The textile sector is the second most environmental harming industry after oil (Sitra & Circle Economy, 2015) About 25% of the existing chemicals are used in the textile industry, for example, the procedure of dying demands many chemicals. Next to chemicals a lot of water is utilized in the production process, for example, washing the garments to rinse out the used chemicals for the dying procedure. The use of water and chemicals has some severe direct and indirect impacts as is shown in figure 12 and 13.

Examples of those chemicals are arsenic, cadmium, nickel and cobalt and are all highly toxic, especially in the amount that it's dumped in the wastewater (Malik et al., 2014). The amount of water used to produce, for example, one single jeans is estimated at 7,000 litres (MUD Jeans, 2016). The biggest problems are the scarcity of water regarding sustainability and the bad or non-existing wastewater treatment (Malik et al., 2014).

Typically, textile industry wastewater can be identified by measurement of heavy metals, suspended solids, dissolved solids, and intense color (See Fig. 14). The primary concern for the local people is aesthetic, as water bodies directly change colors after the release of the wastewater. If for example, the new fashion color is orange for next season, it is visible in cities that have large textile industries (Verma, Dash, & Bhunia, 2012).

Figure 12. Waste disposal of clothes. Source: Donenfeld and Nelson, Panos Pictures (2009).

Other direct impacts are a decrease in sunlight penetration in the receiving water because of a number of chemicals in the wastewater, resulting in damaging flora and fauna of the ecosystem. The chemicals clog the pores of the soil, leading to a lack of nutrition's in soils because the pollutants hardened the ground, and thus, roots cannot be reached (Verma et al., 2012). Eutrophication is another indirect effect, with a growing influx of nutrient rich sewage water, making the water unusable

for humans. Due to the chemicals used, the water has a low biodegradability implicating some severe impacts on killing aquatic life such as fishes, plants, and mammals. Wastewater that is generated from a different stage of the textile process entails an enormous amount of pollutants when there is no proper treatment done. The impact of those chemicals can cause some severe illnesses as it suppresses the immune system and respiratory, circulatory, central nervous and neurobehavioral diseases could occur. It can also cause an increase in leukemia, various myopia, vomiting and tissue and lung infections (Malik et al., 2014). Around 33% of the produced clothes from an average brand end up in a landfill or are incinerated (Interview Circle Economy, 2016). However, numbers on this are hard to verify because brands are not transparent about the actual numbers. The main reason for the estimated number is that companies do not want their names circulating among the 'wrong' customers. Instead, they end up being wasted. About 20 million tons of textile waste is incinerated or landfilled each year in the EU and US (Sitra & Circle Economy, 2015). Methane is released when the textile is in a landfill, as toxic chemicals from the fabric discharge into the soil. When textiles are incinerated, significant amounts of harmful emissions are released. About 95% of the textile waste could be recycled or re-worn (Sitra & Circle Economy, 2015).

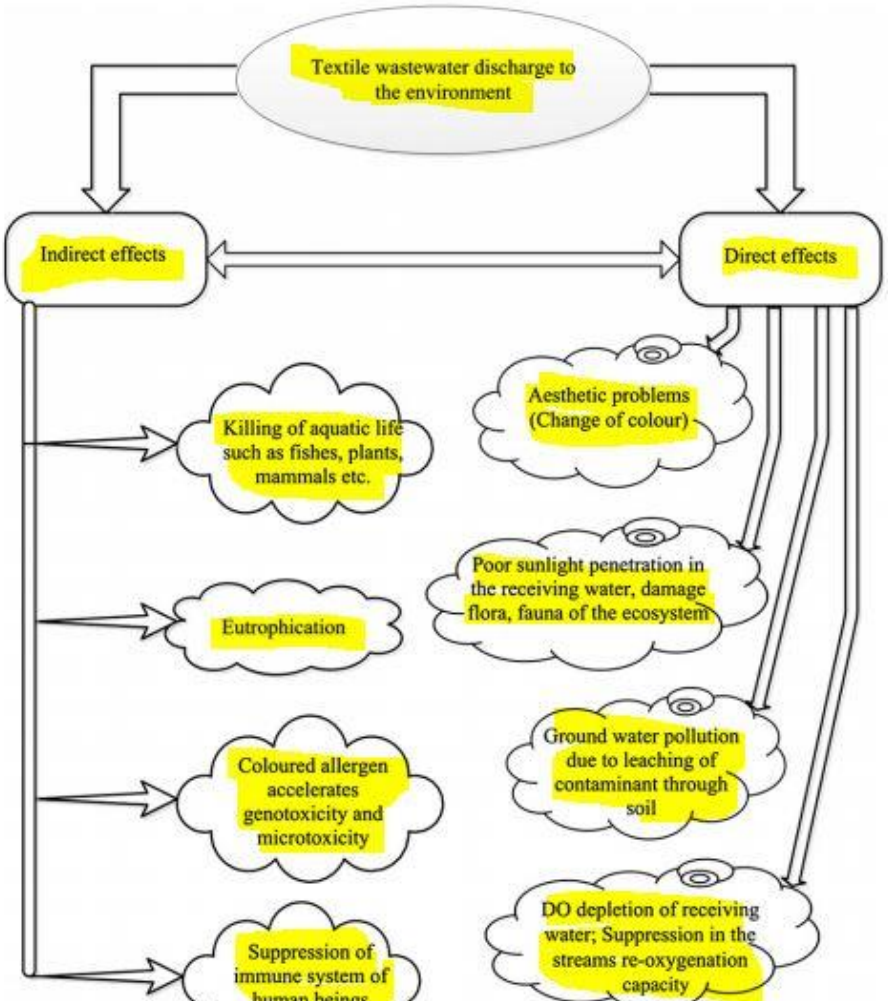

Figure 103. Schematic representation of textile wastewater on environment. Source: Verma (2012)

4.5.1 Environmental regulation

Global environmental regulation is difficult to manage in the countries where manufacture factories are widespread, countries such as Bangladesh and India do not have very strict environmental regulation policies. The large manufacturer companies in India (Tata Chemicals, Indian Petrochemicals Corp, Reliance Industries) have complied in some way to the environmental movement since the Bhopal disaster in 1984 (D'Souza, 2001). However, the problem lies in small and medium companies; those generate most of the pollution. Big apparel industries work with both small, medium and large manufacturers. Especially in those small factories, there is no monitoring and no compliance to environmental standards and laws, and it is unsafe (D'Souza, 2001). India one of the biggest suppliers of the textile industry, the government have adopted the command and control approach. Unfortunately, this works not so well, as they do not have extensive infrastructure facilities, good monitoring capacities, and enforcement tools in place. They have a lack of workforce, political interference and there is extensive corruption (D'Souza, 2001). The biggest challenge is enforcement of environmental laws. Therefore, there is need of an integrated law on environmental protection to comply with enforcement in a meaningful way (Agarwal, 2005). Inspections to the manufacturing companies are put in place by the government, but those controls seem to have no impact on environmental pollution and emissions. They are ineffective in communicating the desired changes in behaviour, mostly because the enforcement is low, the punishment for noncompliance does not exist or is not respected, and they are sensitive for bribes since they are poorly paid (D'Souza, 2001; Roberts, 1995). The small companies have no incentives to comply with environmental standards, and often it is more expensive to install operate equipment, wastewater treatment equipment for example than to comply with the environmental legislation. Small and medium companies have a short-term vision, and the importance of scarcity of resources is of lesser concern to them. There are environmental (water) laws and boards in place such as the Environment (Protection) Act of 1986. However due to poor political interference and other weak enforcement actions those institutions often fail. Corruption is omnipresent; this is also a very constraining factor (D'Souza, 2001; Rajaram & Das, 2008). The Elite is a slight and powerful group of people; often factory owners are in the government as well. For example, the Ministry of Water owns two textile manufacturing plants (Interview DyeCoo, 2016). There is advocated for decentralized governmental actions on environmental improvements, carried out by the local governments. Achieving this difficult to achieve due to all above reasons. A significant incentive could be that in 2008, about 10% of Indian GDP was estimated to be lost due to environmental implications (Rajaram & Das, 2008).

4.6 Conclusion

Landscape: Environmental regulation is often not complied to in the producing regions due to a lack of enforcement, bribes and elite groups maintaining the BAU. Insight in the manufacture or processing factories is often not made transparent. However, one big player (H&M) has done this. Some consumers are demanding a more open production process, especially the users in the age 18- 35 are critical to production processes and are environmentally aware. This group is seen as treasured for

companies, and this might have resulted in the recent sustainability attempts. A brand that is known for its sustainability has an increase in positive media attention.

Regime: The textile industry is incredibly complex with many actors in the supply chain. There are a few big players in the industry, from Europe or the US, producing the leading share of the total clothing production. The manufacturing process is mainly located outside those regions, with Asia as the biggest region for production factories. Many small and medium size manufacturing and processing plants are responsible for a significant share of the production. Their business model is 'fast-fashion,' where the companies can respond very quickly to consumer demands. The dominant actors make use of the existing infrastructure and do not like change, as regime players have fixed ways of working. The scale on which production is done is immense and increasing, with factories subcontracting other companies to deliver. Resulting in environmental damage, human illnesses, and depletion of resources such as water and arable land.

Niche: Niche innovations such as the use of TENCELL or organic cotton is gaining ground in the regime (multinationals). Innovation in this sector is hard to push through, as this sector is fixed in ways of working due to the current infrastructure, short-time frame, the current business model of 'fast fashion' and production process. This industry is also described as a market that is hard to entry for newcomers as big players have much power.

Conclusion: The regime is influenced by the bigger 'movements' such as sustainable consumers demanding more transparency. The most major companies in this industry have in some way worked with the concept circular economy. NIKE and H&M are cooperating with EMAF; this could indicate that niche developments have entered the regime on a small scale.

5. Dutch textile regime

To provide insight in the Dutch regime start-ups are operating in, overarching organizations in the Netherlands have been interviewed for background information to provide more details about the current developments of Circular Economy in the Netherlands. It is important to understand the environment start-ups are operating in to understand the transition towards CE because the regime in the Dutch textile industry differs from the global textile regime.

In general, this section focuses on giving an idea in what kind of environment the Dutch start-ups have built their company on further understanding of the practices of development into a circular economy. All those cases have been interviewed, and they displayed what they have seen happening in their organization or business, related to the development of circular economy in start-ups and in general. The term 'case-study' is used to describe the participating organizations, enterprises and consultancies that have a green solution incorporated in their business, either a technological or business innovation or a platform for stimulating CE. This analysis does not represent the full meaning of a 'case-study,' as there is no in-depth research done with the organizations concerned, only an interview.

An overview of the interviewed organizations:

I. *MVO Nederland* is an independent expertise and network organization on Corporate Social Responsibility founded by the Dutch Ministry of Economic Affairs.
II. *Amsterdam Economic Board* (AEB) stimulates innovation and cooperation between businesses, research institutions, and government.
III. *Kirkman Company* is an consultancy enabling transformations of organizations, employees, partners, and shareholders, recently they are focussing their entire business on enterprises that are willing to transition towards CE.
IV. *Circle Economy* is a social enterprise that is organized as a cooperation, aiming at accelerating the scalable and practical implementation of CE.
V. *Circular Economy Booster* helps start-ups in boosting their sustainable and innovative businesses ideas to achieve a circular business.

5.1 Problems faced for companies to become circular

The central government of the Netherlands aims to make the Netherlands hotspot for CE, the main idea is to accelerate the transition towards a CE and to position the Netherlands as a pioneer of CE (Rijksoverheid, 2013). Therefore, the Dutch environment for transitioning towards CE is supportive; the government has created the 'Circular Valley' and various governmental organizations , such as MVO Nederland supports companies with the required knowledge to shift to CE. All of those activities are shaping the environment in which start-ups have built their business. Therefore, the general barriers in the Dutch regime are identified to transition to an is overview below.

Almost all of the cases are have mentioned that one of the biggest challenges in shifting companies towards a circular approach is changing the mindset of actors in the business, this takes time and is a slow process (MVO Nederland; AEB; Circle Economy, 2016). Two constraining factors that have come forward in the interviews for changing a mindset; people, in general, tend to think of short-term, and generating revenues is often their primary focus (Kirkman company; Circle Economy, 2016).

Another barrier for organizations or businesses to make a shift is unfamiliarity with the market. CE is a relatively new concept to companies, therefore, shifting and investing in a market that is not well known is a risk for companies, resulting in hesitation to take action. Courage is required for businesses to belief in a circular economy. To overcome hesitancy to shift, it is suggested that an actor acting as a motivator can convince people with the power to make changes (AEB; MVO Nederland, 2016). People that are considered to have this power are for example managers or CEO's. Other constraining factors are a fear of 'market readiness,' with questions like 'is the market ready to become circular?'.

The current infrastructure of the textile regime is also a big barrier, vested interest of the regime are a significant constraint to become circular. Companies in the present system like to keep their business protected in the textile industry, the act of a 'defensive investment strategy' by the regime has been mentioned (Interview DyeCoo, 2016).

Hindering regulations are referred to as a barrier for different organizations; the lack of effective legislation as well as the lack of support of local authorities (Kuyichi; AEB, 2016). An example is the Dutch regulation of the prohibition on using waste water; this rule has been implemented for the safety of citizens in former times. However, this is a constraint now for companies willing to reuse their wastewater and turn it into a valuable resource (AEB, 2016).

Next, to the barriers mentioned above, various additional restrictions have been mentioned. Such as the general knowledge to run a business. Start-ups seem 'fluffy' and nice the media is fond of start-ups, they often get a lot of positive media attention. This implies that start-ups who appear in the media also succeed in their businesses. However, this is often not the case as start-ups have a hard time in generating revenues and practical skills such as sales, networking, and generating revenues (Circular Economy Booster, 2016). *'At the end of the day they still have to pay the bill, and it is a hard business, the green business'* (Circular Economy Booster, 2016).

5.2 Key drivers for accelerating Circular economy

Next to barriers, several key drivers for accelerating CE have been mentioned in the 'case-studies.' A driver for accelerating circular economy is bringing all relevant partners around the table. Discussing and setting up partnerships is an important driver for achieving a CE. (MVO Nederland; AEB; Kirkman Company, 2016). Creating a supply chain with partners that want to cooperate and be transparent about their supply chain is hard (Dutch Awearness; Kuyichi, 2016). For start-ups, trust and transparency help them forward. They can share supply chains or ideas and insight about becoming circular and closing the loop. In start-ups this works because often companies have to work together

to sustain their business, there is power in numbers (Circle Economy; Kuyichi, 2016). An example is the collection of worn clothes to run the recycling machine (Circle Economy, 2016). Different cases have pointed out that the Dutch sustainable textile market is confident about sharing ideas and insight in their supply chains and all of them have acknowledged that being cooperative is the way forward (Kuyichi; Wintervacht; Dutch Awearness, 2016).

Focussing on big players that have the most impact in transitioning towards CE is a widespread belief in the overarching organizations. '*the belief is that you can make more impact if you can change a big company, like Akzo Nobel*' (Kirkman company, 2016). Only multinationals have the power for a tipping point, as they have power in numbers, they have the ability to put pressure on the right people and have a strong connection with the mill (textile producer)(Circle Economy, 2016). Shifting the purchasing departments towards circular economy in a big company that has a purchase budget of 100 million has *"obviously more impact"*(Kirkman company, 2016). Many corporate businesses have joined training at Kirkman Company about circular purchasing, ABN AMRO is one of them, indicating an interest of the regime in CE practices.

Circular purchasing is also a topic of interest; this can be done for anything from office desks to chairs. However, many cases studies said that the purchasing department has too little power to make an impact. CE can combine sustainability and a profitable business model. The return on investments is longer due to investments made in a circular business model, so setting up a buffer for this aspect is important (Kirkman company, 2016).

Teaching the government about circular purchasing is a step forward. The whole strategy of a company should be aligned towards CE not only in the purchasing department, then change can be made faster (Kirkman company, AEB, 2016). Shifting an organization requires structural change, and therefore companies will not do it unless it adds value – value is here seen as a financial value. Therefore, convincing the people with power in an organization is important, with courage and a visible 'market readiness' of the consumer (Kirkman, 2016). A tool is to cut this process into steps and start with the 'why' and vision of a company. Having a circular vision is an advantage for start-ups as start-ups have integrated the concept of CE in their infrastructure and supply chain. (MVO Nederland, 2016).

Concluding, the Dutch regime has set up activities that are promising to accelerate the transition towards CE. The case studies belief that only big companies can start the shift, however, the support of the government is helpful. Closed loop systems are an opportunity to accelerate CE, by maintaining close relationships and setting up feedback loops. The presence of a single actor who is capable of convincing the decision-making people in a company is also a useful tool in shifting towards CE. Working together, both within and outside a business is important for niches because there is power in numbers. Lastly, aligning visions about CE, starting with the 'why' of a company is considered a good starting point for shifting a business towards CE.

6. Niche level activity in the Dutch textile industry

In this chapter, five start-ups have been analysed, those start-ups are identified as niche innovations, with novelties emerging and relatively new actors. The selected start-ups are working with CE in some manner and active in the Dutch textile industry. The niche activity for every start-up is analysed by looking into their particular niche innovation, relevant actors and specific barriers the start-ups have encountered in becoming circular.

6.1 Start-ups

For analyzing the niches, the start-ups Kuyichi, DyeCoo, MUD Jeans, Wintervacht and Dutch Awearness have been interviewed (See Table 4). First, an introduction about the start-up is given, followed by an overview of the dominant actors, their specific experimentation room and the barriers they have encountered.

Table 4. Overview interviewed start-ups

Cases
Kuyichi
DyeCoo
MudJeans
Wintervacht
Dutch Awearness

6.1.1 Kuyichi

Introduction: Kuyichi is a Dutch conscious fashion brand that has been founded in cooperation with Solidaridad, a Dutch development organization, in 2001. This business is a niche development because they work with recycled jeans and organic cotton to produce new jeans and sell clothes made of recycled clothing (30%) or organic cotton. Their initial idea was to buy 100% organic cotton in Peru and introduce this in the fashion industry by selling them directly to buyers. In this way, they could track and trace their organic produced cotton. However, it was hard to find purchasers who were willing to buy organic cotton directly from them. They made a restart in 2016 with a small group of actors in their network, four new owners, and one employee and produced jeans that are made from recycled jeans (30%) and organic cotton.

Now, they do not have investors, but they have suppliers of textile in the regime where they buy their organic produced cotton. Kuyichi is dependent on other players from the textile industry. This is an example of niche innovations cooperating with regimes and vice versa. They adopted a new strategy to be less dependent on single suppliers and focus on two leading suppliers in two countries (Tunisia and Turkey). In 2013, about 28% of the purchases was bought from vendors where Kuyichi buys

around 10% of the factory production capacity. They are part of the Fair Wear Foundation, which runs an annual assessment on their supply chain. They get from the Fair Wear Foundation a 43% score on their overall transparency and insight in product chain (Fair Wear Foundation, 2014). Kuyichi is working together with Made-By, an organization that aims at transparency, understanding supply chains and to discover social and environmental impacts of the chain (Made-By.com). They are also part of the Fair Wear Foundation, which runs an annual assessment on their supply chain. They get from the Fair Wear Foundation a 43% score on their overall transparency and insight in product chain (Fair Wear Foundation, 2014).

The new strategy of Kuyichi focuses on less production and fewer seasonal collections. They aim for 'slow fashion', only producing a new collection twice a year, instead of every six weeks as multinationals tend to do in their business concept 'fast-fashion'. Slow fashion in line with the current trend of customers being more environmentally aware. They do not have a sale, for example, as they believe that price should never be an incentive for people to buy clothes (Interview Kuyichi, 2016). Their strategy is to build long-term relationships with their suppliers based on trust. In the future, they would like to see all of their clothes being a 100% recycled however this is technically not possible, as is explained further in the section barriers of Kuyichi.

Dominant actors: Kuyichi works together with regime players the textile industry in Tunisia and Turkey. Their clothing is available in their stores (they have two) and in a few of bigger stores in the textile industry. Their niche product is expanded to some retail shops (MenatWork). They have seen a shift in their target audience as their former consumers were merely a group of 'eco-ladies,' which were already environmental aware of the impact of the textile industry on the environment. The last ten years Kuyichi has seen a shift in consumers buying their products, as more people become environmentally aware of the impact of their clothing (Interview Kuyichi, 2016). The consumer has become more critical on clothing and asks questions about the origin of clothing more frequently (Interview Kuyichi, 2016). The sense of sustainability among consumers also has come forward in the literature (Seock, Yoo-Kyoung, 2007). Kuyichi is not actively busy with the concept CE, however when they speak to organizations as MVO Nederland, they sense that the same concepts are used, but are named differently (Kuyichi, 2016 p. 49).

Experimentation Room: Kuyichi uses certified organic cotton, to acquire this cotton they work together with a textile regime player who's main business is not to produce organic cotton but does this on the 'side.' Organic cotton has a reduced use of chemicals, compared to regulative producing process. The disadvantage of using certified organic cotton is that the volume of purchase must be high because they are specifically producing it organically which requires extra time for the manufacturer (Interview 7, Kuyichi, 2016 p. 15). Not all of their products are entirely organic or recycled, things such as buttons are technically hard to make sustainable, they are working on this. They see themselves as pioneers, so they believe *'the more durable options, the better'* (Kuyichi, 2016, p. 53).

Barriers: an obstacle for Kuyichi was the fear of information sharing due to competitive nature of industries with traditional markets. However, their fear has not become real, other sustainable start-

ups in this industry do not see each other as competitors but are often cooperating (Interview 7, Kuyichi, 2016). Other cases in this study have mentioned this too (Interview Kuyichi; Dutch Awareness; Wintervacht; MUD Jeans, 2016). *"Normally, people in fashion are nasty people, but these people are all nice"* (Interview Kuyichi, 2016 p. 55). The fact that there are more start-ups like Kuyichi are coming up is not threatening them, also because the market of the sustainable consumers is growing. "*For example, the vegan movement in Amsterdam is gaining much popularity, and those people are very fashionable*" (Interview Kuyichi, 2016 p.53). Another barrier many cases experience is a technological barrier, 100% recycling is not possible because the yarn will become shorter and loses its strength after recycling and in this way the product is not sustainable anymore. Recycled cotton is made of post-consumer clothing where yarn is shredded and combined with organic cotton. As mentioned above, buttons and products of these kinds are difficult to produce in a circular way. The volume is another barrier, running the recycling machine requires many volumes, stocking up the clothing to execute the machine is costly too. Another barrier is the difficulty to manage the quantities of components in stock for maintenance due to unpredictable consumer usage. Kuyichi works with regime players because other smaller players do not have the ability to produce the volume the regime player has for the same price. Three important factors for the success of Kuyichi; *Awareness among consumers about the current textile industry (the regime), innovations and the growing group of sustainable consumers.*

6.1.2.DyeCoo

Introduction: DyeCoo is a start-up that produces a machine that can dye clothes with pressured dissolved CO_2. It uses fewer chemicals and water than the current dying process uses (Interview DyeCoo, 2016). The start-up is founded in March 2008 in the Netherlands. This innovative machine can dye clothing without hazardous chemicals being exposed to humans, it requires no heavy workload, and has no polluted wastewater. The concept of DyeCoo started in Delft, where two engineers developed the idea and are cooperating now with two investors, the latter are working in the textile regime.

Dominant actors: The customers DyeCoo is focussing on are textile multinationals, producing the machines is expensive, and the investors have reasoned that those multinationals have the money to invest and the power to change the infrastructure of the whole industry. The investors thought that their collaboration with multinationals would start a revolution in the current textile industry, as their product could revolutionize the industry and save money for companies. The first three years, since 2012, they have been collaborating with large enterprises and have appeared in the news frequently, an overview is given below:

Nike announced in February 2012 a partnership with DyeCoo. They explained their strategic partnership as a step in their journey to save water and serve both consumers as the planet. The long-term strategy is focused on long-term impact, and they are committed to sustainability and innovation as their Vice President of Merchandizing and Product, Erik Sprunk said at the time (Huntsman, 2016). In August 2012 DyeCoo collaborated with the sportswear multinational Adidas, using 50% less water and 50% fewer chemicals in the process of dying. Apparently, about 50,000 T-shirts are produced with

this method (Huntsman, 2016). In 2012 April IKEA Green Tech, an IKEA Group venture capital company, collaborated with DyeCoo in their attempt to create sustainable products and a sustainable supply chain. *"DyeCoo's waterless dyeing technology is a truly innovative system that could bring real environmental and costs benefits for the textile industry by reducing water and chemical use. Through the partnership, IKEA will help to speed up the development and availability of the technology,"* says Christian Ehrenborg, Managing Director of IKEA GreenTech in April 2012(Huntsman, 2016).

Since 2015 it is rather quiet around them, and the reason for that is the sudden lack of interest of multinationals, especially Nike and Adidas (Interview DyeCoo, p.6). Nike, for example, has bought five machines for their factories in Taiwan and on forehand were very enthusiastic. However, it seems their enthusiasm has dampened. According to DyeCoo, this is part of the 'defensive investment strategy' of multinationals. They have invested, not to implement and develop the product, but to make sure it does not threaten their market (Interview DyeCoo, 2016, p. 8). The multinationals did not want to participate in the way DyeCoo intended, *"they have invested to show they do something about sustainability and let the development die slowly"* (Interview DyeCoo, 2016, p. 9). DyeCoo is now having a hard time staying profitable because the machines are very costly and investing in R&D and sales at the same time are too expensive. The multinationals have said they want to buy DyeCoo in exchange for the rights and patents.

This shows the 'defensive investment strategy' and the refuse to change in the textile industry. However, this might be not only the case for textile industries but in all existing industries current companies want to keep their position, power, and revenues and are, therefore, not keen on change.

Reasons for multinationals to not use DyeCoo could be the textile industry itself, which is very consumer driven. The consumer has expectations for cheap clothing, and if consumers are not willing to pay more for more sustainable produced clothing, companies will not invest. The textile industry is very focused on producing products at an extremely low price (DyeCoo, 2016). However, DyeCoo claims using their machines for dying is cheaper, and the investment will pay off in the long term, only the investment at the beginning is very costly, also known as 'high entry costs.' Another obstacle is that DyeCoo can only be applied (yet) on polyester, the fabric that is mostly used for the production of sportswear, upgrading their machines to dye on cotton, for example, could increase the value of Dye Coo's machines.

The textile industry is a long-established industry, change in infrastructure and technologies will require commitments in the whole spectrum of the industry. According to Andrew Filarowski, technical director at Society of Dyers and Colourists *"The only way to produce clothing cheaply is to do it abroad without any real control and certainly not by using the most modernized and sustainable technology."* (Hepburn, 2015).

Experimentation room: The current process of dying and washing in the textile industry is very costly regarding chemicals, water, and energy (see Chapter 4.5). DyeCoo has developed a machine where this can be done in a closed-loop process. It is a beam dying construction, where the fabric is rolled onto a beam then placed into a vessel, then CO_2 runs through the fabric, where the fabric absorbs it.

Pressured CO_2 becomes in a critical phase between liquid and gas and is, therefore, easy to dissolve deeply in the clothes. Polyester is the only fabric the dyes can dissolve in; this material is mainly used for sportswear.

The colours used are a 100% pure and 98% of the color is absorbed. In this process, 95% of the CO_2 used can be reused in their machine, so it is a closed loop cycle (Fall, 2016). *"Dying without water equals geographical freedom, becoming completely independent from clean water availability. We can dye fabric in the middle of the Sahara. This opens up new opportunities for the textile industry, allowing production to occur closer to market, shorten lead times and disconnect from Earth's most valuable resource, water"* (Fall, 2016).

No extra chemicals are added, water is not necessary, the color is more evenly spread than in natural dying, and it can reduce costs for companies by 40 – 60% (Interview DyeCoo, 2016). This process is not only cheaper than the course of dying in textile factories, but the work conditions of the people dying clothes, the environment and communities around the manufacturing mills will become much better due to the reduction of chemicals and wastewater. Also, many environmental implications that come from dyeing textiles are removed when companies are using this machine. The counter side is that many people working in the fabrics will lose their jobs, as operating the machine will not require as many people like today in the factories. However, implementing this technique would revolutionize the way textile factories work and can change the whole infrastructure of the industry.

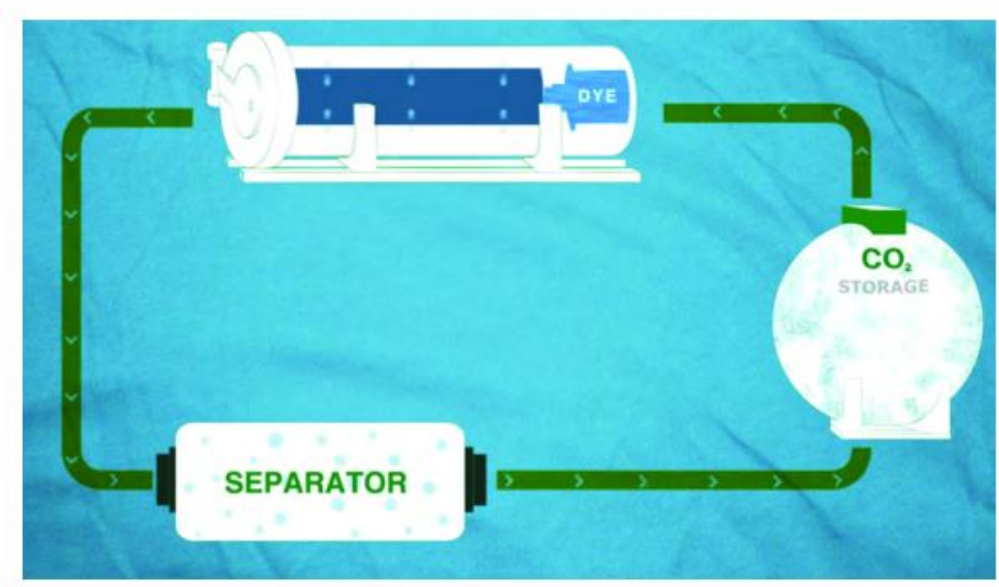

Figure 114. DyeCoo's closed loop dying process. Adapted from: Fall (2016)

Barriers: A barrier is a vested interest from the regime. DyeCoo's technology could be a game-changer in the industry, as explained above. However, multinationals have chosen not to implement the technology totally, only in small amount it's been used. Another barrier from the regime is short-term thinking, *"especially factory owners think only about the- let's say - next 15 hours instead of 5 years*" (DyeCoo, p. 8). Factory owners in Bangladesh or Vietnam have different to none beliefs on sustainability, if they do not accept the order, someone else will do it. Short-term thinking is an

important aspect of the textile industry. Multinationals often have good relations with factory owners. Therefore they can make good deals with a high quantity and still get good deals. Start-ups, however, do not have those relationships and therefore have to work together with multinationals to produce.

Another barrier for DyeCoo is technology; they want to develop ways for dying cotton next to polyester. However, they have not invented this. DyeCoo intends to invest in R&D; then they have to choose between more technology investments or keeping their business sustainable, which is hard now. Additional barriers applicable to the current textile industry came forward as well: The clothing industry is considered to be far removed from people's everyday lives. It is not appealing to people to speak up about this topic. Oceans, for example, are different, most people feel related to oceans, and no one wants oceans to be polluted and dirty (Interview DyeCoo, 2016). Another general barrier is environmental legislation, both on a national and international level, rules to comply with environmental laws are in place. However the terms of environmental permits are not satisfied.

6.1.3 MUD Jeans

Introduction: MUD Jeans is a Dutch sustainable lifestyle brand founded in 2013. It aims at creating zero waste; customers can lease jeans for a period and return it when it is worn out, or consumers are simply 'done with it.' MUD Jeans are designed in a circular way, meaning designed to reuse with the lowest input and the highest value. MUD Jeans does not use leather labels for example but have printed ones. The new yarn is produced by jeans that are worn-out. The jeans are shredded, cut and are blended with virgin (organic) cotton. The returned jeans are upcycled and are sold as vintage jeans if they can be repaired. Alternatively, because the recycled garments are too weak for the production of jeans, the garments are shipped to Italy where sweaters are made out of the used clothes.

The business model MUD Jeans is using is focused on creating non-ownership for raw materials by closing the resource loop. The product used to produce their jeans is organic cotton, about 1% of used materials is elastane, and none is polyester. Creating a pair of regular jeans costs about 7,000 liters of water in the current productio process, and the whole production chains emit in total 23,45 kg CO^2 (Bluedot, 2015a). MUD Jeans reduced this to 1,554 litres of water use, 22% of the average water consumption and the production emits in total 8,88 kg CO^2, 38% of the average production chain of jeans (Bluedot, 2015b).

They want to expand their business all over the world; now they are selling in Amsterdam, Berlin, and Vienna. MUD Jeans does not want to participate in 'fast fashion,' they do not make for every season a new collection, which is relatively rare in the general fashion industry (MUD Jean's interview, 2016). MUD Jeans have won two awards, *Sustainability Leadership Award* and the *Peta Vegan Awards*.

MUD Jeans is involved in sustainable clothing organizations; they are a member of the Young Designer Programme and the Fair Wear Foundation. The company offers its customers free sending back and repairing their jeans. In this way, they promote the circular concept. The MUD Jeans are partly Global Organic Textile (GOT)-certified, this means that standards with the use of suitable chemicals and reduced water consumption. Also, their collection is made from environmentally

preferred cotton, from the Better Cotton Initiative (BCI), an organization stewarding the standards for cotton.

Dominant actors: Their fiber is coming from Greece and the USA. The manufacture fabric is located in Egypt, including the spinning, dyeing, sizing, weaving, and denim finishing. In Turkey, the final assembly is done, including washing. Their target group is 20 – 35-year-olds who are 'well educated, like to eat organic and have children' this group is also known as 'The Millennials' (MUD Jeans, 2016). This group does not accept everything and think for themselves about where clothes are made and how it is done (Interview MUD Jeans, 2016)

Experimentation room: The business model of MUD Jeans is the niche innovation, this is built around the idea of non-ownership of products. Instead of buying a pair of jeans, consumers can lease the cotton. It is possible to rent a pair of jeans and pay per month, if customers want to wear another pair, they can choose another product. This concept is called Cotton Lease. Another option is repairing the pair of jeans, in the textile industry, this is a niche innovation. Another unique concept is that MUD Jeans takes the worn jeans back, refurbish them and sell them as vintage pairs on their web shop.

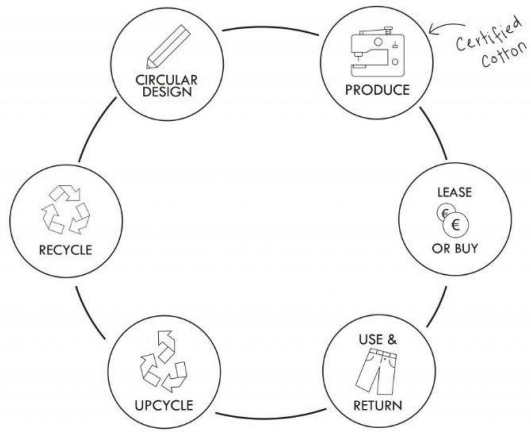

Figure 15. MUD Jeans circulair design. Source: Bluedot (2015)

Barriers: The main obstacle is explaining the business concept and show the value and relevance of the idea of leasing products instead of owning. According to the CEO of MUD Jeans, '*the concept was a bit hard at first to explain to customers. However, many love the brand now.'* The barrier of the 'perception of abundance of materials' and the idea of 'consumerism' is also mentioned as a barrier by MUD Jeans. A financial barrier is to stay profitable, as return and collection activities are costly, and the repair and manufacturing processes are too. Another obstacle is the difficulty of managing the quantity of components in stock, as consumer usage patterns are hard to predict. The mindset of the consumer is another barrier, selling the concept 'leasing cotton' instead of owning is an idea that takes place in the mindset. Convincing people that cheap and fast fashion is harmful to the environment and that resources are finite is a significant obstacle. An opportunity is the Dutch environment, as people are quite open to this concept and there is knowledge about CE.

6.1.4 Wintervacht

Introduction: Wintervacht is a Dutch fashion brand that creates jackets made out of used blankets. Since 2013 the two founders own this company, where everything is hand-made. They do not have other employees. However, the sewing and cutting are done in another atelier. Wintervacht sells their jackets in shops and online. Not everything is recycled, high-quality recycled garments could not be found for example. Wintervacht did not start as a company with sustainability in mind, rather more an esthetical view (Wintervacht, 2016).

Dominant actors: The dominant players in this business are quite small, as the designers are also the owners. They work together with suppliers that provide the blankets they use. The coats are manufactured in a sewing atelier, in the Netherlands by employees that work in the specific atelier. Wintervacht has an online shop and sells in 10 stores in Europe (9) and the US (1).

Experimentation Room: Their experimentation room is the reuse of resources, where old blankets are made into new coats. This start-up has not used an innovative technology, the business model of reusing resources is the innovation. The designers are aware that their resources are finite, and they indicated that if they run out of blankets, other used materials will be used for new products. Their 'new' business could be outside the textile industry too.

Barriers: It is technically impossible to make out a new durable yarn of second-hand sweaters, this technology is not well developed yet. The yarn Wintervacht gets out of reused materials in the production process is too porous (Interview Wintervacht, 2016, p.10). Another barrier is finance, as they have a lack of access to funding. It is financially impossible to live from this business; they do get some subsidies from the government. However, it is not enough; they are not an economically sustainable business (yet). The government is thus, stimulating niche developments by giving them financial support. However, Wintervacht mentioned all kind of designers could apply for a subsidy, not only 'green businesses' (Wintervacht, 2016).

The coats of Wintervacht can be purchased online and in stores, the latter indicating a spread of the niche development in the regime because stores have agreed upon selling the coats. Wintervacht wants to be as sustainable as possible, but it does not have to be only about being recyclable. Working with a 100% recyclable products is more costly for Wintervacht and gives them more restrictions in materials used. For now, they are using old blankets, they have searched for them across the Netherlands. Their next coats will be made of Polish army blankets, and if they run out of those, they need to develop the next step. Therefore a significant barrier for them is that the sources they are using are infinitive, as all resources are. However, multinationals often do have the resources to obtain the required materials. Another important issue regarding the power of multinationals is the patent on the idea if a multinational wants to steal their idea and also make coats out of second-hand blankets, the start-up has no power to prevent this from happening.

Wintervacht cooperates with other sustainable niche businesses and is transparent about their supply chain. Other cases have said they collaborate with likewise businesses too (Interview Kuyichi, Dutch Awearness, Wintervacht, MUD Jeans, 2016). Also, they have seen more cooperation over the years

with businesses like themselves. Wintervacht thinks it is hard to compete with multinationals because of the concept of 'fast-fashion.' However, Wintervacht has seen customers becoming more environmentally aware, and do not only want to buy clothing from the 'fast fashion' cycle. They believe that if customers demand the supplier to become more sustainable and environmentally friendly, the global textile players will eventually have to listen (Interview Wintervacht, 2016).

6.1.5 Dutch Awareness

Introduction: Dutch Awearness (DA) is a business that produces workwear made from recycled material; they can recycle their work wear up to 8 times. Workwear could be for example hospital uniforms or construction workwear. They created '*infinity workwear,'* a fibre that is a 100% polyester and recyclable, complying to the European Work Wear standards. Inside their batches of produced workwear, there is a track and trace software, a Circular Content Management System (CCMS). This system can map the whole chain of raw materials and thus, ensure the origin of materials.

The founder of Dutch Awearness, Rien Otto, was working as a fashion designer before he started DA. He went on a human aid project abroad, there he saw the impacts of the clothing industry, and decided to change his business (Interview 5, Dutch Awearness, 2016). The aim and vision of DA have therefore been very clear, to reduce the amount of waste created by the textile industry to make this industry more sustainable.

DA is the spill in their value chain network, that is their primary asset. DA works performance based – as a company it is possible to buy circular workwear or pay a fee (periodic) from DA. It has a contract with a reseller, Tricorp, a regime player with their client base. At the end of the cycle, collecting places are set up where the material is brought back to Dutch Awearness to recycle.

Dominant actors: DA is the connector in the chain and works together with many different stakeholders, examples are: RoyalHaskoningDHV, Eco chain Technologies for their track and trace (CCMS) system. Eco Pro Fabrics Partners, Eco Chain Technologies. Other partners are Wageningen University, European Commission for example (Sitra & Circle Economy, 2015). Another key strength is their track and trace system (CCMS), they want to expand CCMS system application into other sectors. Their growth strategy is to expand their brand by copying the Dutch value chain in other countries.
In total, their team is only four people, but they bring different interested parties together to cooperate. Many regime companies, such as Rabobank, are a customer at DA. This shows an integration of niche developments in the regime regarding sustainable and recyclable clothing.

Experimentation Room: DA has created various innovations, often in collaboration with other actors. One of them is called 'infinity' and made of a fabric that can be recycled. DA takes the worn clothes back and the garment is reprocessed as a raw material in a factory where the production process start over again. They make new fibers out of the raw material. After that, the fibers are brought to the yarn mill, where the fibers are sprayed into various types of yarn. This yarn goes to a weaving mill, where weaving mill spins new clothing.

Next, to their innovation 'infinity,'another innovation is the Track and Trace system Dutch Awearness created, as is explained above. This CCMS system can track how much energy is used in which production step and trace the product down. They have developed this themselves and selling it now to other areas outside the textile industry. This is a sign their niche innovation is wanted outside their business field. Another innovation, DA has created is '*Cliff,'* a composite made of used textiles. By adding resin and waste bags to the worn textiles, they create building material, leaving no waste. *Cliff is an innovative, fully recyclable plastic product from bio-materials in closed production, with low natural resource use and minimized waste generation* (Dutch Awearness, 2016). Another innovation is made from 'Elephant grass,' miscanthus grass, created together with the Wageningen University. DA wants to create a circular system also for natural fibers. Recently DA is busy with the technological innovation to separate textile materials before recycling. For example to separate polyester from wool which results in a higher quality of the clothes.

A technological barrier was that many innovations were not developed yet. For example, when Dutch Awearness got an order to make a 100% recyclable workwear jacket that could comply with the workwear standards, it took 1,5 year from the testing and development phase to the final coat. *"When the company placed the order we did not expect it took us so long to deliver" (*Interview Dutch Awearness, 2016). Another important barrier is trust, Dutch Awearness would love to work 'performance-based,' but the hardest part of their job, in general, is to find the right partners, who are willing to be transparent. *"Finding the right chain partners who want to work in a circular fashion is the biggest challenge, (Dutch Awearness, 2016).* Due to the CCRM system they are using; partners must be transparent about their supply chain. Choosing between financing and the development of products is also reported as a significant barrier.

First, DA wanted to launch their label and sell it. However, it was easier to just play it via big regime players such as Tricorp. DA is now an ingredient brand, so they place a label of Dutch Awearness their clothes but still let Tricorp sell it

More general barriers for start-ups entering the regime is the closed market; it was difficult to get in the textile industry (Interview Dutch Awearness, 2016). Essential for entering the regime were the social contacts of the founder inside the regime. Another general barrier is the required volume. An amount in stock to store all their collected workwear from the client and the volume of run a recycle machine to be economically sustainable. DA has found something for this problem, they use containers to store the used clothing at customers property. DA comes and picks it up when those containers are full enough for the recycling machine to run economically sustainable.

6.2 Conclusions

The general barriers have come forward and are summarized below. In general, the actors in niche developments are a small group, but with dedicated actors. Their supply chain is transparent, and they are open to other firms by sharing information and by giving insight in their production chain.

Summing up, the most frequently upcoming barriers for the cases were:

I. A technological barrier, some needed technical innovations do not exist yet and investing in technological innovations is costly.
II. A finance barrier- almost all cases faced difficulties in their investment part. Some investments in technologies could not be made due to the restraining finance.
III. The third most frequently named was: vested interest of the regime, due to the current regime protecting their market. This made it hard for niches to enter the market and make developments, implement technologies or change the infrastructure of resource loops.
IV. The fourth barrier is that cases lack capabilities and information. Often start-ups have a hard time gathering the right knowledge about certain technologies, and it was often found a time-consuming process.
V. The fifth was hindering regulations, often put up by government or start-ups have mentioned that governments could be more supportive.

In general, the overarching organizations have seen a trend in CE becoming more of a well-known concept. A shift has been noted in the last five years in awareness and beliefs about CE and sustainability (MVO NL, AEB, Kirkman, 2016). Consumers are more interested in the durability of products and ask questions about the transparency of a production process (Kuyichi, Dutch Awearness, MUD Jeans, 2016). Initiatives like the H&M 'Conscious Collection' could not get off ten years ago, CE is becoming useful concept (Interview DyeCoo, Amsterdam Economic Board, 2016). Businesses like Kirkman want to focus merely on CE in the future as their central business core and sell the concept of CE to other (big) companies. The recent attention in the regime implies that there is a market for informing companies about how to become circular, this is indicating a shift towards CE being slightly integrated into the regime.

In short, start-ups are in general more convinced of a shift towards CE in the textile industry. The Dutch regime is, however, convinced that regime players will have to open the floodgates (Kirkman, AEB, MVO Nederland, 2016).

7. Comparative chapter

In this chapter, the characteristics of transition pathways are discussed and compared to the specific internal and external barriers found in Chapter 6. Consideration is given to the transition phase in which the Dutch start-ups, the Dutch regime and the global textile regime are currently situated in.

7.1 introduction

The aim of this section is to investigate if start-ups are following a particular transition path (Geels & Schot, 2007). Exploring the dynamics of the pathways with its dominant actors, interactions at the landscape, regime and niche level can give added insight in the transition start-ups are following and reveal the challenges they might encounter. In the first part of this chapter, the pathways for each of the five start-ups are determined. The focus lies on the 'transformation pathway' and the 'reconfiguration pathway.' The reasons why both of those pathways have been chosen is that they represent the dynamics in the shift towards CE. Specific details for the reason why a pathway is selected is explained below. Some of those cases have mixed pathways, however, for simplification, those two are selected for further investigation.

In the second part of this chapter, the two pathways are compared to the found barriers in the previous section. It is investigated if the chosen paths have links to specific barriers. Determining the obstacles in the transition and reconfiguration path might add insight to overcome those barriers in the future.

A short repetition of the characteristics of each pathway is given below and shown in Table. 5. Each of the pathways is derived from Geels (2007) and Grin (2010).

Reconfiguration pathway:

On the landscape level, there is no pressure on the regime or moderate pressure (literature is divided about this issue). There are innovations in the regime that trigger further adjustments in the underlying architecture of a regime. The regime remains stable, but it adopts useful niche changes to the regime. In the experimentation room (niche level), the niche innovations have symbiotic relationships with the regime and might be integrated into the regime to solve local problems. The main actors are regime actors and new suppliers, Interactions: regime actors adopt component-innovations, developed by new suppliers. There is competition between old and new suppliers. Keywords to summarize this pathway are*:* cumulative component changes because of economic and functional reasons, followed by new combinations changing interpretations and supplier*.*

Transformation pathway

On the landscape level, there is moderate pressure on the regime. The pathway has on the landscape level moderate pressure on the regime. The regime responds to changes by modifying the regime for a transition, as niche innovations are not sufficiently developed yet to alter the regime. The main actors are the regime actors and outside social groups. The main interactions are between outsiders voicing criticism against the regime, however incumbent actors adjust the regime rules. Keywords to

summarize this pathway are outside pressure, institutional power struggles, negotiations, adjustment of regime rules.

Table 5. Transformation and Reconfiguration pathway. Adopted from: Grin (2010) and Geels (2007)

Level	Transformation pathway	Reconfiguration pathway
Socio-technical landscape level:	Moderate pressure on the regime for a transition	Landscape has no role in this pathway / Landscape has moderate pressure on the regime
Socio-technical regime level:	Responds by modifying the direction of the development paths and innovation activities	Innovations trigger further adjustments in the basic architecture of the regime
Niche innovation level:	Potential niche innovations are not sufficiently developed yet	Innovations at the niche level have symbiotic relations with the regime and are eventually adopted by the regime to solve local problems
Keywords:	Outside pressure, institutional power struggles, negotiations, adjustment of regime rules.	Cumulative component changes because of economic and functional reasons. Followed by new combinations, changing interpretations, and new practices
Actors:	Regime actors and outside (social groups)	Regime actors and suppliers
Type of interactions:	Outsiders voice criticism, Incumbent actors adjust regime rules (goals, guiding principles, search heuristics)	Regime actors adopt component-innovations, developed by new suppliers. Competition between new and old suppliers

7.2 Reconfiguration pathway

In this section, the dynamics of the niches are explored, and there is argued why these start-ups are following a reconfiguration pathway. The start-ups that are determined to be in the reconfiguration

pathway are DyeCoo, Dutch Awearness and Kuyichi**.** Then, the external and internal barriers for this specific pathway are investigated.

7.2.1 Start-ups in the reconfiguration pathway

DyeCoo is estimated to be in a reconfiguration path, where niche innovations trigger further adjustments in the architecture of the regime. In this case, there is a technological innovation that could lead to a major shift in the regime by breaking 'through.' The technology of DyeCoo could create a change in dying procedures in the current textile regime. However, this has not happened, and the niche innovation is added to the regime. In this case by multinationals who have bought some of the dying machines of DyeCoo. On a niche level, characteristics for the reconfiguration path are that niches have a symbiotic relationship with the regime, and niches are eventually adopted by the regime. According to this path, the niche innovation has no chance to replace the old technology with a new niche innovation, only adoption by the regime is possible. This has come forward based on the interview with DyeCoo; it is unlikely their technology will push out the current infrastructure of the regime. One of the key characteristics of this pathway is that actors in the regime have a competitive relationship with the niches. Nike and Adidas have defended their markets, as they tried to buy the patents of DyeCoo to undermine the recent technologies and the implications for their regime. The regime can eventually alter cumulative component changes because of economic or functional reasons, in this case that means that they could implement the technology of DyeCoo, as it is cheaper due to the reduce water and chemical use. The main actors in this pathway are the multinationals as DyeCoo has not shifted the infrastructure of the regime.

Dutch Awearness is in a reconfiguration path, because new products such as 'Infinity' and 'Cliff' have attracted the attention of regime players. DA and regime players, such as Adidas, are in a task force to make the apparel industry more sustainable and this collaboration is focused on stimulating niche innovations to develop themselves. This collaboration displays regime players being triggered to discuss their current infrastructure. Important in the reconfiguration path is the presence of cumulative component changes that can alter the interpretations and practices of the regime. DA is a well-known name in the specific niche, and regime actors know where to find them. The type of interactions in this path are regime actors adopting the innovation, They developed a lot of innovations and technologies and also brought them to the market, this is quite an achievement as many niche developments do not make it to the market (Grin et al., 2010). The producer in Tunisia is supporting DA, the producer produces for many large enterprises, but he is fond of the innovations of DA. Main actors in this path are suppliers and regime actors, this has come forward in the interview with DA as they work mainly with large retailers and businesses. A niche innovation in the reconfiguration path has not (yet) the power to alter the regime, this was also the case in DA.

Kuyichi has characteristics of a reconfiguration pathway *or transformation path* – this pathway is characterized by multiple innovations acting as add-ons to the existing regime. Eventually, the sequence of multiple innovations can cause changes in user practices and beliefs. Kuyichi is cooperating with the regime, by buying their certified organic cotton at regime players. Kuyichi is

dependent on regime players due to their size and influence in the market. The last three years Kuyichi is aiming and giving more transparency in their production process, this enables other actors in this field to copy their business model. By transparency, Kuyichi seeks to inform the customer where their product was produced and in which circumstances. Giving more transparency in their business is not experienced by Kuyichi as a negative aspect – as they thought this would happen, on the contrary, they are inspiring other companies to also give insight into their production process as well. This is an example of a change in user practices or beliefs. Actors in this path are cooperation similar niche players in their market, such as start-ups operating in the same field, creating tension in the regime to also give insight into their production process. The main actors in this path are regime players, adopting niche innovation in their infrastructure, there is competition between new and incumbent players. This has come forward in the start-up as they are operating still on a small scale. However, regime players have adopted an interest in organic cotton. An example comes from H&M, who have trained 1 million farmers in 2015 to harvest cotton with less chemical's and water; this is done in collaboration with Solidaridad and WWF (H&M Group, 2016). For this path, it is unlikely a niche innovation replaces the regime.

7.2.2 Analysing barriers in the reconfiguration pathway

The obstacles for the reconfiguration pathway have been summarized in the table below, all of those barriers have come forward in the section 3.6. The first table explains the external barriers for the reconfiguration pathway. In the external barriers it is found that broadly the relationship with the regime is displayed, these are shown in Table 6. The internal barriers are shown in Table 7.

7.2.3 External barriers reconfiguration pathway

The main barriers in this pathway come from interactions between the incumbent (players in the textile regime) and the new firms (niche innovations), this has come forward in the barriers found in DyeCoo, DA, and Kuyichi. Compared to the transformation path, relatively many barriers were found in the 'market' and 'cooperation and coordination within supply chain,' as a sign of this interaction. Also, there were relatively more barriers found in the technical area, the start-ups in the reconfiguration path are identified to have a more technical approach (DA, DyeCoo).

All of the start-ups in this path have mentioned the fear of information sharing in the current industry as a barrier, this and have mentioned the difficulty they experienced when entering the market. Characteristics of the reconfiguration path are in accordance with those barriers, as there is a competition recognized in the reconfiguration path. There is an interaction between niches and regimes. However start-ups have mentioned their dependency on regime players to work in a system of the regime, and have mentioned their reliance on the engagement of external suppliers on CE. Kuyichi only has reported a barrier in 'society,' this could be explained by the relation Kuyichi has with their consumers, they maintaining a 'business to consumer' relationship. DA and DyeCoo have merely a 'business to business' connection.

Table 6. External barriers reconfiguration pathway.

External barriers	DYECOO	Kuyichi	Dutch Awearness
Market	Fear of information sharing due to competitive nature of industries with traditional markets	Fear of information sharing due to competitive industries with traditional markets	Fear of information sharing due to competitive industries with traditional markets
		Convincing customer through marketing	
	Vested interest regime - hard to enter regime	vested interests regime – hard to enter regime	Vested interest regime – hard to enter regime
Cooperation and coordination within supply chain	Dependence on external suppliers,	Dependence on external suppliers	Dependence on external suppliers.
	Finding partners with influence or power to change an event.	Finding partners with influence or power to change an event	
	Little influence on engagement of external stakeholders on circular practices	Little influence on engagement of external stakeholders on circular practices	Little influence on engagement of external stakeholders on circular practices.
Policy and regulations		Hindering regulations	Hindering regulations
Society		Lack of consumer awareness	
		Consumerism	
		Perception of abundance of raw materials	

7.2.4. Internal barriers reconfiguration pathway

The internal barriers of the reconfiguration path display the relation niches have experienced within their business. The most frequently named barriers were finances, high entry costs, a difficulty to manage the components in stock and high costs associated with return and collection activities. Other obstacles experienced were material matching restrictions and a lack of capabilities of information and knowledge among all the start-ups in the reconfiguration path. Two out of three start-ups have a technological innovation in their start-up and are working mainly with other businesses (business to business). Therefore, it is suggested that the external barriers of start-ups can give insight into the current relations with regime players.

Table 7. Internal barriers reconfiguration pathway

Internal barriers	DYECOO	Kuyichi	Dutch Awearness
Finance	Need for high upfront investments	Increases costs due to lack of components in stock – organic cotton	Need for high upfront investments
	Lack of access resources of funding.	Lack of access resources of funding	
		High costs associated with return and collection activities	High costs associated with return and collection activities
Operational	difficulty to manage the quantity of components in stock for maintenance due to unpredictable consumer usage	difficulty to manage the quantity of components in stock for maintenance due to unpredictable consumer usage.	
			Highly variable processing times for manufacturing and return
Technological		material matching restrictions	material matching restrictions
	Expensive to invest in technology	Expensive to invest in technology	Expensive to invest in technology
Knowledge and information	Lack of capabilities and information	Lack of capabilities and information	Lack of capabilities and information

7.3 Analyzing barriers in the transformation pathway

In this section, the dynamics of the niches are explored and there is argued why these start-ups are following a transformation pathway. Then, the external and internal barriers for this specific pathway are investigated.

7.3.1 Start-ups in transformation path

Wintervacht has the characteristics of a transformation path due to their specific use of second-hand resources for creating their product. However, they do not use any specific technological innovations. This business has the most characteristics of this path because the niche innovations are not fully developed to change or alter the regime. The landscape can eventually only change if regime actors act upon changes coming from niche developments. The niches evolve by making cumulative adjustments in the regime, where niche innovations act as front-runners. Eventually, the adjustments are picked up by the regime, but the regime actors stay in the regime and can import knowledge and

useful insights from the regime. This pathway is best described as niche innovations adding to the existing regime and do not disrupt the current regime.

MUD Jeans: is in a transformation pathway. The niche innovations are not fully developed to reach its full potential, meaning that the market has not fully accepted the 'cotton lease 'concept. Therefore, MUD Jeans is not ready to take full advantage of the current 'pressure' in the landscape, examples of pressure from the landscape is 'the vegan movement.' Their business model is more accepted among customers. As a result their brand is growing. The landscape can change, if actors from the regime act upon those changes, this is seen in the belief of the overarching cases that only multinationals can change the apparel industry. However, the small-scale actors in the niches, MUD Jeans, have the potential to develop this alternative 'technology.' Technology must be seen as 'business model' in this case, namely leasing cotton instead of owning it. This pathway is considered to be a niche innovation adding to the existing regime, not pushing out regime actors. MUD Jeans is not able to push out regime actors by their new business model. At this pathway, regime actors now only import knowledge from niche actors. However, MUD Jeans is acting like a frontrunner, and MUD Jeans is receiving much attention from the media worldwide (MUD Jeans, 2016). The attention has not yet resulted in a global acceptance by the regime, perhaps other multinationals (regime actors) will follow this concept.

7.3.2 External barriers transformation pathway

In the transformation pathway there are interactions of niche innovations and regime players. A key characteristic of this path is the power of regime players; niche players do voice criticism. However, the rules are adjusted by the incumbent players. In the transformation path, there are more barriers compared to the reconfiguration pathway, on interaction with the consumers and with society. The reason for this could be that start-ups in the transformation path do not have a focus on technology, compared to DyeCoo and DA, but on maintaining a closer relationship with consumers. DyeCoo and DA are keeping a more business to business relationship with their customers, MUD Jeans and Wintervacht are maintaining a more business to consumer relationship. Probably because of the design of their business and specific niche innovation. Therefore, barriers as 'consumerism' and a 'perception of abundance of materials' are mentioned only in the transformation pathway. The start-ups in this path are dependent on external suppliers, and it is hard to find partners willing to work with the concept of CE. An overview of the external barriers in the transformation path is given in Table 8.

Table 8. External barriers transformation pathway.

External barriers	Wintervacht	MUDJeans
Market	Fear of information sharing due to competitive nature of industries with traditional markets	
Operational	Convincing customer through marketing	Convincing customer through marketing
Society	Perception of abundance of raw materials	Perception of abundance of raw materials
		consumerism
		Lack of consumer awareness
Cooperation and Coordination	Dependence on external suppliers	Dependence on external suppliers
		Little influence on engagement of external stakeholders on CE

7.3.3 Internal barriers transformation pathway

The internal barriers for this pathway are displaying the internal obstacles start-ups are facing in the shift towards CE. The most frequent barrier is a financial barrier for those start-ups, as is mentioned as well in the reconfiguration pathway. Further operational barriers are difficulties to manage the quantity of components in stock and highly variable processing times for repair activities. These operational barriers might be explained by the fact that the needs and activities of a consumer are highly variable. There are few technological barriers in this path; this can be explained by the fact that those niches have fewer technological aspects in their business and these niches might not have been fully developed yet to encounter technical barriers. The internal barriers for this path are displayed in Table 9.

Table 9. Internal barriers transformation pathway.

Internal barriers	Wintervacht	MUDJeans
Financial	Increased costs due to lack of access components in stock	Increased costs due to lack of access components in stock
	Lack of access resources of funding	Lack of access resources of funding
		High costs associated with return and collection activities
Operational	Difficulty to manage quantity of components in stock	Difficulty to manage quantity of components in stock
		Highly variable processing times for manufacturing and repair
Technological	Material matching restrictions	

7.3.4 Comparison both pathways and barriers

In the reconfiguration path, there are more external barriers than in the transformation path, indicating that niche innovations are further in the process of challenging the regime. Moreover, niches experience more problems because the regime is protecting their current infrastructure because the niche changes are seen as a threat to the regime. In support of this, one of the most common barriers named by start-ups is that the regime is protecting their vested interests in the market and entering the current market is hard. Also, the start-ups in the reconfiguration path face more internal barriers, this could indicate a well-developed infrastructure for niche innovations to be competitive with the regime comparing to the start-ups in a transformation path.

Interesting is that the external barriers represent the interaction of the niches with the regime and the internal barriers give an overview of the type of business (business to business, business to consumer). In this research, business to business start-ups seems to be in the reconfiguration path, business to consumer start-ups are, however, in the transformation path. A general comment about the barriers is that obstacles differ because the start-ups are different and therefore face different obstacles.

7.4 In which phase is CE in the textile industry?

In this chapter, there is determined in which transition stage (see Section 3.2.3) the Dutch start-ups, the Dutch regime and the global textile regime are currently in. These phases are respectively the: pre-development phase, the acceleration phase, the take-off phase and the stabilization phase. To analyze this, a comparative table of the reconfiguration and transformation path is used to reveal the activity in the landscape, regime and niche level and the type of interactions that are present in each pathway, see Table 5. By categorizing the particular actors and keywords, the main developments in each path are displayed. Indicating in which phase the transition towards CE regards the Dutch and the global textile sector can offer an interesting reflection on the transformation towards a CE.

7.4.1 Niche innovations

The niche innovations in the Dutch start-ups are either not sufficiently developed to threaten the regime, or the innovations only trigger further adjustments in the architecture of the regime, not change its infrastructure. This reflects the power regime players have in the textile industry. All of the start-ups have mentioned that competing against the multinationals is very hard, the same goes for entering the market in the conventional textile industry. The actors present in the two paths are niche actors and regime actors. However, regime players still hold power. Regime adjustments are made due to the activities of niche innovation, albeit in a symbiotic manner and can eventually be adopted by the regime. The regime actors have inhabited component innovations, such as DyeCoo's dying machines, however, changing rules and belief systems are adjusted by the incumbent actors, not by the niche actors.

Therefore, the take-off phase is probably the most suitable for describing the activities mentioned above. This phase is characterized by processes of change that are building up and innovations that develop rapidly in niches. Those activities can be noted at the system level, because of the different

reinforcement practices. More actors, not only the small initiators but also the actors active in the dominant sector -the textile regime- have heard of the innovation; defined in this research as a circular economy. However, niche innovations might be in the take-off phase compared to the impact they have globally in the textile industry, but can also be placed in the acceleration phase taking the Dutch environment regarding CE and activities into account.

7.4.2 Phase of the Dutch regime

In the Netherlands, the environment in which businesses operate can be seen as a niche in itself, because the Dutch government has intentions to accelerate circular activity in the Netherlands, such as setting up the 'Circular Valley,' with big multinationals from various industries engaging in this project. Municipalities in the Netherlands have plans on implementing 'circular purchasing' and want to export knowledge about CE to other countries. This is important to take in mind because it reflects the environment Dutch start-ups in the textile industry are currently in and it indicates the stimulation from the Dutch government about the emergence of CE.

The Dutch textile start-ups are experimenting with innovations on the micro level, but are also collaborating with the regime. The interaction between them are regime players offering cooperation and knowledge; the niche innovations deliver new technologies. Those niche innovations are slightly organized, niche actors work together, exchanging knowledge and capabilities. Their innovations are noted at the system level because of the reinforcement activities at the regime level. Players active in CE in the Netherlands are not only the small initiators but also actors in the dominant sector.

Because of the current situation of the niches and the Dutch environment the phase might be between the take-off phase and the acceleration phase. The latter occurs when structural changes occur in the system, thus the regime, level. When the niche enters the regime, the innovation(s) could spread rapidly, pressuring the current institutions of the regime. Change in the infrastructure of the regime is visible in the acceleration phase and could be noted on the cultural, political, institutional, ecological and economic level (meso level). Projecting this on CE, the acceleration phase is reached when CE becomes the dominant system in the textile industry, and the current industry is becoming less visible. Initiatives stimulated from the government, like the 'Circular Valley' and MVO Nederland offering workshops to become circular and reflect the activity in the Netherlands on this topic. However, structural change is little visible on regime level (yet), suggesting the Dutch regime is in between the take-off and the acceleration phase. Projections about the future are hard to make about reaching the acceleration phase for CE in the Netherlands in general.

7.4.3 Regime on the global scale

The transition phase in which the current global textile regime is, is determined in this section. The literature about the existing multinationals has given an overview of the current status of the global regime. From this view, the multinationals are familiar with the concept of CE and engage to differing degrees in environmental practices such as the use of organic cotton or the fibre TENCELL. In this research, it has come forward that multinationals (Inditex, Nike, H&M, LVMH) have shown interest in the concept of CE. However, environmental engagement falls short considering the total production process of multinationals. Despite the knowledge of technology, techniques, and materials that are

available for multinationals, they do not alter their infrastructure and maintains its power. Often the innovative technologies are provided by niche innovations, however often they have not built up enough 'momentum, ' and niche innovations fall short on actively changing the infrastructure of the regime. Thus, the current textile system is protecting their infrastructure and structural changes have been made on a small scale only.

Concluding, the phase in which the global textile industry is currently, can be placed in the take-off phase. Change has been noted at the dominant system level (regime) because of the different reinforcement practices. More actors, not only the small initiators but also the actors active in the dominant sector -regime- have heard of the innovation; defined in this research as a circular economy. Processes of change are building up, and innovations are rapidly developing in niches, as is elaborated on in the interviews with the start-ups. Changes that textile multinationals have adopted are showed in the collaboration EMAF (Nike), working with organic cotton-TENCEL, (Inditex), or have developed an interest in start-ups like DyeCoo (Nike).

The acceleration phase is not achieved (yet) because one of the essential characteristics of this stage is that when CE becomes the dominant system, the conventional industry is becoming less visible. Multinationals have not changed their infrastructure totally, but have only adopted niche innovations in smaller adjustments. It is uncertain at which rate the current infrastructure of the textile regime is shifting towards a circular approach in the (near) future.

8. Conclusions

This study applied transition theory to explore the current status of the circular economy in the Dutch textile industry. The main research question is:

How is transition theory contributing to garnering further insight into the transition of start-ups in the textile industry, both in the Netherlands and globally, towards a circular economy?

The sub-research questions were:

1. What are the characteristics of the textile industry regarding transition theory?
2. What are the barriers Dutch start-ups in the textile industry face in shifting towards a CE in relation to transition theory?
3. What are the opportunities for start-ups and multinationals in the textile industry in transitioning towards CE?
4. In which phase in the transition theory can CE in the textile industry be placed?
5. To what extent can both multinationals and start-ups contribute to the shift in the textile industries towards CE?

This section elaborates first on the sub-research questions in the order described above, starting with the characteristics of the textile regime based on the results of the literature study. The second and third research questions are about the niches in the Dutch textile regime, both the barriers and opportunities for start-ups to engage in CE are discussed. After that transition pathways of the start-ups mentioned above are set forth, with the focus on the transformation and the reconfiguration path, as those two paths have come forwards as the trajectories the start-ups have taken in the shift towards CE. Finally, the last sub research question, to which extent can start-ups and can multinationals contribute to a transition towards CE, is answered. The central research questions is answered lastly, taken into consideration all sub-research questions and focussing on transition theory applied to this research.

The current textile industry is characterized by big multinationals; those hold a significant share of the textile production process worldwide. The multinationals are defined as 'regime players' and are all based in Western countries, producing mainly in non-Western countries. The power those regime players hold in this industry is vast. Therefore multinationals are determined as the regime in this research. Their success is primarily due to their fruitful design concept 'fast fashion', which is encouraged by consumers. Consumers demand the business model of 'fast-fashion,' but simultaneously demand more transparency and corporate sustainability from multinationals. Those consumers or so-called 'frontrunners,' are the most important target group for multinationals. Engaging in environmental activities generates positive media attention resulting in higher revenues for multinationals, this could be an explanation why the multinationals engage in environmental activities.

An important characteristic of the global textile industry is transparency; very few multinationals give insight in their supply chains, this is a constraining factor for regulating environmental rules. Regulation is troublesome to implement, as environmental laws differ per country and often corruption dominates the political landscape in the countries the textile mills are located. Another factor contributing to non-transparency is the infrastructure of the regime; this is highly complex with many manufacturers in a wide variety of countries, some of them subcontracting other manufacturers. The lack of supply chain information about their manufacturing plants is indicating that multinationals are protecting their supply chain. Also, the refusal of all contacted multinationals to cooperate with this research could show non-transparency in this sector.

Regarding the second research question, various barriers to engage in environmental activities for start-ups have been analysed. The main barrier is that regime players protect their own business and have vested interests, therefore, it is hard to entry this market for niches. Another obstacle found is the investment in technology, niches want to invest in their technologies to keep renewing themselves. However, the lack of sufficient financial resources does not always allow for this activity. Another barrier for niche innovations is a lack of capabilities and information, this could be regarding implementing CE and closing resource loops, but also a general lack of capabilities such as marketing or sales. The last barrier is hindering regulations, the government is on the one side a hindering factor, on the other hand, the Dutch government stimulating is CE.

Opportunities for start-ups to accelerate the transition towards CE is cooperation within the niche; this can be regarding infrastructure, resource or information sharing. Another key driver for start-ups is a feeling of trust to be transparent about their business. In start-ups, trust can lead to confidence to share their experiences and cooperate with like-wise businesses. Individual actors who can inspire others, especially board members, are a big opportunity for start-ups to change people's minds. Another advantage start-ups have is that they have created a circular vision from the start, which enables start-ups to create a circular infrastructure. The latter is often hard for multinationals to incorporate because their infrastructure is so complex. It has been observed in the interviewed start-ups that they often started their business out of dissatisfaction regarding the current textile industry.

Regarding the fourth and fifth sub question, transition pathways determined for the start-ups are the reconfiguration and the transformation path. The interactions in the pathways are between incumbent dominant actors and niches. However, the dominant actors still hold power to adjust regime rules and change institutional beliefs. Niche actors cannot exert influence at the regime level as regime players protect their market. The infrastructure of the regime is hard to change due to the global interdependencies of multinationals and manufactories. This is found in the in this research as start-ups in the textile industry have too little power to alter the infrastructure of the regime, and, innovations are adopted in the regime to differing degrees, but not replaced by niche innovations. The competition between new and old suppliers has come forward to a lesser extent, although it is a key characteristic of the reconfiguration path, as the dominant actors in the regime hold the most significant influence.

The determined pathways, the transformation and the reconfiguration pathway, are linked to the obtained barriers via this research. In general, it was found that external barriers represent the interaction of the niches with the regime, and the internal barriers give an overview of the internal obstacles within the start-up. In this research, start-ups in the reconfiguration path have a business to business relation, however, in the transformation pathway, the start-ups have a business to consumer interaction. Start-ups in the reconfiguration path have a more technological innovation and therefore, are more focused on businesses, while the start-ups in the transformation path were focused on consumers and had a business model innovation.

In the last sub-question, it is researched if the phase in which CE currently is can be determined by comparing the characteristics of the transition phases by the key actors of the transformation and reconfiguration pathway. Comparing those two concepts has not been well researched in the literature. However, comparisons are made and the transition phase of the start-ups, Dutch regime and the textile regime is determined. Many niches have not been able to 'break through' the regime and as a result, alter the infrastructure of the textile industry. Instead, niche innovations have been adopted by the regime as component changes or add-ons for the regime. The biggest share of manufacturing factories in the textile industry are in non-western countries, the chance that those countries are going to change shortly is considered tiny. Therefore the cautious conclusion can be drawn that CE in the global textile industry is in the take-off phase.

As for the Dutch textile industry, the environment to for CE to develop is supportive; the Dutch government has the desire to export knowledge about CE. Therefore, the Dutch environment can be seen as a niche innovation, due to the 'safe haven' and supportive atmosphere to develop and circular activities. The phase in which the Dutch textile sector can be determined is in between the take-off phase and the acceleration phase, one stage 'further' than the global textile industry. The main reason why it cannot be placed in the acceleration phase (yet) is that a key characteristic namely, niche innovations are replacing regime players, has not been observed in this research. In addition to answering the last sub-question, the overarching institutions all have said that niche developments are interesting for developing innovations, but not for altering the infrastructure of the current textile industry. Multinationals and large enterprises only can achieve change in markets, according to this research.

All sub-questions are resulting into answering the main research question

How is transition theory contributing to garnering further insight into the transition of start-ups in the textile industry, both in the Netherlands and globally, towards a circular economy?

This study applied transition theory to reveal the current status of circular economy in the textile industry in the Netherlands and the global textile industry. TT is the overarching umbrella where concepts such as the MLP is applied to distinguish the niche, regime and landscape activities regarding CE. The interactions have been revealed and characteristics of specific pathways have been analyzed and the main actors, interactions, and activities on all levels of MLP are determined. Corresponding barriers were linked to those pathways, although the links were not extremely

convincing, the general obstacles and opportunities have been revealed. Eventually, the current phase of the circular economy in the Dutch textile industry and the global industry has been determined. TT as an overarching concept is suitable to research transitions in the Dutch industry because it takes a socio-technical approach and takes the system as a whole into account. The question that arises is if TT can be carried out in other sectors to give insight in their transition. I believe that is possible, however, using a less global scope can bring more accurate insights into the characteristics of transition theories.

9. Discussion and recommendations

One of the most striking examples of the power of the regime was the feigned interest in the technology of DyeCoo by multinationals, especially Nike. The technology of DyeCoo has the potential to shift the entire infrastructure of the regime and has, therefore, the potential to decrease (environmental) harm of the current textile industry. However, this innovation is a threat to the power the regime holds, and multinationals have tried to buy the patents of this niche innovation to prevent the niche innovation from developing fully. In general, the power of the current textile industry is enormous compared to the impact niche innovations have. Therefore, the regime in this research is defined as multinationals, instead of governmental institutions.

According to Geels, the development of niches can be seen on two levels simultaneously, on the level of global practices and the local level (Schot & Geels, 2008). The sequence of the local practices can enhance the emergence of global niche practices. In this research, however, local niche innovations can attract the attention of multinationals, but it does not have the power to influence the enhancement of niche innovations on a global level.

Investigating in which direction CE in the textile industry is moving might be too early, as transitions are very hard to predict. Transitions happen over a timeline of 25 or more years, organizations like the EMAF only started in 2010 and multinationals have just recently adopted more sustainable approaches to producing clothes. Some start-ups are in pathways that are not 'finished yet' and will perhaps 'breakthrough' in the future. Investigating the start-ups for a longer time-frame could generate different results. According to Grin (2010), pathways could be a mix and often do not follow one specific path, in this research there is chosen for two pathways. However it could also be a mix of two or more if the time-span of 25 years is taken into consideration.

Considering transition theory, the research of the Dutch textile industry might not be the best industry to research transitions, as this industry is extremely global and many different factors play a role. Although this is probably the case in most of the sectors, using fewer theoretical frameworks and focus on a few aspects could have given a more accurate outcome. Focussing only on barriers for Dutch start-ups to become circular or determining in which phase the current textile industry is in the Netherlands could have been broad enough to function as the central research question.

The whole perspective taken on CE is a West-European approach, as the EMF approach is Euro-centric (Griffiths, P. Cayzer, 2016). This is considered not a bad thing, but it cannot be expected from developing countries to think and act as Western nations. The biggest share of manufacturing factories in the textile industry are in non-western countries, the chance that those countries are going to change shortly is considered tiny. In this research, the regime is portrayed as something that has to be overcome by the niche innovations. The latter should break through and replace the old regime with their innovations. This could result in a narrative that displays regimes as 'mean' with (green) innovations as saviors of the world (Grin et al.,2010, p. 78). Also, it is assumed in the literature that

niches want to break through and replace the regime, however, they might want to be adopted by the regime.

The current movements of sustainable and critical consumers, vegan (organic) movements and the current attention that is given to climate change the last years could indicate that the landscape is changing. This is an influence from 'above,' outside the regimes and niches, but both influencing them. The current literature is merely focused on the interaction between niches and regimes and vice versa. The pressure of the landscape is seen as a broad development, having only little influence on the regime (Geels & Schot, 2007; Grin et al., 2010). The influence of the landscape, the deep cultural patterns and beliefs about macroeconomics, might have a bigger influence than is assumed in the literature and thus, deserves more attention.

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List of Figures

Appendices

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actor - network
attention for start-ups CE
barrier clear communication
barrier fear info sharing due to competitive nature of industries within traditional markets
barrier finance
barrier infinite resource
barrier internal mindset and values
barrier long term thinking
barrier multinationals branding
barrier start up communication
barrier start up coordination and cooperation within supply chain
barrier start up policy and regulation
barrier start up scaling
barrier start up technology
barrier start up Volume
barrier start ups lack of power
barrier vested interests regime
barrier volume
barriere start up insight supply chain
barriere start-ups lack of capabilities and information
barriers start up CE
business model
circular models
communication between stakeholders
consument regime shift
consumer as powerfull actors
consumerism
convincing consumer through marketing

cooperation niches with niches
cooperation regimes with niches
dependence on external suppliers
dependence on regime
design
drivers engaging CE
expertise
facilitator
fast fashion
finance
finding partners with influence power to change an event
Future CE Overarching Organisation
future CE start ups
hindering regulations
infrastructure
infrastructure company multinational
Internal values start up CE
lack of focus multinational
lack of focus niche innovation
lack of standardisation
landscape
multinational CE
Netherlands as a niche development
niche development in regime
niche innovations at micro level
niche innovations in other sectors
opportunity CE internal frontrunner
opportunity collaboration
opportunity cooperation and coordination with supply chain
Others
pathway
power in numbers
production process
Reason to shift to CE
regime
regime actors have a lack of knowledge
regime actors organizing niche developments
regime has power for change
regime non compliant to change
regime scaling

slow fasion
sociotechnical regime
stakeholders
stimulating niche innovation from regime
supply chain
target audience
technology regime
textile regime shift
transition management
transparency
transition theory
value creating
value increase regime
vision

INTERVIEW EXAMPLE FOR START-UP

Questions

1. Waarom is DyeCoo opgericht? – vanuit welk idee? Hoe is dit proces gegaan? – wat waren de lastigste aspecten van deze ontwikkelingen?
2. Hoe werkt het proces?
3. Wat zijn de lastigste aspecten van het CO_2 dying proces?
4. Wat is jullie grootste klantengroep? Hoe ziet de markt eruit voor jullie en hoe heeft zich dat ontwikkeld de afgelopen tijd?
5. Wat waren de obstakels bij de ontwikkeling van deze technologie?
6. Hoe zien jullie de reguliere textiel industrie?
7. Hoe ziet de toekomst van de textiel industrie eruit volgens jullie?

INTERVIEW EXAMPLE OVERARCHING ORGANIZATIONS

MVO Nederland – Interview

Hoi, mijn naam is Sofie en ik ben een Master student Climate Studies aan de Wageningen Universiteit .Ik ben geïnteresseerd in circulaire economie en schrijf mijn thesis over de kansen en obstakels die multinationals en start-ups in de textiel industrie tegenkomen in de transitie naar circulaire economie.

Het doel van dit interview is om inzicht te krijgen in de algemene tendens van bedrijven om circulair te worden en om inzicht te krijgen in de obstakels en kansen die bedrijven tegenkomen in de transitie naar circulaire economie (specifiek start-ups) in Nederland.

Vragen:

- Hoe zit MVO Nederland in elkaar?

- Waarom hebben jullie interesse in CE? Waar komt dat vandaan ? is dat aangestuurd via een bepaalde partij?

- Sinds wanneer zijn jullie begonnen met focussen op CE?

- Hoe ging dat proces?

- Is er een specifiek soort bedrijven dat zich bij jullie aansluit?

- Zijn start-ups aanwezig? Is er een branche oververtegenwoordigt, en zo ja welke?

- Hoe zie je CE zich ontwikkelen? Is dat via niches of op grote schaal (denk multinationals in kleding industrie)

- Wat is de voornaamste reden start-ups bij jullie komen? Welke problemen?

- Wat voor vragen krijgen jullie het meest van bedrijven om circulair te worden?

- Waar liggen de grootste kansen in de transitie naar CE voor bedrijven in Nederland? En barrières?

- Hoe ziet die markt eruit voor start-ups, hebben jullie het idee dat start-ups zich er veel mee bezig houden?

- Is de transitie naar CE anders voor start-ups anders dan voor SME's naar jullie inzicht? In welke opzichten?

- Gebruiken jullie een CE tool dat jullie toepassen op bedrijven? Zo ja welke?

- Gebruiken jullie circulaire modellen om bedrijven op weg te helpen naar een duurzaam bedrijf?

- Wat denken jullie van de conventionele economie? (lineaire economie)

- Zien jullie meer bedrijven die circulair willen gaan de afgelopen tijd?

- Hoe zien jullie de transitie naar CE verlopen in het algemeen? – wat heb je gezien de afgelopen tijd?

- Wat is het doel binnen MVO Nederland wat betreft CE? Is er bijv. een 5 of 10 jaren plan?

- Hoe denk je zelf over CE?

- Wat denk je dat er (meer) moet gebeuren om Nederland circulair te maken?

K