

Master Thesis Cultural Economics & Entrepreneurship



From shareholder to stakeholder value

A comparative qualitative study on the transition towards Circular Economy in the
Textiles and Clothing industry in the Netherlands

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Revaluing Fashion

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Abstract

This study investigates a relatively new phenomenon: Circular Economy (CE). CE strives for a ‘closed-loop’ system and is based on the 9R’s principle with e.g. recycle, reduce and reuse principles. This study is focussed on the transition towards CE in a specific area: the textile and clothing (T&C) sector, with a primary focus on The Netherlands. The study can be used as an exploratory and exemplary study for the global T&C industry. With an eye on the challenges the T&C industry is facing, the overarching research questions are:

How is the transition towards CE implemented, in the case of the T&C industry in NL?

Who are the stakeholders involved in the transition process towards CE, why are they involved and what for?

The research will address the following sub topics; how will different stakeholders in the Multi-Level-Perspective define the role of policy in the transition, what kind of stakeholders are involved and what is their role, what is the level of transition in CE of the T&C industry in NL currently according to stakeholders from the MLP, what kind of CE innovations are identified by stakeholders in the MLP and what is the role of these innovations to CE in the T&C industry in NL.

In order to answer the questions, the research is conceptualized with the transition theory and Multi-Level-Perspective (MLP) with macro (*sociotechnical landscape*), meso (*sociotechnical regimes*) and micro (*niche-innovations*) levels. Besides the use of the MLP, CE transition indicators are used in this research to adequately substantiate the theoretical ground of the study. A triangulation approach with multiple sources of empirical and secondary data collection are applied for this study. The study consists of in-depth semi-structured interviews (n=9), participant observations (n=1) and a document analysis (n=16). For the analysis of the empirical data the Value Mapping Tool (VMT) has been used.

The transition towards CE in the T&C industry in NL is taking place on a lower- and higher level transition. In the MLP, key stakeholders, the purpose and valuation differs substantially. The *socio-technical landscape* and the *sociotechnical regime* interact on policy level and coordination of the CE innovation landscape via intermediaries and intermediary organisations. Multi-stakeholder collaboration is therefore crucial in the transition towards CE. Including not only technical but also cultural innovations because they prove the value of culture in the transition towards CE in the T&C industry in NL.

Keywords: circular economy, transition, fashion, multi-stakeholder collaborations, intermediaries, governance

Preface

Fashion both has a symbolic and functional value as Kawamura (2011) argues and functions in a complex system of “social network markets” (Potts *et al*, 2008, p.169).

Fashion is:

‘a cultural construct of the embodied identity’

as fashion historica dr. Valerie Steele (Fashion Theory) mentioned in her lecture that I attended at the Rijksmuseum last year. However what does that mean in relation to the current linear practices in the fashion industry? With a background in fashion design this discrepancy has always intrigued me. Over the past two years I have had the chance to fully immerse in the academic cultural economics realm of fashion for which I am grateful. I have grown in the role of fashion intermediary in the web of economic, social, societal, cultural and environmental behaviour and values.

Today’s VUCA (Volatility, Uncertainty, Complexity and Ambiguity) world requires 21st century creative skills such as: imaginative and associative abilities, problem-solving and critical thinking, communications and teamwork and the recognition of continuity that are not immediately obvious. It is unfortunate that those ‘soft skills’ are unrecognized, as touched upon by Bast *et al*. (2015) education in the globalized economy is essential in the arts and creativity. Additionally, the symbiosis of both knowledge and imagination creates an understanding and a sense of how to handle the sustainable transition combined with the current crisis the fashion industry is facing.

Last but not least, I see fashion as a medium and a craft because it is close to the body and so present in our daily lives (we wear clothes every day). It is the perfect tool to take and show responsibility, creating awareness and advocating for the (re)valuation of our earth and the chance for future generations to do the same!

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List of acronyms

AGT	Agreement on sustainable Garments and Textile
B2B	Business to Business
B2C	Business to Consumer
CE	Circular Economy
CEBM	Circular Economy Business Models
CEI	Circular Economy Indicators
CI	Creative Industries
CSR	Corporate Social Responsibility
CtC	Clothes the Circle
C2C	Cradle to Cradle
ECAP	European Clothing Action Plan
EC	European Commission
EMAF	Ellen MacArthur Foundation
EU	European Union
DA	Document Analysis
DCTV	Dutch Circular Textile Valley
IPCC	Intergovernmental Panel on Climate Change
I&W	(Ministry of) Infrastructure & Water management
LCA	Life Cycle Analysis
LE	Linear Economy
MCI	Materials Circularity Indicator
MLP	Multi-Level-Perspective
MVO	Maatschappelijk Verantwoord Ondernemen
NDA	Non-Disclosure Agreement
NL	The Netherlands
OECD	Organization for Economic Co-operation and Development
SDG	Sustainable Development Goals
SME	Small and medium-sized enterprises
T&C	Textiles & Clothing
TR	Theoretical Framework
TT	Transition Theory
UCRF	Union of Concerned Researchers in Fashion
UNCTAD	United Nations Conference on Trade and Development
UN	United Nations
VMT	Value Mapping Tool

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1. Introduction

Linear practices (take-make-use-dispose) focus on return on investment and profit maximisation followed by short-term strategies and a lack of investment in long-term strategy. This growth model has been favored by the economy for the past decades mainly because of the supposedly infinite availability and inexpensiveness of natural resources (EMAF, 2013; Kallis, 2017). However, we are nearing a period where linear practices are no longer viable. The world population is expected to increase from 7 billion in 2019 to 10 billion in 2100 with rising mid-incomes resulting in immediate effects on the scarcity of resources (UN, 2019). The relevance for this research lies in the societal, cultural and environmental emergency of resource scarcity and the reason for this research is because a deeper understanding is needed on how the various problems mentioned can be overcome.

This study is investigating a relatively new phenomenon in the sustainability domain: Circular Economy (CE). CE strives for a ‘closed-loop’ system (Bocken *et al.*, 2016) and is based on the 9R’s principle with e.g. recycle, reduce and reuse principles (Potting *et al.*, 2017). The work of the Ellen MacArthur Foundation (EMAF) and Kate Raworth’s Doughnut Economy in 2017 steered the debate on CE solutions for resource scarcity and a regenerative economy. In academia, the urge is voiced as well with The Union of Concerned Researchers in Fashion (UCRF). The UCRF was formed in 2018 and launched the *Manifesto of concerned researchers* in 2019 which appeals fashion researchers to unite and advocate for systems and paradigmatic change, to create an ‘activist knowledge ecology’: to establish a structure for knowledge about fashion sustainability, formulate visions and research practices and take the frontrunner position in questioning existing and new ideas (concernedresearchers.org, 2020).

A systemic change like CE does not happen in an instance, with as main reason that this research considers the transition process towards CE as main research topic. In this study, the multi-level-perspective (MLP) of the transition theory has been applied in order to make clear how “transition as outcomes of alignments between developments at multiple levels” functions (Geels & Schot, 2007). The levels are: *sociotechnical landscape* (Macro), *sociotechnical regimes* (Meso) and *niche-innovations* (Micro) (Geels & Schot, 2007).

This exploratory study is focussed on a specific area: textile and clothing (T&C) sector, with as primary focus on the Netherlands. According to Fisher & Pascucci (2017) and Lavanga (2019), the Dutch T&C industry has a pioneer position in the transition of circular material flows with its niche-innovations. The Netherlands is a knowledge economy and advanced in research on CE (Geissdoerfer *et al.*, 2016). The Netherlands has the ambitious strategy: ‘The Netherlands circular in 2050’ which aims to have a contraction of virgin resources usage of 50% by 2050¹. In the sociotechnical regime (meso), several Dutch-based civil-society organisations are active in facilitating the sustainable transition of T&C companies and consumer sentiment towards sustainability is growing (Lavanga, 2019; Lettinga *et al.*, 2017). With examples of the Dutch Circular Textile Valley and the Clothes the Circle textile consortium, tackling issues related to linear design practices and support to increase used textiles collection as well as the use of recycled material volumes. Besides the ongoing efforts, the CO2 emission of textiles production in used consumption goods is still 7% and consumption of clothing textiles has risen by 39% between 2000 and 2017 in the Netherlands (CBS, 2019).

On a Macro level, the developments in CE resulted in several agreements such as the establishment of the Sustainable Development Goals (SDG’s) of the UN in 2015 (sustainabledevelopment.un.org, 2020). With the Paris agreements: Fashion Industry Charter for Climate Action of the UN, 89 international fashion organisations and 29 supporting organisations committed by signing the agreement (unfccc.int, 2020). Other international industry commitments are the Global Fashion Agenda 2020 Circularity Commitments, set up in 2017 (globalfashionagenda.com, 2020). The Ellen MacArthur’s Foundation ‘Make Fashion Circular Commitments’ include their ongoing work on the ‘Jeans Redesign Guidelines’² (ellenmacarthurfoundation.org, 2020). On a European level initiatives such as the ECAP (European Clothing Action Plan) and the EU Ecolabel for clothing and textiles products. In March 2020 the EU has launched its ‘Circular Economy Action Plan’ with textiles as one of the five focus sectors (ec.europa.eu, 2020).

¹Nederland Circulair in 2050, according to the report, not only ecological footprint is reduced by circular economy but also societal and health impact.

² Ellen MacArthur’s Foundation ‘Make Fashion Circular’ launches the Jeans Redesign project in 2019

The report urges for a sustainable approach towards design of products because 80% of products' environmental impacts are determined at the design phase (ec.europa.eu, 2020).

It is argued by Fisher & Pascucci (2017) that the main threat in the transition towards CE is to organise collaboration and business relations while at the same time being mannered by the linear economy establishment. Geissdoerfer *et al.* (2016) indicates that, although there is an increase in studies on CE over the past years, relatively little research has been carried out on (CE) innovations and policy implications. Additionally, studies have shown that there is still an absence of knowledge on the benefits of CE and environmental legislation (FUSION, 2014; AMEC, 2013 in Rizos, 2016). Further, a survey under 300 European companies illustrated that most firms did not understand the term or did not comprehend the meaning of CE (FUSION, 2014 in Rizos, 2016). The transition towards CE is thus still in an early stage. The main aim for this study is to understand how multi-level dynamics interact in the transition towards CE in the T&C industry in NL.

1.1 Research Objectives

This research has two objectives. In order to provide an in-depth analysis of the process of transition towards CE, first of all an understanding needs to be created of how multi-stakeholder collaborations function and how they affect the transition. Second this research aims to determine what kind of different stakeholders are involved in the transition process and what kind of value is created in various levels of the MLP by the stakeholders in the transition towards CE in T&C industry in NL. With an eye on the challenges the T&C industry is facing, the overarching research questions are:

How is the transition towards CE implemented, in the case of the T&C industry in NL?

Who are the stakeholders involved in the transition process towards CE, why are they involved and what for?

In order to respond to these questions, the research uses the transition theory and Multi-Level-Perspective (MLP) with macro (*sociotechnical landscape*), meso (*sociotechnical regimes*) and micro (*niche-innovations*) levels, further conceptualized in the theoretical framework. The research will address the following sub topics; the kind of policy

measures existing to facilitate the transition, how policy is perceived in the transition process by stakeholders in the MLP, the role of intermediary organisations, how stakeholders perceive the level of transition, CE innovations identified by stakeholders and the perceived role of CE innovations in the transition towards CE in the T&C industry in NL.

Social and cultural values related to both the T&C industry and circular economy require a social science approach since this study is about changing systematic economic behaviour. It requires a triangulation approach with multiple sources of empirical and secondary data collection which, combined, form a coherent view of the developments in this research field. Therefore this research is approached from a cultural economics perspective. The study consists of in-depth semi-structured interviews (n=9), participant observations and case study (n=1) and a document analysis (n=16). Besides the use of the MLP, CE transition indicators are used in this research to adequately substantiate the theoretical ground of the study. For the analysis of the empirical data the Value Mapping Tool (VMT) has been used. The tool introduces different forms of value: value captured, value uncaptured, value destroyed, value surplus, value absence, value opportunity and purpose (Bocken *et al*, 2013). The VMT in combination with the MLP has been applied in the analysis of this study to structure the results and reduce the complexity, compare and contrast between different layers. Followed by the results, discussion, conclusion and recommendations for further research.

2. Theoretical framework (TR)

2.1 Introduction

The ensuing section conceptualises the topics of this study: the transition process and CE. The TR is constructed in order to analyse the topics in relation to the specific industry (T&C) and country (NL). The literature review functions as a point of departure in the development of theoretical research. Existing theoretical research, research methods, key contributors on the research topics and the credibility and contribution to the research topic is examined (Bryman, 2016). Due to the novel combination of the topics, a combination of peer-reviewed journals or other academic sources and non-peer reviewed documents such as consultancy and policy reports are used for the development of the TR.

The core concepts in the TR are clustered as followed:

2.2	Circular Economy	Circular economy, linear economy, sustainability, values and purpose
2.3	Transition Theory	Transition Theory, multi-level-perspective, multi-level dynamics, innovation, innovation commons
2.4	Networks	Networks, partnerships & collaborations: knowledge transfers, the crowding-out effect & intrinsic motivation
2.5	Governance	Political decision making, regularly tools, policy instruments, extended producer responsibility, innovation policy & policy assessment
2.6	Fashion	Creative industries as social network markets, cultural aspects of the fashion industry, textiles & clothing industry and intermediaries in the T&C industry.

Table 1: overview core theoretical concepts (own elaboration)

Section 2.7 delves deeper in the process of transitioning towards CE in the T&C industry in NL with *niche-innovations* and current linear practices of the *sociotechnical regimes*. Followed by transparency and traceability, CSR, global and national T&C figures, the practice of CE and CE applied on the T&C industry. Section 2.8 covers the divers and barriers for the transition towards CE. The final section (2.9) includes exemplarity cases for governmental policy measures on European and national level of the *socio-technical landscape* in the T&C industry.

2.2 Circular Economy

2.2.1 Definition of Circular Economy (CE)

Kirchherr *et al.* (2017) analysed 114 Circle Economy (CE) definitions and came to the following definition. The definition connects elements of Geels and Schot's (2007) systemic multi-level-perspective (MLP) and social, cultural and economic value creation to the definition which is leading to the following definition:

“A circular economy describes an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations” (Kirchherr *et al.*, 2017, p. 226)

2.2.2 Linear Economy (LE)

LE is defined by Murray *et al.* (2017, p.371) as “converting natural resources into waste, via production”. The linear economy is focussed on natural resources in a one-way system, where resources are seen as waste after its usage (Murray *et al.*, 2017).

Cheyne & Purdue (1995, p. 152) define waste as “a subjective element by requiring the holder or creator of the substance to have disposed of or discarded the substance” another categorisation is waste as “a 'residue', 'byproduct', 'surplus', for which its producer 'has no further use'” (Cheyne & Purdue, 1995, p. 152). Waste is defined by the extent to which the substance or object is marked as ‘unwanted’, the unwanted can still be of value but used in another way than the primarily use (Cheyne & Purdue, 1995). For alternative usage, waste management strategies such as policies with different CE strategies such as increased accountability, responsibility of care, reduction and removal of waste or increased control over collection, transport and disposal could be instrumental (Cheyne & & Purdue, 1995).

2.2.3 Sustainability, values and purpose

The CE is a sustainable approach to the economy. Sustainability is defined by Geissdoerfer *et al.*, (2016, p. 759) as: “the balanced and systemic integration of intra and intergenerational economic, social, and environmental performance.”. Throsby (2017) urges for a fourth pillar: cultural capital in relation to sustainability. Cultural capital is tangible and intangible resources whom exemplify or elevate cultural value (Throsby, 2017). Throsby (2017) refers to this as culturally sustainable development (CSD). Culture can be interpreted as ‘a way of life’, in sociological and anthropological perspectives ‘an expression of shared values and expressions’ (Throsby, 2010). One of the principles Throsby (2017) uses in the CSD is *interconnectedness*, which emphasizes that systems should not be seen separate, rather a holistic approach is desirable.

Closely related to the topics discussed, is the notion of how individuals ‘value’ certain things and if and how we act from our personal values. Standard economics equates value with price (Klamer, 2017). In a cultural economics perspective, ‘values’ usually refer to “qualities of works of art, scientific contributions, organizations, cities, countries and cultures” (Klamer, 2017, p.48). Associated with values is Klamer’s (2017) value-based approach to the economy, he argues that individuals and businesses operate from a ‘purpose’, a (shared) mission or vision. Activities in the value-based approach are sense-making activities (Klamer, 2017). *Creative commons*, is an inclusive open-source social phenomenon acting as an artistic conversion, where participants share and co-create (Klamer, 2017), this is where sense-making activities take place.

2.3. Transition theory (TT)

2.3.1 Transition theory

Transition is defined by Rotmans & Loorbach (2009) as a restructuring of societal systems. According to Loorbach *et al.* (2017) the term sustainability transition is used to understand large-scale societal changes that try to solve major economic and social challenges. TT is used to build a theoretical framework in order to understand systems and technological change (Loorbach *et al.*, 2017). Technology is defined by Handke (2010) as practiced tacit and codified knowledge and protocol about products and

services. Technological change is the process in which practiced knowledge is changed disseminated in new products and processes (Handke, 2010). Handke (2010) is referring to Schumpeter which stated that technological change is seen in the long run as source of economic growth, the rise of new markets and raised productivity. This relates to economic competence: the capacity to recognise, extend and utilize business opportunities, this is irregularly dispersed among firms (Carlsson & Jacobsson, 1997).

2.3.2 The Multi-level-perspective (MLP)

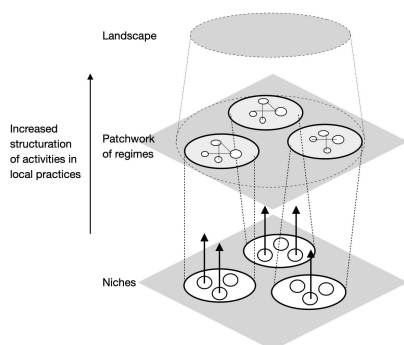
The multi-level-perspective (MLP) is part of the TT. Geels and Schot (2007, p. 399) use the MLP which aim is: “understanding transition as outcomes of alignments between developments at multiple levels”. The three types of MLP are: *sociotechnical landscape*, *sociotechnical regimes* and the *niche-innovations* (Geels & Schot, 2007).

The *sociotechnical landscape* (macro level) is the external climate that is not immediately affected by the niche or regime level, rather operates in necessary subjects such as macro-economics, deep cultural patterns, macro-political developments (Geels and Schot, 2007).

With the *sociotechnical regime* (meso level), is determined the shared knowledge transfers in an engineering community in combination with constituted technological developments (Geels *et al*, 2007). It is argued that everyone in society is contributing to the sociotechnical regime (Geels and Schot, 2007).

Technological niches are defined as the micro-level where radical innovations appear (Geels and Schot, 2007). Niches function as ‘incubators’ safeguarding innovations against the forces of market selection. Small networks of dedicated actors are active in the niche-innovations level (Geels *et al*, 2007). *Figure 1: Multiple levels as a embedded hierarchy.*

Adapted from Geels, 2004.



2.3.3 Multilevel dynamics

Transition theorists argue that there are ‘multilevel dynamics’ in which the niche, regime and landscape operate (Loorbach, *et al*, 2017). Those are the *higher-level* and *lower-level transitions* (Loorbach, *et al*, 2017).

Figure 3 illustrates how *higher-level* (with the new regime) and *lower-level transitions* (with the old regime) take place. From the TT, it is emphasized that transitions involve various stakeholders with different backgrounds, this is termed as *multi-actor dynamics*, which include market, government, science and civil society (Loorbach, *et al*, 2017).

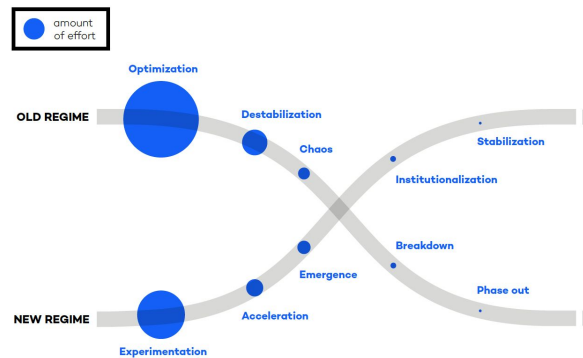


Image 1: higher and lower-level transition dynamics. source: Buchel *et al.* (2018)

2.3.4 Innovation

Innovation is part of the TT because at a micro level, *niche-innovations* function as incubator. Edquist defines innovations as (1997, p.1): “new creations of economic significance. They may be brand new but are more often new combinations of existing elements”. In the name of Schumpeter, distinguishes Fagerberg (2003 p. 4) five types of innovation: “new products, new methods of production, new sources of supply, exploitation of new markets and new ways to organize business”. Innovation can be categorized in ‘incremental’ and ‘radical’ innovation (Fagerberg, 2003). Incremental innovation requires continuous advancement of existing products or services whereas radical innovation is the introduction of a new product, invention or technological revolution (Fagerberg, 2003). As Edquist (1997) demonstrates, is the process of the

appearance of technological innovations remarkably complicated. Technological innovations arise through the dissemination of knowledge features (e.g. with scientific and technological capacities) and translates it into new products and production processes (Edquist, 1997).

2.3.5 Innovation commons

The *first generation* of commons, or defined as common-pool resources (CPRs) was shaped by institutionalist Nobel Prize winner Elinor Ostrom's' oeuvre and was defined as shared physical natural resources e.g. fisheries, forest, oceans and airspace (Ostrom, 2010; Allen & Potts, 2016). Ostrom argued that natural resources in neo-liberal economics had been seen primarily as input to produce pure private and public goods (Ostrom, 2010). Furthermore, the governing of those natural resources had been arranged by either the market or the government, whereas Ostrom proposed a third approach of governing; polycentric, through the commons (Ostrom, 2010). Ostrom's work can be described as "social-contract theoretic" (Potts, 2018, p. 1032).

The *second generation* commons has developed towards intangible CPRs of information and knowledge, such as science (Boyle 2007; Schweik & English, 2012; Allen & Potts, 2016) and culture (Ostrom & Hess, 2007; Frischmann *et al.*, 2014; Allen & Potts, 2016). The *innovation commons* are part of the second generation commons. At the beginning of a novel technology development, a group of enthusiasts comes together to discover new possibilities (Allen & Potts, 2016). Knowledge exchange by different stakeholders is taking place in a noninstitutionalized informal sphere where precariousness has been adequately diminished that the actors are able to confidently act (Allen & Potts, 2016). The innovation commons does not mean peer production of products or technologies per se, but rather peer production of knowledge and information (Potts, 2018). This is necessary to uncover availability for new products and services in markets, firms and industries (Potts, 2018). In the 'social-contract' theoretic approach, innovation problems are collective action problems which can be undertaken with adequate governance institutions (Potts, 2018).

2.4 Networks

2.4.1 *Networks, partnerships & collaborations*

In order to bridge the gap between knowledge transfers, the connectivity of the different parts of a system matter (Carlsson & Jacobsson, 1997). Important network linkages are academia, industry and institutes (Carlsson & Jacobsson, 1997). Networks and collaborations generate positive externalities and reduce transaction costs via internalized transactions with through product or service innovation, shared resources or access to new markets (Carlsson & Jacobsson, 1997; Kant Hvass, 2014). In handling different sustainability issues, collaborations and partnerships between different industry partners are important (Kant Hvass, 2014; Googins & Rochlin, 2002; Neergaard *et al.*, 2009).

2.4.2 *Knowledge transfers*

Bathelt *et al.* (2004) point out the influence of social relations in the production process and make a distinction between ‘tacit = local’ and ‘codified = global’ knowledge transfers. Tacit knowledge is the transportation of non articulated tacit forms of knowledge (Bathelt *et al.*, 2004). This kind of knowledge is difficult to transmit and is strongly related to a specific location (Bathelt *et al.*, 2004). Codified knowledge is related to global markets, communication technology and travels most often over the internet (Bathelt *et al.*, 2004).

2.4.3 *The crowding-out effect & intrinsic motivation*

According to Frey & Jegen (2001), financial rewards could crowd out intrinsic motivation. The ‘crowding-out effect’ is seen as one of the most important deviations of in economics because it opposes essential economic law that financial incentives raise supply (Frey & Jegen, 2001). Intrinsic motivation is defined by Deci (1971, p.105) as “one is said to be intrinsically motivated to perform an activity when one receives no apparent reward except the activity itself”. Frey & Jegen (2001) emphasize that intrinsic motivations play an essential role in how communities could solve collective action problems. External incentives such as compensation could crowd-out communal

responsibility or intrinsic motivation and fundamentally alters the perceived nature of a situation (Frey & Jegen, 2001).

2.5 Governance

2.5.1 Political decision making

The government has two roles: to act as agent of society and principle of bureaucratic agents (Mazza, 2011). Government policies are often used to foster economic growth and to ensure that the entire system functions (Carlsson & Jacobsson, 1997). Despite that, the government's role is to maximize welfare, while at the same time it needs to make decisions on how to spend taxpayers money (Mazza, 2011; Rizzo, 2011). Resulting in different incentives and disincentives generated by different institutional features (Rizzo, 2011). Civic or industry influence on political decision making functions via lobbies (Mazza, 2011). In order to influence public decision making, lobbies have several instruments: providing financial resources or valuable information and organized groups can exert pressure (Mazza, 2011).

Important in the process of political decision making are market failures. Market failures are external 'unpriced' or 'covenanted' benefits and information problems about the quality of cultural goods (Towse, 2019). From the demand side this entails: external benefits in the production and consumption and non-market demand, irrationality, income distribution and lack of information from the consumer (Frey, 2011). Market failure from the supply side involves: imperfect competition, declining costs and income distribution (Frey, 2011).

2.5.2 Regularly tools

Regulation is defined by (Rizzo, 2011) as non-financial government mediation aligned with government policy aspiration, aiming to diminishing or adjusting activities of economic representatives. Regulatory policy includes intellectual property law and cultural rights (Throsby, 2010).

2.5.3 Policy instruments

For the implementation of policy, various policy instruments are available. Fiscal policy refers to measures that include government spending or boosting public revenue over a tax system (Throsby, 2010). They can be direct: supply of goods or services, subsidies and grants or indirect: tax concessions or assistance to consumers (Throsby, 2010). Consumption taxes are an example of a fiscal policy instrument, they could control consumption patterns (Rizos, *et al.*, 2016).

Industry policy from a governmental perspective is framed as ‘strategic trade policies’, in order to develop trade in the economy and is used as tool to advance competitiveness in specific areas by creating the benefits from first mover advantages (Carlsson & Jacobsson, 1997). Industry policy may involve dismantling tariff protection for the tenacity of international markets or tax incentives and investment allowances (Throsby, 2010).

2.5.4 Extended Producer Responsibility (EPR)

An example of a fiscal policy instrument is the EPR. In the current debate on CE policy measures, the Extended Producer Responsibility policy measure has been mentioned as possible effective tool for regulation. The OECD defines EPR as “an environmental policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle” (OECD, 2001, p. 18). The EPR has two functions: 1) to shift responsibility to the producer by internalizing the environmental and waste disposal costs through incorporating them in the costs of the product and 2), with the focus on the post-consumer phase (OECD, 2001 in Kant Hvass, 2014). The core obligation for the producers is to financially support sorting with a fee on newly produced textiles (FFact, 2019).

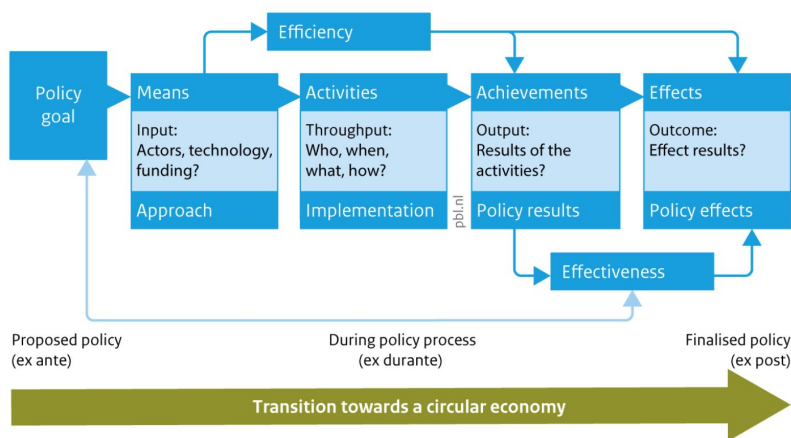
2.5.5 Innovation policy

It is a crucial task of policy to identify new technological and economic opportunities at the immediate stage and raise awareness of these opportunities at various stakeholders e.g. in the industry and academia (Carlsson & Jacobsson, 1997). Considering

a technology at the premature or in transition theory mentioned ‘niche’ state, it is unachievable to realize most utility of technology (Cohendet & Uerena, 1997). There needs to be a mechanism that strongly depends on the capacity for the local community to disseminate learnings and creations to the community (Cohendet & Uerena, 1997).

The system relies on: an exchange of information resulting in collective sharing of new technology and collective learning between local mechanisms of innovation and the capability to fastly systematize the new knowledge with as result that communication on innovations becomes available (Cohendet & Uerena, 1997).

2.5.6 Policy assessment



Source: Netherlands Court of Audit 2005; edited by PBL

Figure 2: Policy assessment framework (Potting et al., 2017)

According to Potting et al. (2017) the assessment framework for measuring the progress of the transition towards CE is categorised in three phases: *ex ante*, *ex durante* and *ex post*. Traditionally the tracking the economic outcomes can be measured by value of output, such as complete value of production of value added, levels of import/export of products, rates of growth, price levels and income levels (Throsby, 2011). Nonetheless, tracking cultural, social and environmental outcomes requires a different view on assessment. The section on CE transition indicators (3.4.1) in the Methods passage goes more in detail on CE transition assessment methods.

2.6 Fashion

2.6.1 Creative industries, Fashion, T&C industry

This research is taking place in the context of the fashion industry. Fashion is a dimension in the Creative Industries. As Caves argued (2003), production in creative industries generally includes inputs in technologically driven sequences.

According to the UNCTAD, the Creative Industries (CI) includes:

- “
- are the cycles of creation, production and distribution of goods and service that use creativity and intellectual capital as primary inputs;
 - constitute a set of knowledge-based activities, focused but not limited to arts, potentially generating revenues from trade and intellectual property rights;
 - comprise tangible products and intangible intellectual or artistic services with creative content, economic value and market objectives;
 - are at the cross-roads among the artisan, services.” (UNCTAD, 2008, p. 13).

2.6.2 Creative industries as social network markets

The fashion industry as part of the CI has a market-oriented focus (Potts *et al.*, 2008). Therefore, Potts *et al.* (2008) argue that CI operates not in the artistic realm but in domain of individual choice in a complex social system of other individual choices and therefore functions as a market. The CI relies on socio-economic aspects such as taste, culture. Popularity and individual choices are influenced by feedback over social networks (Potts *et al.*, 2008). This has its effect on both in the production and consumption of creative goods (Potts *et al.*, 2008).

2.6.3 Cultural aspects of the fashion industry

Caves (2000) expressed that the cultural objectives and the social context of creative goods' consumption is nowhere more evident than in the domain of 'fashion'. Taste is built upon cultural consumption capital and the industry is drowned in search costs akin to the 'infinite variety' of fashion goods (Caves, 2000). Another term used to describe the fundamental uncertainty that the producer faces of a creative good is

‘nobody knows’ (Caves, 2000). Fashion is created through design, which is defined as “the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture or materials of the product or its ornamentation.” (IPO 2015, p. 1) resulting in sketches, samples and final products (Janssens & Lavanga, 2018). Kawamura (2011) defined fashion as twofold, the social aspect of wearing clothes and fashion or clothes itself. Since fashion goods or garments have both a functional and social function (Kawamura, 2011), the garments are used by the wearer for protection (for e.g. weather conditions) as well as for reputational use. Fashion both has symbolic and creative meaning as well as an industrial and commercial process of the production of the product (Köppchen, 2014).

2.6.4 Textiles & clothing industry

The clothing industry (also referred to as the garment/apparel/fashion industry) is assigned to the production of garments, whereas the textile industry frequently refers to the production of yarn, textiles and fabrics, while the clothing industry (European Parliament, 2019). For this research both the textiles as the clothing industry, as part of the fashion industry are taken into account since they are often intertwined.

2.6.5 Intermediaries in the T&C industry

With the rise of complex division of labor, segmentation and a globalised economy, the role of cultural intermediaries has become increasingly important in the T&C industry (Lavanga, 2018). There are two main characteristics identified for cultural intermediaries. First, the value formation through mediation and power relation in the intermediary or interaction process (Lavanga, 2018). Second, the role of experts in specific markets (Lavanga, 2018). Cultural intermediaries are defined as professional experts in taste and value in the cultural field (Lavanga, 2018).

Fashion goods, like all creative goods require ‘humdrum’ inputs (labor, capital, human capital, etc.) and ‘creative’ inputs (Caves, 2000). Humdrum activities in the fashion industry also include functions such as production, distribution and promotion and they are coordinated by intermediaries or gatekeepers (Lavanga, 2018).

2.7 The process of transitioning towards CE in the T&C industry in NL

As far as known, is the transition theory (TT) and the Multi-Level-Perspective (MLP) has not been applied in empirical research on the T&C industry. The TT is primarily used in core technical industries, often referred to as STEM sectors (science, technology, engineering and medicine) (Jaaniste, 2009). Jaaniste (2009) argues that the creative industries hold a different position in the temporary innovation landscape, which requires a different approach towards empirical research. Therefore, I argue that in order to develop an understanding of the process of the transition it is relevant to apply the multi-level perspective to compare various levels and stakeholders. From the *lower-level transition*, old regime can be considered as the LE and the *higher level transition*, new regime is the CE. The following section delves deeper in the process of the transition towards CE in the T&C industry in NL.

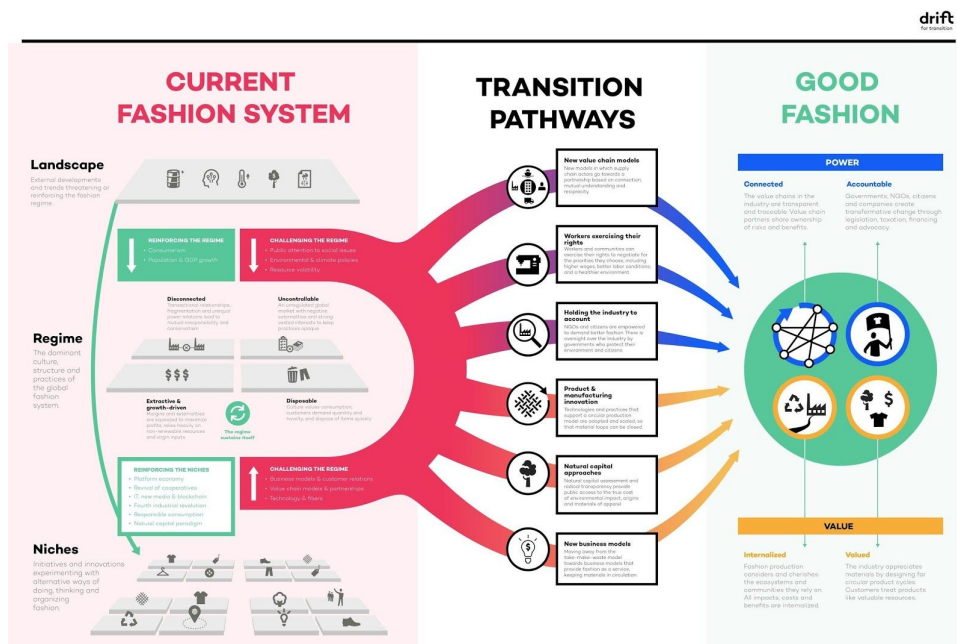


Image 2: Mapping the transition to circular fashion report (Buchel et al., 2018)

DRIFT, the research institute in the field of sustainability transitions at the Erasmus University in Rotterdam carried out a report 'Mapping the transition to circular fashion' for the C&A Foundation in 2018 with the transition theory. The report is used to better understand the deeply rooted systems logic and economic dynamics in the fashion industry (Buchel et al., 2018). The report advises to invest in transformative,

radical and disruptive innovation and an active role to break down existing linear structures, incentives and institutions (Buchel *et al.*, 2018).

2.7.1 Niche-innovations in the T&C industry

At micro-level, radical innovations emerge: new initiatives or alternatives of thinking, organizing and doing. According to Buchel *et al.* (2018) the niches are organised in three categories (Table 2). Fashion and textile SME's are currently able to add value by applying their practical skills, knowledge and expertise to recycle, reduce and reuse previously discarded textile waste (Ballie & Woods, 2015). The Center for Sustainable Fashion found that designers become more conscious of sustainable fashion but it remains difficult to work with sustainability topics (Kozłowski *et al.*, 2012). The following overview displays the various circular design methods and strategies identified and used in the transition to CE.

Technological niches		R9 Strategy
Technology and Fiber	Recycling innovations (e.g. automated sorting, chemical recycling)	Recycling
	Industry 4.0: 3D-printing; virtual prototyping; robotic or AI automation (Saldivar <i>et al.</i> , 2015). 3D visualisations	Refuse, Reduce, Rethink
	Design for circularity : zero waste pattern cutting, subtraction cutting, circular design guide, Textiles Environment Design (TED) program, design for disassembly (DFD), design for managing obsolescence, sustainable design cards, design thinking methods, multifunctional, transformable and modular design, design for longevity.	Rethink, Refuse, Reduce, Repurpose, Recycle
	Use of new materials (e.g. fruit leather or algae)	Refuse, Rethink
	Rediscovery of existing materials (e.g. hemp, flax)	Refuse, Rethink, Reduce
	Innovations that reduce the impact of the dyeing process and water, energy and chemical use (e.g. with enzymes and nanotechnology)	Reduce
Business Models and Customer Relations	Fashion as a service (FAAS)	Rethink, Reduce
	Longer-term or personalized relationships, user involvement with customers (e.g. lease/rent models, reuse, remake, repair, resell, personalization, on-demand production)	Re-use, Refurbish, Remanufacture, Repurpose
	Customer behaviour and social media customer trends (e.g. minimalism, capsule wardrobes, zero waste, slow fashion, sharing initiatives, vintage)	Refuse, Reduce, Rethink, Re-use, Repair, Repurpose
Value Chain Models and Partnerships	Ethical brands working closely with manufacturers	Rethink
	Short supply chains	Rethink
	Local for local (or regional) production and reshoring, re-distributed manufacturing perspectives (RDM)	Rethink
	Radical transparency initiatives, e.g. open design	Rethink
	IT-based traceability initiatives using blockchain, RFID tags	Rethink, Reduce
	Environmental profit and loss accounting	Refuse, Rethink, Reduce

Table 2: overview of niche-innovations. based on the work of: Buchel *et al.*, 2018; De Angelis *et al.*, 2018; Bocken *et al.*, 2017; Smith, *et al.*, 2017; McQuillan *et al.*, 2013; EMAF, 2018; Earley *et al.*, 2016; Earley *et al.*, 2018; Den Hollander, 2018; Niinimäki, 2018; Maldini & Balkenende, 2017; Potting *et al.*, 2017).

2.7.2 Current linear state of the T&C industry

By applying Geels and Schots systemic multi-level-perspective (MLP) to the fashion industry, (2007), we examine that conventional dominant culture, structure and practices in the *sociotechnical regimes* and the linear business model (take-make-use-dispose) are still predominant.

The most frequent business model used nowadays in the fashion industry is Fast Fashion (Todeschini, 2017) or also defined as the short-life cycle model. The business model strives for profit maximization, resulting in a comparative advantage and market power over other companies (Hoskins *et al.*, 2004). Market power and industry structures are important to understand because it has a major effect on the decision making in the T&C industry (Hoskins *et al.*, 2004).

Traditional ways of responding to consumer demand has been forecast based, with as result: asymmetric information problems, risks of over-stocked or under-stocked supplies (Christopher *et al.*, 2004). This development is complicating the management of fashion logistics. Because firms have adopted sourcing strategies to lower costs wherever possible, production and design are often taking place geographically separate, resulting in a reduction of effective communication (Köppchen, 2014). Because of the pressure to perform the high levels of production, this business model is sensitive for exploitation of manufacturing workers resulting in poverty-line wages, severe health and safety issues and worker repression (Buchel *et al.*, 2018).

2.7.3 Transparency and traceability in the T&C industry

Over the past years, an increase of attention has been shifted towards transparency and traceability in the T&C industry. The origin of this awareness can be traced back to the collapse of the Rana Plaza factory 24th of April 2013 in Dhaka, Bangladesh (Hira & Benson-Rea, 2017). During the collapse 1134 factory workers died and around 2500 workers got injured. After the disaster, the ‘Bangladesh Accord on Fire and Building Safety’ was signed by 150 apparel companies, two global labour unions (IndustriALL and UNI), several local unions and several non-governmental organisation (NGO) signatories (Hira & Benson-Rea, 2017). The accord legally binds companies to spend

money to improve factory conditions. Numerous agreements and research reports followed with the aim to map the fashion industry and increase transparency and traceability in the dispersed supply chain.

2.7.4 Corporate Social Responsibility (CSR)

Organisations that serve the interests of CSR in the T&C industry are seen as important intermediaries nowadays. CSR is defined by the European Commission as: “A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis” (European Commission, 2011, p. 3). CSR can also be an integrated part of a T&C organisation responsible for CSR policy, due diligence, sourcing policies, codes of conduct, CSR policy implementation (Abernathy *et al.*, 1999; Klein, 2000; Park and Lennon, 2006; Shaw *et al.*, 2006; Kozłowski *et al.*, 2012).

Due diligence is defined as: “under the UNGPs and OECD Guidelines, enterprises bear a responsibility for preventing and reducing any adverse impact on people and the environment by their own operation or business relationships in the production or supply chain” (SER, 2016, p. 8).

2.7.5 Global T&C industry figures

Although it is often argued that adequate sources of empirical data on the environmental impact are scarce and there is a need for more scientific research in the T&C industry, there are some indicators that demonstrate the urge to transform towards CE. For example, the textile production and consumption combined make up for 3% of global CO₂ emissions worldwide (van der Velden, 2016; Laitala *et al.*, 2015; Madsen *et al.*, 2007; Carbon Trust, 2011). The production of one 1 kilogram cotton costs approximately 10.000 liter water, which has its effects on nature in production countries by for example the disappearance of the Aral lake in Central-Asia (CBS, 2019). The use of chemicals and pesticides has effect on biodiversity, soil conditions, water conditions, health and safety for garment workers and population in production countries (CBS, 2019). Finally transport in the globally scattered supply chain is a source of CO₂

emissions (CBS, 2019). According to reports, has 1% of the global material flows for clothing been ‘closed loop’ recycled (EMAF, 2017; Fibersort, 2020).

2.7.6 National T&C industry figures

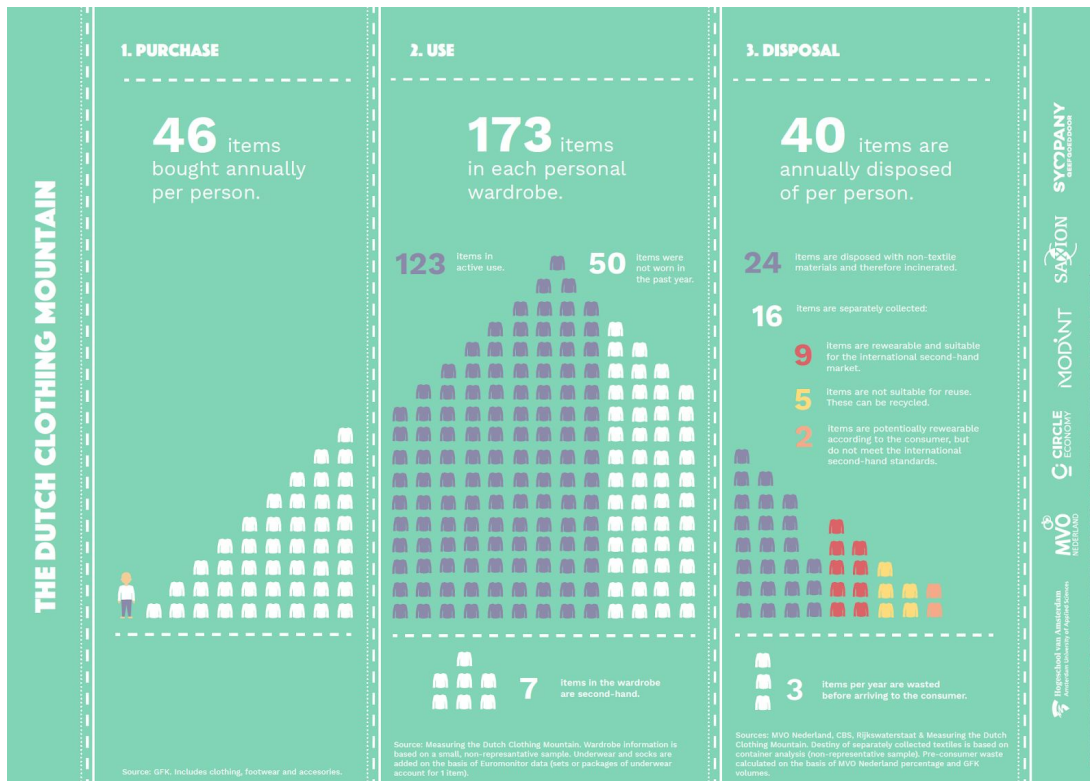


Image 3: The Dutch clothing mountain, source: Maldini et al. (2017)

The household expenditure on clothing and footwear in the Netherlands in 2017 in NL is 5,4% (Eurostat, 2020). According to figures shown in the report ‘Measuring the Dutch Clothing Mountain’ (Maldini et al., 2017), 46 items are bought on an annual basis and 40 items are disposed (Image 3). According to other reports, the textile supply chain of used goods in the Netherlands is responsible for 1-1,5% CO2 emission and for consumption this is 7% CO2 emission (CBS, 2019). The consumption of clothing textiles has risen with 39% between 2000 and 2017 (CBS, 2019). Additionally, the CBS report features the difference in environmental damage for virgin and recycled yarn and indicates that at least 50% of emissions are reduced for recycled yarn.

2.7.7 The practice of Circle Economy

The phenomenon of CE is of great interest to scholars and practitioners because it is considered as an operationalization for businesses to implement sustainable development (Kirchherr *et al.*, 2017; Ghisellini *et al.*, 2016; Murray *et al.*, 2017). In response to waste reduction in the LE, CE's aim is to keep products, components, and materials at their highest utility and value at all times (Bocken *et al.*, 2017). Within the CE, products remain in the 'loop' or 'cycle' and all products return eventually into the economy (Bocken *et al.*, 2016). CE eliminates waste through efficient production and focus on long-life product cycles that intensify the usage of products (Bocken *et al.*, 2016). Further, the value is maintained through the extension of product lifetimes various strategies, such as the 9R's (Table 3) (Potting *et al.*, 2017). These 9R's increase the level of circularity and reduce the level of natural resources resulting in less environmental pressure (Potting *et al.*, 2017). CE also includes a strong focus on alternative business and consumer models (Koszewska, 2018; Bocken *et al.*, 2017). The strategies correlate with changes in ownership relationships, such as leasing and product service systems (PSSs) (Bocken *et al.*, 2017).

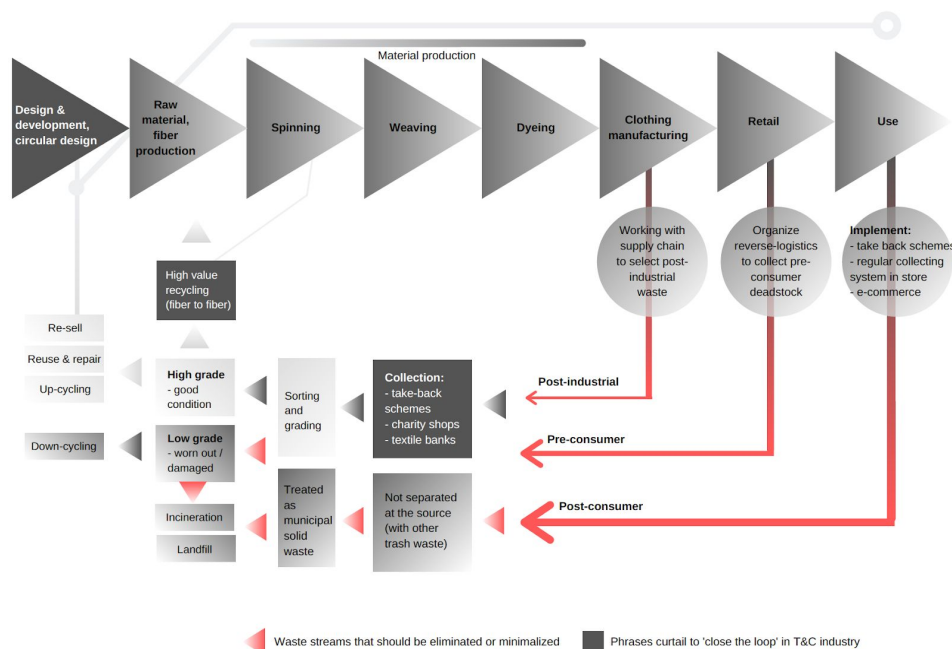
9R's model for increased circularity			
Increase in CE	Smarter product use and manufacture	R0 Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
		R1 Rethink	Make product use more intensive (e.g. through sharing products, or by putting multi-functional products in the market)
		R2 Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
	Extend lifespan of product and its parts	R3 Re-use	Re-use by another consumer of discarded product which is still in good condition and fulfils its original function
		R4 Repair	Repair and maintenance of defective product so it can be used with its original function
		R5 Refurbish	Restore an old product and bring it up to date
		R6 Remanufacture	Use parts of discarded product in a new product with the same function.
		R7 Repurpose	Use parts of discarded product in a new product with a different function.
	Useful application of materials	R8 Recycle	Process materials to obtain the same (upcycling) or lower (downcycling) quality
R9 Recover		Incineration of materials with energy recovery	
Linear Economy			

Table 3: 9R's model for increased circularity (Potting *et al.*, 2017)

Since the transition to CE in the T&C industry deals with deep cultural patterns in various layers for the MLP with multi-actor dynamics, it is important to include values in the conversation and how they are internalized. The transition to CE requires unconventional thinking, reconsidering LE thinking, the pre-use, use and post-use phase should be included in the conversation because of adding and retaining different types of value in all stages (Achterberg *et al.*, 2016).

2.7.8 Circular Economy applied to the T&C industry

Fisher and Pascucci (2017) argue that an institutional analysis in the transition towards CE in the T&C industry is necessary because it explains how strategic decisions are made on resource allocation by various stakeholders. Fisher and Pascucci (2017) identify three key categories: chain coordination, contracting and financial mechanisms. The starting point is optimizing one product or material stream followed by upscaling to the entire collection. The chain coordination in circular material flows is lacking transparency and clarity in relation to the quality and price of fabrics made with post-consumer fabrics (Fisher and Pascucci, 2017). The function of contracting is primarily facilitating arrangements between “supply chain” actors (Fisher and Pascucci, 2017). In order to optimize the CE material streams, an open source sharing approach is needed to accelerate transition developments, this can be done by contracts according to Fisher and Pascucci (2017). According to the model of Koszewska (2018) (figure 3) closing the loop in the T&C industry takes place through a complex system of supply chain sequences. *Figure 3: Circular supply chain, adapted from Koszewska (2018)*



2.8 Drivers for the transition towards CE in the T&C industry

It is expected that CE has positive effects on the economy, which could incentivise various stakeholders to invest or participate in the transition towards CE. Rizos *et al.* (2016) identify with a study under 30 case studies the core enablers for the CE: company environmental culture (67%), networking (34%), support from the demand network (30%), financially attractive (27%), recognition (24%), personal knowledge (10%) and government support (4%). It is argued that the process of transition can become successful by collectively achieved effort which requires exchange and dissemination of knowledge and innovation among different stakeholders along the value chain (Rizos *et al.*, 2016).

A promising way of sharing risks and rewards is the “dynamic earning model”, a model in which an agreement between several partners facilitates the distribution between sharing revenues (rewards) and risks (Fisher and Pascucci, 2017). This model enables incentive alignment and increase in trust among stakeholders (Fisher and Pascucci, 2017). Nevertheless, empirical data does not seem to prove viability of the model yet in the textiles industry in NL (Fisher and Pascucci, 2017).

Further the EMAF estimates that potential material costs savings in fast-moving consumer goods sectors (e.g. clothing) could potentially be 700 billion dollar annually (EMAF, 2015). Technological and organisational innovations supporting a CE could allow Europe’s resource productivity to grow with 3% by 2030 with as result 1.8 trillion total benefits in different industries (EMAF, 2015). The savings include primary resource use and costs, cost linked to externalities such as health impacts from pollution (EMAF, 2015). It is estimated that CE could conceivably lead to greater employment potential, in the United Kingdom a rise in CE developments could lead to a job creation of approximately 54.000 jobs by 2030, in areas of recycling and remanufacturing (Morgan & Mitchell, 2015). CE also unlocks new business opportunities with waste management (Rizos, et al 2016). With the implementation of CE business models, cross-sectoral knowledge exchange and development can be facilitated throughout SME sectors across different countries (Rizos, *et al.*, 2016). Considering policy measures, could the EPR be a driver for changes in the material and design process (Kant Hvass, 2014).

2.8.2 Barriers for the transition towards CE in the T&C industry

Besides the drivers, there are several barriers to distinguish in the transition towards CE in the T&C industry. Since 99% of the organisations in 2018 in the T&C industry in Europe is SME (which is also the situation in NL), the focus for this part is mainly on SMEs (Euratex, 2020). Rizos *et al.* (2016) identify with a study under 30 case studies the core barriers for the CE: lack of support supply and demand network (54%), lack of capital (50%), lack of government support (25%), administrative burden (21%), lack of technical know-how (21%), lack of information (13%), company environmental culture (8%), other barriers (conservative or economic downturn) (13%). The main barriers considering the supply side involve the absence of ‘green’ suppliers (Rizos *et al.*, 2016). From the demand side is the creation of a viable business case for consumers and the support from the demand-side network with the need to provide accurate figures seen as main barriers for CE (Rizos *et al.*, 2016).

In this section, there are two different types of barriers to identify: *internal* and *external* barriers. Internal barriers include: technological, operational, financial, economic and cultural barriers. External barriers are market, societal, industry and policy barriers.

Internal: Technological barriers

Technological barriers include the availability of technology in the market or lack of technological or industry specific know-how (Rademaekers *et al.*, 2011). Second, linear technologies are widely accepted and create a lock-in, this is known as ‘business as usual’ (Kok *et al.*, 2014). The demand for eco-friendly technologies is low, there is insufficient investment, focus on eco-design and the lack of advanced resource efficient technologies (Rizos *et al.*, 2016). Finally, low prices of virgin materials and increased complexity in mixed materials and methods are seen as important technological barriers (Rizos, *et al.* 2016). Technological developments should not be hindered by governmental competition legislation, but policy could potentially be effective in limiting cartel formation (Rizos *et al.*, 2016).

Internal: Financial barriers

In terms of financial mechanisms, the issue arise of the facilitation of joint investment to develop new technologies (Fisher & Pascucci, 2017). Investors see risks in investing because they lack the knowledge on return on investment in CE (Fisher and Pascucci, 2017). Besides the risk for investors, there are several costs: return, collecting and sorting costs, monitoring resource flows and updating products life cycle can be costly (Rizos *et al.*, 2016). Direct or indirect fiscal government policy could result in financial barriers for the transition.

Internal: Economic barriers

The main economic barrier is related to monetary rewards, they could crowd-out intrinsic motivation (Frey & Jegen, 2001). Since intrinsic motivation plays an important role in how communities could solve collective action problems, it is necessary to consider this as a barrier. Different incentives, concerning for example in spending government budgets or environmental importance, are important barriers. Trade-offs between economic, social, cultural and environmental issues could be seen as barrier. Further, the economic problem of innovation involves choosing among the set of feasible institutional arrangements; rules that protect the relationship specific-investments at least costs (Edquist, 1997; Allen & Potts, 2016).

External: Market barriers

The tendency of outsourcing production and offshoring specific tasks is inevitable because of the labour and capital intensive characteristics of the industry (Köppchen, 2014). This is increasing the lead-times, transport, transaction costs and environmental impact (Christopher *et al.*, 2004). Sensitive information of economic value, has been kept protected with for example patents, NDA's and intellectual property rights is considered a market barrier. Firm and industry behaviour depends on the market structure (Hoskins *et al.*, 2004). The role of market power and industry structures is important to understand because it has a major effect on the decision making in the T&C industry.

External: Societal barriers

The resistance from societal perspective against ‘the new’, the everlasting struggle between entrepreneurs or innovators and *social inertia* is seen as a barrier (Fagerberg, 2003). Missing effective governance institutions for collective action problems in innovation commons could hinder the transition (Potts, 2018).

External: Industry barriers

A Circular Economy can only be achieved through collective effort, with the exchange and dissemination of knowledge and innovation among different stakeholders (Rizos *et al.*, 2016). Trust need to be gained and build among stakeholders to create a safe environment where information and expertise is passed confidentially by companies (Rizos, *et al.*, 2016).

External: Policy barriers

Policy has a strong anticipatory element and the government and other policy actors need to have an appropriate system for early identification of potential policy problems (Carlsson & Jacobsson, 1997). Furthermore policy requires a long-term view because of the implementation and learning phase (Carlsson & Jacobsson, 1997) which can be treated as barriers.

An important aspect for relevant policy intervention has to be considered: the distribution and the interdependence of knowledge and learning capacities in the innovation system (Cohendet & Uerena, 1997). Coordination in the innovation and learning processes and structure in the innovation system are crucial (Cohendet & Uerena, 1997). The role of policy should be to develop relevant tools and institutions that allow for an adequate level of coordinated diversity in competences inside firms, research institutes and financial institutions (Cohendet & Uerena, 1997). These tools and institutions should be available to economic agents resulting in an increase in the diversity of products and processes and creation of new research areas (Cohendet & Uerena, 1997). The economy should be flexible enough to realize the benefits of these technological opportunities and with the existence of increasing returns, the timing of

policy is essential (Carlsson & Jacobsson, 1997). Further policy requires a long-term view because of the implementation and learning phase (Carlsson & Jacobsson 1997). Since most of the policy measures are still in process (*ex durante*), it remains difficult to assess the effectiveness of policy measures in this phase (Potting *et al.*, 2017).

Despite the significant contributions in CE policy, there is still a lack of government support and effective legislation (with the provision of funding opportunities, training, effective taxation policy, laws and regulations, etc.) (Parker *et al.*, 2009 & Calogirou *et al.*, 2010; Rizos *et al.*, 2016). This is seen as a significant barrier for the uptake of environmental investments (Rizos *et al.*, 2016).

Internal & External: Operational barriers

Operational barriers are: the robust infrastructure of current linear practices in the industry, stock levels of inventory and transport in the global supply chain (Rizos, *et al.*, 2016; Köppchen, 2014). Further, risks of over-stocked or under-stocked supplies are barriers (Christopher *et al.*, 2004). A barrier could be industry policy, for example tariff duties. Tacit knowledge transfers are specific to one location, which could lead to a barrier for the transition (Bathelt *et al.*, 2004). Codified knowledge transfers are related to global markets and could lead to communication problems (Bathelt *et al.*, 2004; Köppchen, 2014).

Internal & External: Cultural barriers

Differences in philosophy, habits, and attitudes and towards implementing circular economy business practices are cultural barriers (Rizos *et al.*, 2016). Socio-economic aspects such as taste, culture, popularity and individual choices interlinked in information feedback over social networks (Potts *et al.*, 2008). The ‘infinite variety’ attributes of fashion goods (Caves, 2000). The fundamental uncertainty that the producer faces of a creative good: ‘nobody knows’ (Caves, 2000). Likewise, current unsustainable design and production practices in the fashion industry (Kozlowski *et al.*, 2012). Further, the curation and coordination of cultural intermediaries with current linear practices (Lavanga, 2018). Likewise missing shared and internalized values and purpose is considered as a barrier (Klamer, 2017). Since the transition to CE in the T&C industry

deals with deep cultural patterns in various layers for the MLP with multi-actor dynamics, it is important to include values in the conversation and how they are internalized. The transition to CE requires unconventional thinking, reconsidering LE thinking, the pre-use, use and post-use phase should be included in the conversation because of adding and retaining different types of value in all stages (Achterberg *et al.*, 2016). Finally, the lack of interconnectedness is identified as a barrier (Throsby, 2017).

2.9 Governance: policy and regulation

This section covers exemplarity cases in the *socio-technical landscape* in the T&C industry. By 2013, the CE entered in the conversation of policy making in Europe in the effort to coordinate environmental and economic policy objectives (Kovacic *et al.*, 2019). The most recent policy development in the beginning of 2020 was the Circular Economy Action Plan as part of the European Green Deal by the European Commission (EC) with textiles as one of the focus sectors (EC, 2020). The following section provides context on current developments in the socio-technical landscape with examples of existing policy measures.

2.9.1 T&C Industry policies and regulations on a European and International level

Box 1: 2.9.1.1 EU Ecolabel Clothing and Textiles

Besides the Circular Economy Action Plan of the EC, there is also the EU Ecolabel Clothing and Textiles. The EU Ecolabel is a certification and policy measure that guarantees limited use of substances harmful to health and environment, reduction in water and air pollution and colour resistance to perspiration, washing, wet and dry rubbing and light exposure (ec.europa.eu, 2020).

Box 2: 2.9.1.2 REFLOW project

Another European program is the REFLOW project. REFLOW is a three year research project (2019–2022) funded by the EC with “focus on development of constructive metabolic processes for material flows” (Waag.nl, 2020). One of the resource streams is textiles and the Textiles Lab of Waag (research institution) in Amsterdam is charge of the coordination of all six city pilots and lead of the Amsterdam textile pilot (Waag.nl, 2020).

Box 3: 2.6.2.3 French Extended Producer Responsibility (EPR)

The in France established in 2007 Extended Producer Responsibility (EPR) policy is the first legal framework for managing textiles waste, which aims to hold textiles producers responsible for collection and recycling end-of-use clothing, linen and shoes (Bukhari *et al.*, 2018).

A report on the French EPR's 10 year existence illustrates the effectiveness of the policy measure: in 2018 624.000 tons of items are collected resulting in 44 R&D projects in the T&C sector with a budget of 3,9 million (www.ecotlc.fr, 2020). 58,6 Garments are destined for reuse, 41% are destined for recycling and energy recovery, 0,4% cannot be recovered and is incinerated (www.ecotlc.fr, 2020). The collection of items has increased with 2,2 times between 2008 and 2018 with an increase in reuse and recycle rate and reduction in disposal rate (www.ecotlc.fr, 2020).

Furthermore, the operations for collection and sorting clothing, textiles and footwear alone represent about 2,500 jobs in France, of which 1,500 jobs specifically dedicated to sorting. R&D budgets are used to develop textile innovations in the T&C sector with for example commercial partners such as apparel brand Decathlon (www.ecotlc.fr, 2020). Table 4 displays the price per item the producer has to pay per produced good (www.ecotlc.fr, 2020). Items with a proven minimum of 15% recycled post consumer recycled fibers, receive a 50% discount on the contributions (www.ecotlc.fr, 2020).

Table 4: Tax overview French EPR (www.ecotlc.fr, 2020)

Extended Producer's Responsibility (EPR)				
Type good	Very small items (TPP):	Small items (PP):	Average items (MP):	Large items (GP):
Clothing:	€ excl.VAT 0.00156	€ excl.VAT 0.00626	€ excl.VAT 0.00938	€ excl.VAT 0.06259
Home textiles:	€ excl.VAT 0.00178	€ excl.VAT 0.00713	€ excl.VAT 0.01068	€ excl.VAT 0.07128
Footwear:	€ excl.VAT 0.00739	€ excl.VAT 0.01107		

2.6.3 T&C Industry policies and regulation on a National level

Initiative	Year	Theme											
		Due Diligence & buying behaviour	Communication	Innovation	Forced labour	Child labour	Living wage	Safe work environment	Freedom of association	Virgin resources	Water, chemicals & energy	Animal welfare	CE
Green deal Textile sorting	2012												
Action plan: green is the new red threat	2013												
Agreement Sustainable Clothing and Textile	2016												
Roadmap Circulair Textiel	2017												
Dutch Circular Textile Valley	2019												
Sectorplan Clothing & Textiles	2019												
Dutch Sustainable Textile Pact	2020												

Table 5: Overview of Dutch policy measures in the T&C industry. Adapted from the sector plan Circular T&C industry Netherlands (2019)

Since 2012 has the Dutch T&C sector been active in increasing sustainability, which led in 2013 to the development of the first sustainability agreement in the Dutch T&C sector. Table 5 giving an overview of the policy initiatives over the past years.

Box 2.6.3.1 Agreement Sustainable Garments and Textile (AGT)

The international CSR ‘Agreement Sustainable Garments and Textile’ (AGT) was established by the SER (Social Economic Council) in 2016 for the term of five years. The AGT is established to reduce direct and indirect effects of the Dutch T&C industry to human and animal welfare the environment (SER, 2016). Topics of the AGT are: due diligence, discrimination, forced labour, child labour, freedom of association, living wage and animal welfare (SER, 2016).

In 2019, the first 2,5 years of the AGT has been evaluated with main conclusions: AGT has made important steps towards multi-stakeholder collaborations, the set term of 5 years is too short to achieve the overall goal of the AGT (rather a 5-10 year time frame is recommended), the OECD guidelines has proven to be difficult to implement in practice and the objective to reach 80% of market share in 2020 is too ambitious and can only be achieved by including non-Dutch companies (Avance,

2019). The overall recommendation is to focus on taking immediate action in the supply chain in order to achieve set goals (Avance, 2019). Image 4 illustrates a schematic view of the governance of the agreement.

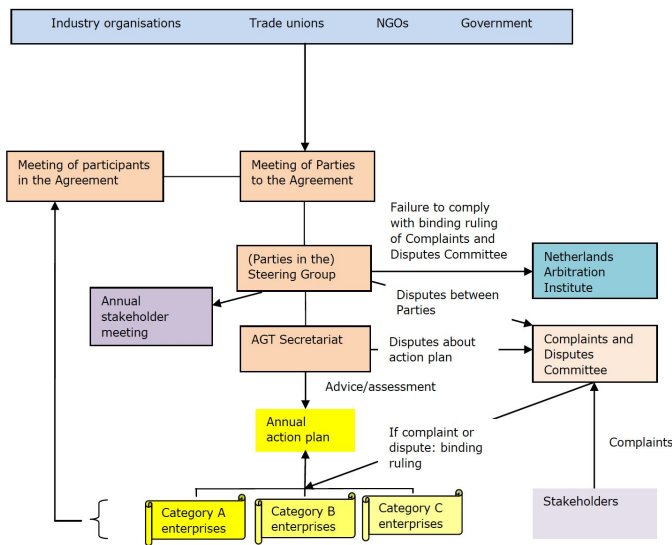


Image 4: Schematic view of governance of the AGT (SER, 2016)

Box 5: 2.6.3.2 Dutch Circular Textile Valley (DCTV)

The DCTV is an initiative launched in 2019 with government funding from the Dutch Ministry of Infrastructure and Water management. The DCTV collaborates with industry partners and aims to create a circular textile chain with reduced environmental impact in textile waste and virgin fibers use (dutchcirculartextile.org, 2020). Additionally, is the DCTV partnership divided over four network ‘hubs’ with their own expertise: Twente (high-end textiles recycling), Tilburg (circular workwear), Gelderland (circular design and new (bio based) materials) and Amsterdam (circular brands and CEBMs) (dutchcirculartextile.org, 2020).

The ambition has set to combine all sustainability activities reach a circular value chain in the T&C industry in NL by 2050 (Sectorplan Dutch clothing and textiles sector, 2019).

The Dutch Sustainable Textiles Pact (2020) combines the two most important pillars (AGT & Sector plan Circular Clothing and Textiles) to develop effective governance towards the achievement of the set goals.

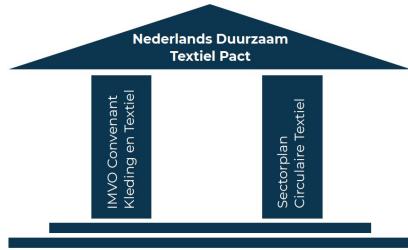


Image 5: The Dutch Sustainable Textiles Pact (Sector plan Circular Clothing and Textiles, 2019)

3. Method

In order to bridge the theoretical framework with the empirical data, this chapter establishes the research design and operationalisation of variables. This chapter is structured as followed: the choice of research design is justified, then the methodology is explained with the subsections: units of analysis, data gathering, operationalization of variables, with the subsection the use of CE transition indicators, data collection and data analysis. For the data analysis is a separate subsection on the Value Mapping Tool. Finally limitations and the effects of the Covid-19 crisis are touched upon.

3.1 Research Objectives, Research questions & Research Design

This research has two objectives. In order to provide an in-depth analysis of the process of transition towards CE, an understanding needs to be created of how multi-stakeholder collaborations function and how they affect the transition. Second, this research aims to determine what kind of different stakeholders are involved in the transition process and what kind of value is created in various levels of the MLP by the stakeholders in the transition towards CE in T&C industry in NL. With an eye on the challenges the T&C industry is facing, the overarching research questions are:

Research questions	How is the transition towards CE implemented, in the case of the T&C industry in NL?
	Who are the stakeholders involved in the transition process towards CE, why are they involved and what for?
Subquestions	
Macro	What kind of policy measures do exist to facilitate the transition towards CE in the T&C industry in NL?
	How do stakeholders in the MLP perceive the role of policies in the transition process to a CE in the T&C industry in The Netherlands?
Meso	What is the role of intermediary organisations in the transition process towards CE in the T&C industry in NL?
	How do stakeholders perceive the level of transition towards CE in the T&C industry in NL?
Micro	What kind of CE innovations are identified by stakeholders in the T&C industry in NL?
	How do stakeholders perceive the role of innovation in the transition towards CE in the T&C industry in NL?

Table 6: Overview of research questions and sub questions (own elaboration)

I will answer the research questions by means of a triangulation approach with the qualitative and ethnographic research methods: in-depth semi-structured interviews, participant observations and document analysis. The reasons for the use of the methods are explained in the next alinea.

It is argued that the relevance in qualitative research is an important criterion, which suits the emergent ecological and culturally important research topic (Bryman, 2016). Moreover, qualitative and especially ethnographic research focuses on the process of social life in order to recognize patterns and concepts over time (Bryman, 2016). With the ethnographic research method of participant observations, the recognition of these patterns is aimed to make clear. Qualitative research underlines the existence of multiple realities and is based on an interpretivist epistemology, which means that it is concerned with micro-scale conditions of social reality (Bryman, 2016). The participant observations resulted in a case study in which the micro-scale conditions have been studied. The case study which is identified as ‘unique’ case study was been undertaken at an organisation (Bryman, 2016), in this study: the Textile Network of MVO Nederland.

The benefit of qualitative and ethnographic research lies in its inductive approach. Concepts and theory emerge from data and allow the researcher to keep an open mind on the outline of the research (Bryman, 2016). The participant observations have been used to guide the research. The sampling and analysing strategy can be adjusted throughout the research process based on emerging data (Bryman, 2016). Derived out of inductive reasoning, conclusions can be drawn. The research therefore has a flexible, iterative and ideographic character. From the participant observations, the choice for interviewees and documents for the analysis has been established.

I have chosen to rely on qualitative and ethnographic research methods because of the informal interactions between units of analysis, tacit knowledge spillovers and limited or not yet existing quantitative data available in this field of research. Empirical data is collected with a triangulation or mixed method approach, using multiple sources of data and methods of research to compile a comprehensive view on the matter and increase the confidence, greater validity and credibility of data collection (Bryman, 2016). The triangulation approach refers to multiple observers, theoretical observations, sources of

data and methodologies and triangulates findings (Bryman, 2016). Figure 4 explains how the triangulation approach has been used for this study.

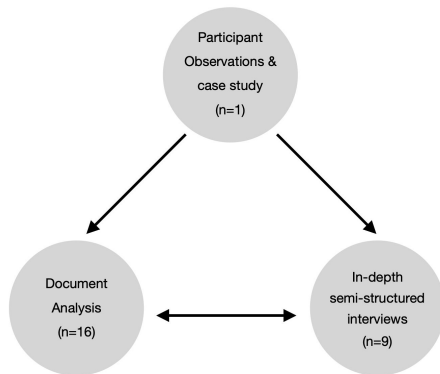
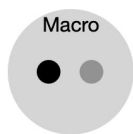


Figure 4: Explanation of triangulation approach (own elaboration)

3.2 Units of analysis

The sample for the in-depth semi-structured interviews (n=9) consists of different stakeholders: professionals in the T&C industry in NL who already are affiliated with the CE principles. The stakeholders are categorised in the TT framework of *multi-actor dynamics* and the MLP macro (*sociotechnical landscape*), meso (*sociotechnical regimes*) and micro (*niche-innovations*). An overview of the interviewees can be found in Appendix B.



The distribution of units of analysis over the MLP is as followed (Figure 5), the Macro level has n=2 unit of analysis. The Meso level has n=5. The Micro level has n=2 units of analysis. The light grey units of analysis are from the Textile Network.

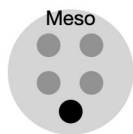


Figure 5: Units of Analysis (own elaboration)



The units of analysis, the sample for the document analysis (n=16), are identified and gathered during the participant observations (Appendix E).

The documents consist of e.g. notes from CtC meetings, challenges of network partners, ambition documents and positioning statements.

3.3 Data gathering

At first, a preliminary list of interviewees was established. While attending meetings and having conversations with network managers of the Textile Network, valuable foreknowledge was gathered and the units of analysis have been further defined with the non-probability purposive sampling method. One unit of analysis was approached due to snowball sampling, after a conversation with the network manager of the Textile Network. The units of analysis have been approached via email to participate in the research and the interviews have been scheduled accordingly.

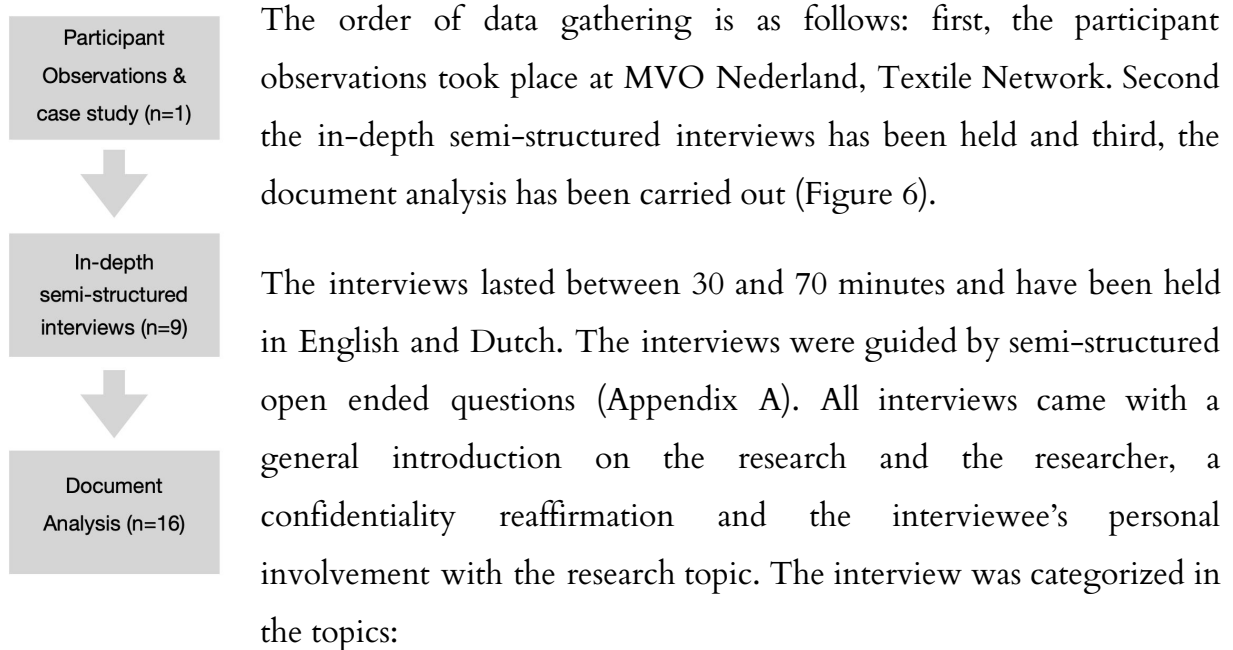
The data is gathered through an (micro) ethnographic research with participant observations in an overt role (disclosing the role of the researcher) which resulted in a case study. Qualitative and ethnographic research is defined by its context-sensitivity, which is helpful in the researchers data immersion in this study (Babbie, 2011). In ethnographic research access to closed settings is important, that is why is chosen to undertake an internship at MVO Nederland of one day a week at the Textile Network for six months from December 2019 till May 2020. Due to the granted access, during the participant observations, the most important part of the data collection could take place.

First, the Textile Network of MVO Nederland is working on several important projects in relation to the transition towards CE in the T&C in the Netherlands. For example, the DCTV multi-stakeholder project. The project is collaborating a diverse group of stakeholders: Fashion for Good (supporting org.), Circle Economy (supporting org.), ABN Amro (bank), MVO Nederland (network org.), Het Groene Brein (research org.) and Modint (industry org.).

Second, the Clothes the Circle (CtC), Indian-Dutch Textile consortium. The consortium consists of parties in waste management and specialists on circularity, production companies, logistics and sustainability. The following parties are involved: de Boer group/Frankenhuys (textile sorting and recycling), UPSET Textiles (circular textile production chain), i-did (social entrepreneurship & circular materials), GVK Society (regenerative cotton producer in India), Sympany (textile sorter) and Havep (workwear producer). The project is partly supported by the Dutch government.

The approach of MVO Nederland is unique, since the purpose of the organisation is facilitating circular economy industry transition through process and stakeholder management, matchmaking activities and advocacy. In order to develop an understanding of how the transition towards CE in the T&C in NL is taking place, the Textile Network of MVO Nederlands is the exquisite case to gather valuable insights on the research topic.

Figure 6: Order of data gathering (own elaboration)



Existing industry structures / knowledge on CE, Stakeholders, Transition, Governance and Alternative value creation.

The benefit of the interviews was, that information still unclear after the participant observations became clear and resulted in a thick description. During this process, it became possible to create a better understanding of how the transition of CE in the T&C in NL took place. Due to the amount of interviewees (n=5) from the Textile Network in the Meso and Macro category, the main part of the collection is based on the Textile Network. Nonetheless, n=4 units of analysis were not part of the Textile Network, which increased the reliability and credibility of data collection and has been

used to contrast and compare other units of analysis. In order to increase the data validity, probing questions were asked during the interview by the researcher.

During the participant observation notes have been taken (Appendix D), a list of possible interviewees is gathered and documents (n=16) for the document analysis (DA) are collected. Appendix B consists of the interview list and Appendix E the list of documents for the DA.

3.4 Operationalization of variables

Conceptualization gives definite meaning to a concept by specifying indicators. An indicator is a sign of presence of a concept of studying (Babbie, 2016). In order to answer the research question and subquestions, the operationalization of variables was established. The measures used in the operationalization of variables are: concepts and dimensions, indicators from the TF and source of theory. The concepts are connected to CE transition indicators (section 3.4.1) and the source of the CE transition indicator. The operationalization of variables is combined with an overview of research methods and data sources to identify if the type of data source is effective for data collection. Ultimately, the overview and use of CE transition indicators is used to create conceptual order. The overview of the operationalization of variables (Appendix F) is used in the first stadium of the data collection to set up the interview guide. The interview questions are developed based on the theoretical framework, operationalisation of variables and CE transition indicators that correspond with the theory. The CE transition indicators are used in the process of analysing the data.

3.4.1 CE transition indicators

Decently measuring the progress of the CE transition is challenging, large characteristics across supply chains and their CE transition goals in relation to innovation require efforts from actors in the entire product supply chain alongside socio-institutional factors (Potting *et al.*, 2017). The challenge lies in the assembly of abundance of indicators into a controllable set that sufficiently reflects the effects of a CE transition (Potting *et al.*, 2017).

There are several methods available to measure the level of transition towards CE. Key Performance Indicators (KPIs) are the main indicators used by an organisation to track performance. Sassanelli *et al* (2019) evaluated eight CE performance assessment methods. The most prominent one is the Life Cycle Assessment (LCA), which is a quantitative method of environmental assessment according to the international standards (ISO 14040 and ISO 14044, 2006): LCA is used to measure eco-impact (van der Velde, 2016; Kozłowski *et al.*, 2012; Sassanelli *et al.*, 2019). Van de Velde (2016) argues that the main reason to use the LCA in the T&C industry is that the method provides an integrated approach for CO₂, water and land use, toxicity and material depletion. Besides that, the LCA is relatively easy to understand and communicate, use of indicators is universal (van der Velde, 2016). Zeller *et al* (2016) used LCA for a study on Hugo Boss garments and came to the conclusion that the LCA did offer important insights on environmental impact of the clothing industry and with these results, it was aimed to effectively reduce them.

Cultural economic valuation methods such as *intrinsic motivation* and *crowding in or out* can be considered to be helpful in transition to CE. According to Frey & Jegen (2001), extrinsic motivations can ‘crowd out’ intrinsic motivations. On the other hand, a person can be extrinsically motivated to perform an activity when the person acts to receive a reward beyond the performance of the activity itself (Knights *et al.*, 2013). This psychological process is related with the monetary, social, cultural and environmental incentives, rewards and the willingness to contribute (Klamer, 2017).

The *stakeholder analysis* (SA) is used to map stakeholders and identify their incentives. The SA is used as part of the managerial and operational culture of many firms and is linked to organisational performance which is also used in the T&C industry (Donaldson & Preston, 1995; Kozłowski *et al.*, 2012). The increase of engagement and concern of stakeholders has led to improvements in environmental and social impacts in the supply chain (Kozłowski *et al.*, 2012).

The Ellen MacArthur Foundation has developed the Circularity Indicators (CEI) (2015), an approach for the measurement of circularity. The EMAF is a non-profit organisation, launched in 2010 with the aim to accelerate the transition into the CE. The

indicators can be used for the design of new products, internal reporting purposes and procurement decisions (EMAF, 2015). The paper also introduces the Material Circularity Indicator (MCI) and focuses on the reclamation of material flows at product and company levels. The EMAF also developed the Circulytics for accurate measuring of circularity (EMAF, 2020). After the analysis of CE transition methods, this table (Figure 7) gives an overview of indicator sets that are used for the operationalisation of variables. From the indicator sets, the researcher selected indicators for the research. Appendix F, the operationalisation of variables, is giving an overview of the used indicators and sets in the interview guide. For example interview question 3: *“Do you participate in or lead circular economy related initiatives?”* and interview question 15: *“To what extent do you engage with suppliers to increase sourcing based on circular economy principles?”* are from the Circulytics CE transition indicator set of the EMAF. Interview question 32: *“What do you think of the current mechanisms in place to enhance policy coherence of sustainable development in NL?”* is connected to a CE transition indicator from the SDI.

Abbr.	Indicator set	Advocated by	Characteristic/ data source	Ind .
SDI	Sustainable Development Indicators	UNEP	Major global environmental issues	30
SDG	Sustainable Development Goals	UNDP	End poverty, fight inequality and injustice, and tackle climate change	17
GGI	Green Growth Indicators 2017	OECD	Environment, resources, economic and policy responses	25–30
CEI	Circular economy indicators	EMAF	Indicators currently available	7
RE	Resource efficiency, EU Resource Efficiency scoreboard (2015)	EURES	Eurostat, EEA and others	32
CDIS	Culture for development indicators	UNESCO	Cultural development indicators	22
C	Circulytics (2019)	EMAF	Circulytics supports a company's transition towards the circular economy, regardless of industry, complexity, and size	30
PBL	Innovation measuring in CE (Netherlands Environmental Assessment Agency) (2017)	PBL	Circular Economy: measuring innovation in the product chain , Source: EEA (2016b); Hekkert et al. (2011); Huijbregts et al. (2006)	15

Design				
Abbr.	Indicator set	Advocated by	Characteristic/ data source	Ind .
TGR	The Ten Golden Rules	C. Luttrupp, J. Lagerstedt (2006)	EcoDesign and The Ten Golden Rules: generic advice for merging environmental aspects into product development	10
EPI	EPI's Ecodesign 2015	I.I. Issa, T.C. McAloone, D. Pigosso, T. McAloone	Product-related Environmental Performance Indicators	

Table 7: CE transition indicators overview (own elaboration)

3.5 Data Analysis

The analysis applied to this study is the qualitative comparative case-oriented analysis, since the research is about three profiles and case-oriented because this type of research “understand complex units” (Porta, 2008). The cases from the MLP are: *sociotechnical landscape*, *sociotechnical regimes* and *niche-innovations*. The concepts used are partly constructed during the research and address a systematic process analysis. An increase of variables is used in order to make the description thicker. There is an understanding created through differences used to explore diversity (Porta, 2008).

There has been chosen for the use of the program Atlas.ti because the software program aims for a systematical and thorough approach to qualitative data analysis. The program does that through several features such as codes and code- and quotation manager systems, which group the codes and quotations. The program has advanced features such as linked semantical codes, visualisations in networks, word cruncher and smart links. Finally, the program is suitable for large research projects and reduces complexity and increases validity.

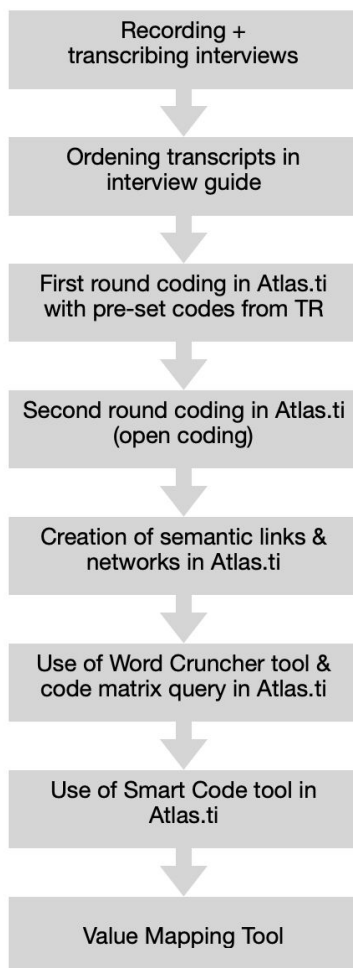
The data analysis was carried out in several steps. First of all, the interviews and documents has been coded with pre-established codes from the theoretical framework and CE transition indicators. After that, open coding techniques have been applied. During that process, new codes have been added and other codes have been merged or deleted. The analysis was executed in order: first micro, second meso & Network / CtC DA analysis and finally macro. The allocation of analysis was done in order to contrast, compare and identify between cases.

In preparation for the analysis, all interviews have been recorded and transcribed. The program Happy Scribe (<https://www.happyscribe.co/>) supported the first round of raw transcripts and the editing of the transcripts. After full transcription, the data was pre selected and processed in the original interview guide for the first round of data ordering.

The subsequent analysis of the transcribed interviews and selected documents was done with the qualitative data analysis software Atlas.ti. In Atlas.ti, 13 Code Groups with in total 289 codes were created: Circular Economy, Circular fashion, Cultural

barriers/drivers, Economic barriers/drivers, Environmental, Governance, High-level transition, Linear Economy, Lower level transition, Market barriers/drivers, Operational barriers/drivers, Technological barriers/drivers and Transition theory. The codes and code groups has been derived from the theoretical framework. One code is named 'unique' in order to identify outstanding data. 4 document groups have been created: Macro, Meso, Micro, Textiles Network / CtC (for the document analysis).

Additionally various semantic links have been created, different relations such as 'merge', 'contradict' 'relates to' and others between the codes. Semantic relations are made visible by the network tool in Atlas.ti. In this stage, the Network tool of Atlas.ti provided an instrument to unfold the first layer of analysis with a visual presentation of



the semantic links between key concepts (Appendix G). The program also allows for the creation of memos and annotations for thoughts during the coding process.

The second step was the filtering of text search query with the Word Cruncher tool and the code matrix query. Further, Smart Codes were developed. With the development of Smart Codes, the Linear Economy code group is merged with the Market barriers/drivers group and a Smart Codes group is created. During this step, identification of similarities, emerging themes and patterns were used in order to establish relationships and identify differences between the different cases. The Smart Code tool was used to assign instructions to the program, for example to combine various codes in order to filter the quotations (external document). This tool has proven to be very effective in structuring and analysing the data. Finally, after the analysis of the interviews and documents, the point of data saturation has been reached.

Figure 7: Overview of data analysis (own elaboration)

3.5.1 Value mapping tool

Qualitative research consist of a large amount of text or narrative data (Renner & Taylor-Powell, 2003). The analysis of narrative data for a large part requires structuring and defining categories (Renner & Taylor-Powell, 2003). In order to make connections, contrast, compare and identify between different categories, the Value Mapping Tool (VMT) has been used in this study. The Value Mapping Tool (VMT) is originally developed by IfM's Centre for Industrial Sustainability (ifm.eng.cam.ac.uk, 2020). The VMT is developed for use in sustainable business modelling which introduces different forms of value: value captured, value uncaptured, value destroyed, value surplus, value absence and value opportunity. This results in a circle with in the middle: purpose. The VMT is used for innovation and rethinking of the value proposition (products and services a firm offers to its stakeholders) (Bocken, *et al.*, 2013). In this study, the VMT is deployed to analyze the differences in valuation in the transition towards CE between the levels of the MLP: *sociotechnical landscape* (Macro), *sociotechnical regimes* (Meso) and *niche-innovations* (Micro).

3.6 Limitations

Qualitative and ethnographic research has several advantages and disadvantages. The advantage is that this type of research is “especially effective for studying subtle nuances in attitudes and behaviors and for examining social processes over time” (Babbie, 2016, p. 326). The strength of the method was used to support the researcher to have a better understanding on behaviour, preferences, needs, tastes and emotions through the in-depth studies. The results of this study could not have been generated by quantitative research because there is limited or no quantitative adequate data available on the research topic.

The disadvantage of qualitative research is that the method is rather time consuming due to intensive collection, transcription of data and analysis phases. This aspect was taken into account in the planning of the research process. The researcher is in need of training or experience with interviewing techniques to ensure that rich and detailed data is drawn from the in-depth interviewing. Training for this study was

gained during the pre-master thesis research and various research projects during the master.

Nevertheless, the method has its limitations in terms of validity, reliability and replicability. The knowledge produced by the qualitative and ethnographic method might be difficult to generalize because of the focus on a small population (Bryman, 2016). With the lower level of duplicability of the study, the level of external validity is in danger (Babbie, 2016). With the presumably biased subjective judgment of the research in qualitative research, external reliability is considered to be difficult to achieve (Babbie, 2016). That results in the consequence that random sampling methods are not used. Already a set of different interviewees and a different setting for the participant observations could have given a different perspective. The reproducibility and generalization of ethnographic case studies is limited because of tacit and informal location bound transactions.

However, the researcher is well aware of the limitations concerning qualitative and ethnographic research and does not aim for generalisations. The ethnographic case study could be replicated in a different setting. In order to reduce the limitations with validity and reliability, triangulation approach with various methods is used such as the division of units of analysis with the MLP, multiple data collection methods and use of VMT for the analysis.

3.7 The effects of the Covid-19 crisis

During the research, a pandemic outbreak of the Covid-19 virus took place. Resulting in a global health and economic crisis. In this section is explained how this, according Walmsley (2019) ‘reactive change’: a force that is suddenly imposed has affected the research. First of all - due to government restrictions - from the 13th of March 2020 buildings are closed and there is a 1.5 meter social distance regulation. Consequently, the restrictions affected the data collection because the participant observations had to take place online, instead of physically at the office of MVO Nederland. Luckily, the internship had started in December 2019 and the physical observations had been taken place at the office for the first 3,5 months. Additionally the digital ICT infrastructure of MVO was very well developed and supported a good environment to continue the observations (attending digital meetings) and obtain the documents for the document analysis.

Furthermore, the interviews could only be taken online via digital tools such as Skype and Microsoft Teams. The interviews took place a month after the restrictions got applied, which gave the interviewees the time to get used to the situation. The digital environment did not hinder the interviewees and did not make them feel uncomfortable with the situation substantially. In some cases, the availability of interviewees increased because various tasks or projects got postponed or canceled. For other interviewees the crisis reduced their availability because their business was in immediate financial danger and crisis management had to be applied. In general, it resulted in minor organisational changes. Since the research topic contained a current industry transition, questions on the immediate effects of the Covid-19 crisis have been added to the interview guide (Appendix A). A section on this issue is added to the results and discussion section.

4. Findings & Discussion

The following chapter provides a summary, analysis and a discussion of the results as outcome of the data collection process with the triangulation approach, participant observations, semi-structured interviews and document analysis. The first section (4.1) provides an overview of the respondents divided over the levels of the MLP. The second section (4.2) covers the *socio-technical landscape*: the kind of policy measures existing to facilitate the transition in the T&C in NL (4.2.1). The episode is further divided in: how policy is perceived in the transition process by stakeholders in the MLP (4.2.2). The *sociotechnical regime* (4.3) addresses the role of intermediary organisations with a case study on the Textiles Network and CtC consortium and how stakeholders perceive the level of transition. The *niche-innovations* (4.4) assesses the CE innovations identified by stakeholders and the perceived role of CE innovations in the transition towards CE in the T&C industry in NL. Finally, section 4.5 covers an overview of the preliminary effects of the Covid-19 crisis on the transition towards CE in the T&C industry.

4.1 Overview of respondents

Level		Respondent	Type of stakeholder	Organisation
Macro	1	Holly Syrett	Coordinator sustainability transition, senior sustainability manager	Global Fashion Agenda
	2	Michiel van Yperen	Coordinator sustainability transition, network manager	MVO Nederland
Meso	3	Pals Brust	Co-founder of textiles recycling companies	Upset Textiles & Sympact (SME)
	4	Fioen van Balgooi	Facilitator and network manager	MVO Nederland, Textiles Network
	5	Ellen Sillekens	Innovation manager & CE trainer	Sympany & Circo (SME)
	6	Pascal Penning	Owner workwear wholesaler	PB Protection (SME)
	7	Zoé Daemen	Corporate Responsibility manager sustainable clothing brand	Kuyichi (SME)
Micro	8	Anouk Beckers	Artist / designer	JOIN Collective Clothes
	9	Francisco van Benthum	Co-founder independent fashion brand / designer	Hacked-by (SME)

Table 8: Overview of respondents (own elaboration)

4.2 Socio-technical landscape

4.2.1 What kind of policy measures do exist to facilitate the transition towards CE in the T&C industry in NL?

Agreement Sustainable Garments and Textile (AGT)

The AGT is a regulatory policy tool, non-financial government mediation aligned with government policy aspiration, aiming to diminishing or adjusting activities of economic representatives (Rizzo, 2011). The AGT is part of the IMVO (international CSR) program of the Dutch Ministry of Foreign Affairs. A respondent (coordinator sustainability transition) mentioned: currently all foreign policies are under evaluation *-ex durante* phase-, including the AGT (Potting *et al.*, 2017). The evaluation has effect on the implementation and funding of the AGT, respondent Macro-2 describes. Participation to the AGT is without obligation, which can be a barrier in the transition to CE since it does not incentivise the T&C industry to work towards CE. However, intrinsic motivation is not hindered by obligation or monetary boundaries for the participation of the AGT.

Dutch Circular Textile Valley (DCTV)

The DCTV is, like the AGT, a regulatory policy tool focussed on CE innovation. The DCTV is funded by the Dutch Ministry of I&W with a starting capital of 400.000 euros in 2019 and follow-up financing in 2020. It is argued by Carlsson & Jacobsson (1997), It is a crucial task of policy to identify new technological and economic opportunities at the immediate stage and raise awareness of these opportunities at various stakeholders e.g. in the industry and academia. There needs to be a mechanism that strongly depends on the capacity for the local community to disseminate learnings and creations to the community (Cohendet & Uerena, 1997). The DCTV is an example of a mechanism that strives for the identification and support innovations and the linkages between various stakeholders.

The system relies on: an exchange of information resulting in collective sharing of new technology and collective learning between local mechanisms of innovation and the capability to fastly systematize the new knowledge with as result that communication on

innovations becomes available (Cohendet & Uerena, 1997). The DCTV compiled a ‘maturity checklist’ for circular innovators in the T&C industry in NL. Indicators: test/lab stage, proof of concept, pilot ready, scaling, commercial adaptation. Six niche innovations are chosen by the DCTV to be supported. Besides that, the DCTV has published a list of +150 circular innovators in the T&C industry in NL on the DCTV website. The list is curated by intermediaries yet not tested by measurable circular transition indicators. The DCTV is taking the role of CE innovations coordinator, providing tools and linkages between stakeholders and increasing the diversity of products and research areas (Cohendet & Uerena, 1997). Coordination in the innovation and learning process and structure in the innovation system are crucial (Cohendet & Uerena, 1997).

Overview of core activities of the DCTV:

- Policy and research: create stimulating conditions
- Knowledge network: strengthen and coordinating current innovation landscape on a national level.
- Innovative companies: connect, renew and facilitate companies to grow fast.

The DCTV differs from the AGT because the focus of the DCTV is fully on CE, the AGT contains all CSR topics. A respondent (Macro-2) states that the AGT is concerning the current linear practices of the T&C, the DCTV is about the CE future of the T&C industry. This is corresponding with the higher and lower-level transition (Loorbach, *et al*, 2017).

Lobby for the EPR (Extended Producer Responsibility) (in Dutch: UPV)

The EPR is a fiscal policy instrument. In the process of political decision making, the government is considered as agent of society and principle of bureaucratic agents (Mazza, 2011). The government's role is to maximize welfare, while at the same time it needs to make decisions on how to spend taxpayers money (Mazza, 2011; Rizzo, 2011). Resulting in different incentives and disincentives generated by different institutional features (Rizzo, 2011). The EPR's core obligation for the producers is to financially support sorting with a fee on newly produced textiles (FFact, 2019). For producers, a financial barrier could crowd-out intrinsic motivation in their efforts to become more

engaged in CE, 5 respondents emphasise. A tax deduction (reward) for the use of recycled content could possibility incentivise producers for their efforts. Nonetheless, this is contrasting Frey & Jegen’s theory (2001). The EPR is also focussing primarily on recycling, reuse and reduce which does not focus on other R9 strategies of the CE.

Various stakeholders (primarily waste management stakeholders) from the industry lobby to influence on political decision making, in this case for the procedure of the EPR. The EPR is focussed on CE principles such as ‘closed loop’, waste management, 9R strategies such as recycle, reuse, reduce and high utility of resources (Bocken *et al.*, 2016; Potting *et al.*, 2017). The implementation process towards EPR policy regulation will take at least 2 years Macro-2 respondent explains, this can be considered as a barrier. The EPR also unlocks new business opportunities in CE with waste management by being a funding mechanism, this is a driver for CE (Rizos, et al 2016; Kant Hvass, 2014).

During the research, a policy plan for Circular Textiles 2020–2025 was published (14-04-2020) by the Ministry of I&W and the Ministry of Foreign Affairs. In the policy plan the urge for a global circular supply chain has emphasized with as aim to have a fully circular supply chain in 2050 (corresponding with the government-wide policy plan) (I&W, 2020a). In the infographic from the policy plan, is advocated for the EPR because it will incentivize producers and retailers to reduce costs on collecting, sorting and recycling and prolong lifespan, stimulate reuse and recycling (I&W, 2020b).

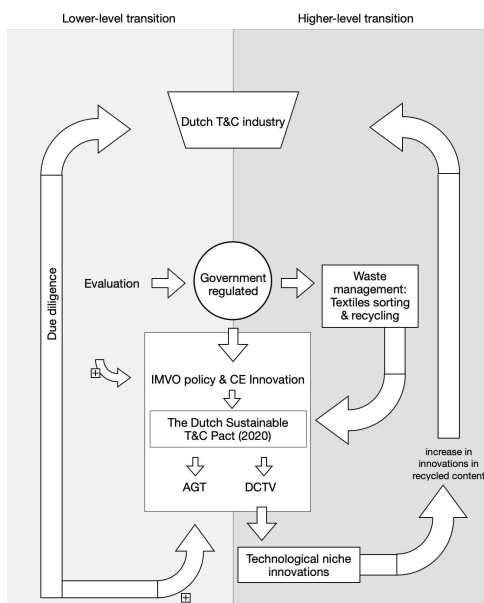


Figure 8

Figure 8: Overview of current policy landscape in T&C industry in NL (own elaboration)

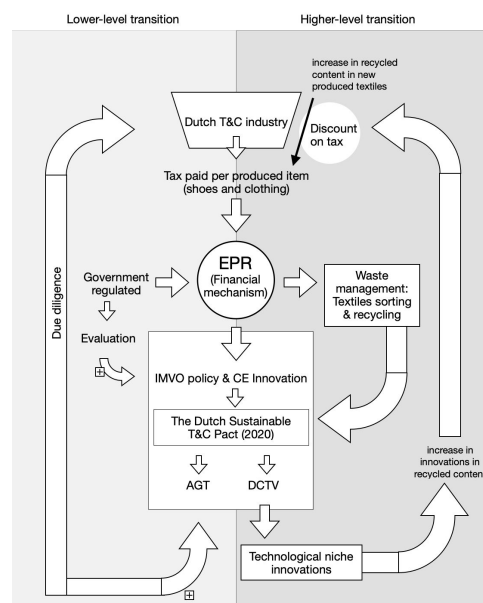


Figure 9

Figure 9: Overview of potential future policy landscape in T&C industry in NL (own elaboration)

Direct government funding

The lack of funding is considered as a main barrier for CE (Rizos *et al.*, 2016). However, there are many funding possibilities for CE innovations/projects in NL. The majority of respondents (6) received direct government funding for CE projects they participate in. The accelerator platform of ‘Nederland Circulair’ (initiated by the Ministry of I&W and other arms-length bodies) provides an overview of funding possibilities, Stichting DOEN (public/private funding), the FMO (Dutch Entrepreneurial Development Bank, connected to Dutch government funds), DGGF (Dutch Good Growth Fund) from the RVO (Netherlands Enterprise Agency), Creative Industries Fund NL and the DCTV (public funding) are mentioned as sources for funding of CE innovations.

4.2.2 How do stakeholders in the MLP perceive the role of policies in the transition process towards CE in the T&C industry in NL?

International developments in relation to policy

Three respondents state that a national focused governmental policy and legislation hinders the global transition towards CE in the T&C industry, especially in relation to the globally operating supply chain. There are many different governmental legislations in various countries. These initiatives lack compatibility and comparability. Intrinsic motivation will be crowded out (Frey & Jegen, 2001) and efforts by industry players to become more sustainable will reduce. Instead, it could be effective to, as a respondent (Macro-1) mentions to: “look at how can we meet all these different regulations.”

From the DA CtC analysis and the participant observations, it becomes clear that specific indicators for social and environmental sustainability already exists (ISO, OECD, OESO, GRI, SDGs, SA8000, BSCI, LCA). Besides that there are many certifications available. Missing effective governance institutions or structures is considered as barrier for the transition (Potts, 2018). One respondent (Meso-7) mentions about the C2C certification:

Certifications like C2C are just unaffordable for SMEs per product a licencing fee of 3000 euros is charged. For editions of 2000 products, that is just not profitable. In my opinion, it is just used as a communication tool.

Therefore, the urge for the development of radical transparency, a global standardized environmental and social impact certification system in the T&C industry is expressed by four respondents since existing labels currently lack comparability and credibility. One of the respondents (Macro-1) argues:

So what the European Commission and also the Sustainable Apparel Coalition have been working on for many years now is a standardized system that will be regulated and applied across all clothing items that if you want to sell a piece of clothing in Europe, it will have to have this label on it. And what defines this label from the other label is that it is based on sophisticated environmental footprinting analysis.

International or European policy developments are considered as long lasting. The project with the EC is already running for 6 six years without actual legislation the respondent (Macro-1) argues. The timing of policy is argued to be essential (Carlsson & Jacobsson, 1997). However, policy requires a long-term view because of the implementation and learning phase (Carlsson & Jacobsson, 1997).

National government policy

Agreement on Sustainable Garment and Textile (AGT) & DCTV

One of the core drivers for the transition towards CE is networks (Rizos *et al.*, 2016), the AGT is providing the network structure where knowledge transfers take place. A respondent (Meso-7), taking part in the AGT states: AGT is a good driver for the transition, several NGO's with industry leading positions are connected and share valuable industry knowledge. The AGT organizes workshops, meetings and publishes a newsletter with latest industry reports and other important information. The AGT also initiate projects. For example; a project on water management with mills³ in Tamil Nadu in India. Partners of the AGT are able to apply for these projects. These projects are not ran by the AGT itself, but by the Dutch labour union CNV. Since the DCTV is a

³ In the T&C industry, with mills is ment factories in which denim fabric is produced (woven, dyed, finished).

relatively new initiative, limited responses came from the interviewees on how they perceive the activities of the DCTV.

Lobby for the EPR

There are several arguments pro EPR. A respondent (Macro-2) states: since the AGT is running out by 2021, another funding mechanism should be developed in order to continue the work that has been done in the transition towards CE. Two respondents (Macro-2 & Meso-5) argue that the EPR could be an effective tool to fund The Dutch Sustainable Textiles Pact activities.

MVO Nederland is advocating for the EPR and is involved in a lobby with a working group together with other stakeholders, a respondent (Macro-2) mentions. Another respondent (Meso-5) also advocates for the EPR and mentions that within the organisation lobby activities take place to advise the government. The organisation of Meso-5 also carried out a research on the EPR and delivered it to the Ministry of I&W. Because increased complexity in mixed materials and methods are seen as important technological barriers for the transition (Rizos, et al 2016). A specific advice from Meso-5 is that - for example with workwear - there should be extra attention on the design and material phase with regards to material choices and design for disassembly. The respondent advocates for a regulation on the use and complexity of mixed materials (e.g. fireproof materials, chemicals etc).

Funding

A lack of government funding is regarded as a barrier for the transition towards CE (Rizos *et al.*, 2016), but it seems that there are enough funding possibilities. One respondent (Meso-3) argues: "It is very good that there is a focus for the international developments, for example in India. The RVO and DGGF have supported us in feasibility studies abroad.". Another respondent (Micro-8) has received 25.000 euros public funding (Creative Industries Fund NL) for developing a collective modular fashion system. Not necessarily the lack of government funding hinders the transition in the T&C industry in NL, but the lack of criteria on environmental impact measurement

and the restrictions to national boundaries for funding (of which the DGGF is an exception) hinder the transition, two respondents (Macro-2 & Meso-3) mention.

Regulation

Concerning regulation, three respondents argue that restrictions and regulations could possibly crowd out intrinsic motivation for undertaking efforts in the transition towards CE in the T&C in NL. One respondent (Meso-7) states that the government restrictions concerning high import duties are a barrier for the transition, because post-consumer textiles waste (take-back systems / reverse logistics) is sent back to the recycling factory abroad. The import duties directly increase the price for recycled textile content which results in higher consumer prices, the respondent (Meso-7) states. Resulting in a possible reduction in the demand for sustainable products and reduction of intrinsic motivation for fashion brands to accomplish CE efforts because it becomes less profitable.

Micro level

The niche-innovations do not engage with the developments on government policy level. The niche-innovations are situated primarily at the beginning of the supply chain, in the circular design phase or fiber/textile production (Koszewska, 2018). Niches act as ‘incubators’ protecting innovations against market selection and are carried out by small networks of devoted actors (Geels *et al.*, 2007). The niche-innovations rather act out of a proactive attitude and problem solving ability of independent creator, instead of

engaging with the *sociotechnical landscape* and *sociotechnical regime*.

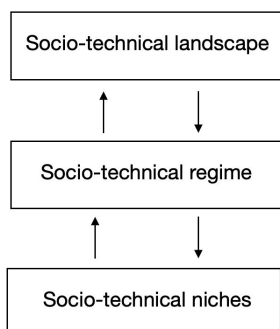


Figure 10: Overview of policy dynamics over the MLP (own elaboration)

Overview of policy mechanism in transition to CE in T&C in NL. The *socio-technical regime* with intermediary organisations has central position in coordinating regulatory policy measures.

4.3 Sociotechnical regime

4.3.1 What is the role of intermediary organisations in the transition process towards CE in the T&C industry in NL?

From the TT, it is emphasized that transitions involve various stakeholders with different backgrounds, this is termed as *multi-actor dynamics*, which include market, government, science and civil society (Loorbach, *et al.*, 2017). Second, the T&C industry is having a market oriented focus (Potts *et al.*, 2008). Third, partnerships and collaborations between between different industry stakeholders play an important role in the tackling of various sustainability issues (Googins & Rochlin, 2002; Neergaard *et al.*, 2009; Kant Hvass, 2014). This is evident in the amount of multi-stakeholder initiatives active on an international, European and national level. Seven respondents mentioned that there is an abundance in these initiatives. With the rise of complex division of labor, segmentation and a globalised economy, the role of cultural intermediaries has become increasingly important in the T&C industry (Lavanga, 2018). Most multi-stakeholder initiatives focus on the production part of the supply chain (Figure 3, p. 33). Though, it is argued that everyone in society is contributing to the sociotechnical regime (Geels *et al.*, 2007). As two respondents (Macro-1, Micro-9) argue: active engagement with consumers or citizens is needed and still lacking in the current developments.

In the Dutch T&C industry a variety of multi-stakeholder initiatives are present and active. These initiatives function as intermediaries throughout the supply chain. Table 9 is providing an overview of the different functions of the initiatives and stakeholders involved in the different initiatives active in the T&C industry in NL.

Intermediary organisations function as experts in specific markets and value formation through mediation and power relation in the interaction process (Lavanga, 2018), an example is the DCTV. Input for the innovation landscape in the T&C industry in NL comes from the representative's (intermediaries) own network. A respondent (Macro-2) explained, the DCTV is striving for a vigorous cooperation group which results in a dominant system of CE T&C innovations in NL. The dominant system accelerates the transition.

Multi-stakeholder initiative	Networking	coalition trajectory guidance	Fashion focus	Textiles focus	Sector agreements / covenant	Lobby	Cross-sectoral connection	Connect with global supply chain	Stakeholders
MVO Textile Network (network organisation)									textiles recycler & fiber producer, a textiles sorter, textiles sorter/fiberizer & recycler, social enterprises in local production, supplier of regenerative cotton and workwear producers, government institutions, wholesalers, textile experts,
Modint (industry organisation T&C, carpet, upholstery, workwear)									government institutions, supporting organisations, educational institutions, NGOs, fashion brands, textile, clothing producers, wholesalers, retailers, textile manufacturers
InRetail (industry organisation retail)									retailers, consumers, government institutions
VGT (industry organisation wholesale)									wholesalers, fashion brands, e-commerce, supporting organisations
Circle Economy (supporting organisation)									producers, fashion brands, fashion conglomerates, textile sorters and recyclers, sustainable packaging, NGOs, e-commerce, manufactures
Fashion for Good (supporting organisation)									fashion brands, start-ups, fashion conglomerates, producers, manufacturers, educational institutions, consultancy, NGOs, investors, supporting organisations, certification partners, trade initiatives, knowledge partners, banks
C&A Foundation (corporate foundation)									fashion conglomerates, brands, retailers and manufacturers, governments, NGOs and associations of farmers and workers
Clean & Unique (supporting organisation)									SMEs, designers, producers, manufactures
Fairwear Foundation (social responsibility)									fashion brands, fashion conglomerates, political bodies, business associations, trade unions, and civil society organisations, NGOs, farmers and workers
AGT (Agreement Sustainable Garments and Textile)									government institutions, supporting organisations, NGOs, fashion & textiles organisations, trade unions, branche organisations
DCTV (CE transition coordination in T&C industry)									government institutions, research and education institutions, investors, start-ups, SMEs, textile collector/sorter/recyclers, textiles producers, workwear producers, supporting organisations, banks, branche and network organisation.

Table 9: Overview of multi-stakeholder initiatives in the T&C industry in NL. Data retrieved from DA, participant observations, interviews, websites organisations.

Other organisations are:

- Dutch Circulaire workwear association: initiative with different stakeholders along the supply chain aim to develop a circular supply chain for workwear.
- Dutch Geotextiles association: promote knowledge and use of geotextiles⁴.

Rizos *et al.*, (2016) underlines that company environmental culture (67%), networking (34%), support from the demand network (30%) are important drivers for the transition to CE. Through collectively achieved effort which requires exchange and dissemination of knowledge and innovation among different stakeholders along the value chain, the transition can be successful (Rizos *et al.*, 2016). Intermediary organisations and intermediaries provide important linkages with essential aspects in the transition to CE in the T&C industry.

⁴ Textile Network manager explains: Geotextiles is permeable material used in water-, road construction and agriculture.

Supplier relations

It is argued that, collaborations generate positive externalities and reduce transaction costs via internalized transactions by sharing resources, product or service innovation or access to new markets (Carlsson & Jacobsson, 1997; Googins & Rochlin, 2002; Kant Hvass, 2014). In handling different sustainability issues, collaborations and partnerships between different industry partners are important (Neergaard *et al.*, 2009; Googins & Rochlin, 2002; Kant Hvass, 2014). In current linear practices the fashion brand has a higher bargaining position over suppliers because the fashion brand is buyer of the produced goods. Additionally a lack of transparency in the global supply chain results in information asymmetry problems, lack of knowledge transfers and ignorance, a respondent (Meso- 6 & Micro-9) acknowledges. Collaboration with both international suppliers and re-distributed manufacturing systems results in higher levels of responsibility and long term relationships with stakeholders in the supply chain four respondents argue. Only then, the widely accepted linear technologies creating a lock-in (Kok *et al.*, 2014), known as ‘business as usual’ can be broken down. Additionally, trust need to be gained and build among stakeholders to create a safe environment (Rizos *et al.*, 2016). The intermediary’s role could be to build trust relations. One of the respondents (Meso-7) confirms:

Because our suppliers also want us to get through it, they work with their best intention to make it possible. In this way, we have created a relationship of respect and trust. Because of that, we are able to still work with our supplier as they know we promise and commit to our agreements. I think this is how you have to work with suppliers.

Leverage

Besides good supplier relations and collaborations, leverage is an important factor in the transition towards CE, intermediary’s role is to mediate between different parties. One respondent (Meso-7) explains that as small stakeholder (SME) in the T&C industry, a good bargaining position is essential in accomplishing sustainable goals. Higher leverage is achieved in e.g. multi-stakeholder collaborations.

Another respondent (Meso-3) explains that SMEs are the only ones having difficulties in making sustainable business choices. The respondent has 37 years of

experience in the T&C industry as commercial director for a large fashion company. The respondent was one of the initiators for the use of organic cotton. The respondent stresses economic barriers, trade-offs and incentives from consumers and buyers, as well as linear technologies who are widely accepted and create a lock-in (Kok *et al.*, 2014). The respondent (Meso-3) states:

Organic cotton is a lot more expensive than regular cotton. Initially we started with baby rompers, the price for regular cotton was 4,95 euros. If we kept the same margin, the product with organic cotton would be 9,95 euros. Well, I can tell you, you are not going to sell much with that price. Often the conclusion is drawn, consumers are not ready for buying sustainable products, but that is not true. The spendable income of a consumer just does not allow it. So here is what we did, we bargained a price of 5,95 euros, resulting in a pricing war but we still did it. At that moment, consumers start to have a choice because the difference was just one euro which resulted in a stream of conscious consumers, low inventory stock levels and limited discount. This was in contrast with regular cotton with much higher inventory stock levels. Finally, it became more attractive because margins became more aligned. The example illustrates that consumers really willing to make sustainable choices, but you have to give them a choice.

A barrier for the transition is the lack of support in the supply and demand network in the industry (54%)(Rizos *et al.*, 2016). Previously customers only demanded for functionality not for sustainability one respondent (Meso-6) mentions. This has changed because even sustainable resources are diminishing, a respondent (Meso-3) explains:

Finally, the goal was to become a market leader in 2020 at the children's department in the use of organic cotton, but that did not happen because the demand for organic cotton worldwide was so high that there was even a scarcity in the sustainable resource.

Niche-innovations

There is a distinction to be made between technical and cultural niche-innovations. The technical innovations and the function of intermediary organisations is discussed in the case study on the Textile Network. Cultural innovations, do not interact with intermediary organisations, rather the involvement of consumers and the co-creation with participants (designers, amateurs, artists) is seen as important by two respondents (Micro-8& -9). The respondents question the T&C industry as a medium to communicate and develop fashion as a platform or service (FAAS). They see themselves as initiator/pioneer/intermediary and create an open and safe space to rethink

fashion and the role of designers/makers/users/consumers. One respondent (Micro-8) explains:

The modular system is developed to function as an invitation to other makers, it doesn't matter whether they are professionals or not. Just everyone who wants to take part. The idea is that everyone is taking part in the collaboration.

4.3.2 Case study: MVO Nederland, Textile Network & Clothes the Circle consortium (CtC)

MVO Nederland is a network organisation and, considering that networks are essential in the transition to CE (Rizos *et al.*, 2016), the following section explores the case study of the Textile Network and the CtC consortium. Stakeholders pay contribution to MVO Nederland and become partner. The partners are part of a sectoral network of MVO Nederland. MVO Nederland initiates various projects, where partners from different networks are able to participate. Due to this system, cross-sectoral exchange is taking place, which is considered as driver in the transition process towards CE (Rizos *et al.*, 2016).

The Textile Network gradually came to its existence after seven years of textiles related projects (e.g. coordination of the working group CE Textiles in the Action Plan Sustainable Textiles, precursor of the DCTV and the development of a circular clothing line in medical workwear in 2014). The structure of the Textile Network of MVO Nederland is as follows (Figure 11). The Textile Network focuses on three themes: production of high quality fiber resources (from pilot phase to scale-up), transparent supply chains and matchmaking for entrepreneurs and producers.

The Textile Network is managed by two intermediaries: Fioen van Balgooi (title: facilitator and network manager) and Michiel van Yperen (title: transition manager). Since the Textiles Network is also functioning as facilitator, the role of the network manager is to map the challenges of the network partners. The network manager's tasks is to stay objective, provide industry specific knowledge, act as matchmaker between different parties and initiate new projects. Textile Network managers also contributed to

the project and funding plan for 2020 the DCTV (respondent Macro-2) mentions. The Textile Network also assisted in the development of the cascading schedule for material flows (www.dutchcirculartextile.org/tools, 2020).

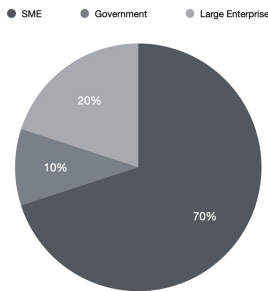


Figure 11: Division of different stakeholders in the Textile Network in 2019 (DA)

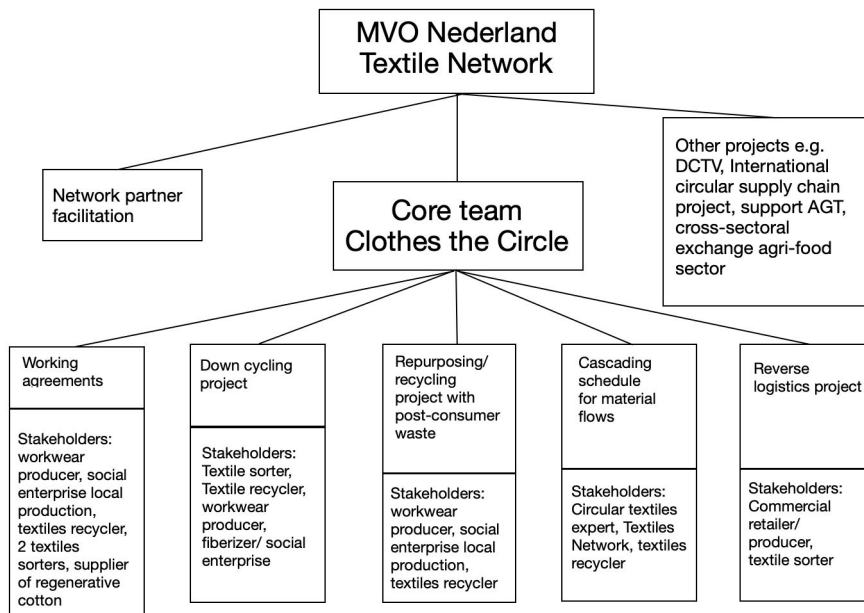


Figure 12: Overview of Textile Network at MVO Nederland (own elaborations, based on of DA and participant observations)

The Clothes the Circle has formalized their collaboration and guidance of MVO Nederland in the summer of 2019 with an ‘ambition statement’ endorsed by all Clothes the Circle partners.

The statement include the topics:

- Accessible: production of high quality fiber resources for B2B and B2C market.
- Circular: closed loop system, post-consumer textiles waste recycled in new textile resources.
- Humane: CSR approved produced products with fair practices.
- Transparent: and traceable supply chains.
- Upscaling / Co-creation: Enlarge impact by scale up and co-creation.

The ambition of the Clothes the Circle (CtC) consortium is:

“In 2023, the aim is to have a fully functioning business case for mainstream (textiles), offered in the Netherlands, with 100% post-consumer and post-production textiles waste, produced on a circular, social and environmental sustainable way.”

The core team of CtC exist of the stakeholders: textiles recycler & fiber producer, a textiles sorter, a textiles sorter/fiberizer & recycler, social enterprise in local production & fiberizer, supplier of regenerative cotton and a workwear producer. The stakeholders are collaborating in different projects within the CtC consortium (the projects are mentioned in figure 11).

Every six weeks the CtC partners gather in a meeting at the office of MVO Nederland. During the meetings, the partners are giving an update per project, an external party or member of the CtC is giving a presentation on a project or a potential new member, offers and challenges are being discussed and the network manager is giving an update on current developments in the field. Separate meetings take place per project group without the network managers.

Several respondents argue that the CtC consortium is an important factor in the transition to CE in the T&C industry in NL, because collaboration of different supply chain partners is required to effectively ‘close the loop’ and make the supply chain CE proof. One respondent (Meso-3) states: “Actually, you need to become a sort of supply chain director to realize a CE supply chain.” The role of intermediary is present here (Lavanga, 2018) in which the CtC aims to have all relevant partners in the consortium to

effectively work towards CE which can function as buyer, seller or knowledge partner and have a frontrunners position in the transition to CE.

The Textile Network is also seen by several respondents as a catalyst and intermediary for CE developments, being an inspiration and knowledge hub and bringing different stakeholders together. The CtC consortium is also participating in a study from the Hogeschool of Amsterdam on multi-stakeholder collaborations in the T&C industry, raising awareness of opportunities at various stakeholders e.g. in the industry and academia (Carlsson & Jacobsson, 1997).

Based on the interviews and DA, it is emphasized that relevant supply chain partners should be part of the consortium. This coincides with the concept that collectively achieved effort requires exchange and dissemination of knowledge and innovation among different stakeholders along the value chain (Rizos *et al.*, 2016). The partners for the CtC network are working on incremental and radical innovations.

Nonetheless, there needs to be a strict examination on the amount and relevance of partners. It is argued by the respondents and the DA, that an abundance in partners will affect the decisiveness and the leverage the consortium has in order to achieve the mission. It is the intermediary task of the network manager to curate this process.

According to (Rizos *et al.*, 2016) a driver for the transition to CE is company environmental culture (67%), related to shared values and purpose (Klamer, 2017). It is seen as very important that potential partners share the same purpose, agree with the mission and internalize it in their practice, four respondents emphasize. Yet, partners from the CtC consortium are also collaborating with other external organisations. For example in the ‘Repurposing/recycling project of post-consumer textiles waste’ and the ‘Reverse Logistics’ project. Overall, the Textiles Network has close connections with various T&C industry stakeholders in NL and abroad. Nonetheless, it is mentioned by several partners during the participant observations that a design partner or fashion brand is still missing in the consortium.

Conscious Collaboration

The CtC consortium functions as a thought-provoking example of an *innovation commons*, existing at the beginning of a new technology development, a group of enthusiasts comes together to discover new possibilities (Allen & Potts, 2016). Knowledge exchange by different stakeholders is taking place in a noninstitutionalized informal sphere where precariousness has been adequately diminished that the actors are able to confidently act (Allen & Potts, 2016). Several projects are evolving from pilot/idea phase to a potential scalable prototype. In the process of collaboration, the consequence is that the level of transparency between network partners reduces and competitiveness increases. Innovation problems are collective action problems that can be resolved with effective governance institutions (Potts, 2018). The role of the intermediary is to identify needs and provide useful direction during the innovation process.

One of the respondents (Meso-3) describes: “Right now we are working on a fine trajectory, it is called ‘conscious contracting’, to deal with these kind of things.”. Another respondent (Meso-5) mentions that the same is happening with other collaborations in the T&C industry in NL. The respondent explains:

A mutual agreement is needed in which the conditions for the collaboration are clear and lead to a successful partnership. The parties involved need to have a clear view on what their incentives are and why they participate, what is needed in every step of the process. It is very important to work that out together and have an agreement in the end.

Agreements could potentially also hinder the transition as several respondents illustrate. An respondent (Meso-5) clarifies:

Stakeholders are sometimes taking part in different consortia and collaborations. For example two parties - a textiles collector and a textiles sorter - also were involved in a project with a governmental body. They had signed a NDA and argued that it was not fair to stay in the partnership. These parties have left the partnership, unfortunately but unavoidable.

4.3 Sociotechnical regime

4.3.3 How do stakeholders perceive the level of transition towards CE in the T&C industry in NL?

The Rana Plaza factory disaster in 2013 set the transition (both higher & lower level transition) towards CE in motion and increased the urge for fair practice and sustainability transition in the T&C industry, one respondent (Macro-2) and DA analysis clarifies. The respondent states:

In the beginning of a transition, a few organisations are active. Gradually, a hectic climate with many activities arise, that is the phase we are in right now. At a given moment, at the tipping point, it becomes so busy in the transition that evaluation has to take place. The question is, how these activities are able to cluster and how to stimulate the development towards a dominant level. Because these activities compete with each other. In the next phase, there are a few bigger initiatives left and that is the phase we are approaching.

The transition is a process, it does not happen sudden. The respondent (Macro-2) adds:

“Eventually, we have gained so much knowledge on how to do things, committed so many mistakes and done things over again, that the best methods eventually remain.”

Besides that, one of the respondents (Meso-4) explains that the Textile Network organises network meetings and is mapping the challenges that network partners are facing. The Textile Network is able to examine the level of transition towards CE in the T&C industry. The CtC consortium is an example of an *innovation commons*, becoming a dominant group that could potentially start a business together, a respondent mentions (Macro-2). At the CtC consortium, higher-level transition is taking place (Loorbach *et al.*, 2017).

Three respondents in the *sociotechnical regime* mention that the last few years numerous pilots have taken place with different CE niche-innovations such as reverse logistics (& overstock), recycling methods, repurposing, fiberizing, collecting and sorting. These pilots are currently in the process of developing towards mature business cases. This coincides with the stages experimentation, acceleration and emergence of the higher-level transition (Buchel *et al.*, 2018).

Asymmetric information problems

Current linear practices of the T&C industry are dealing with lower-level transition. This requires a mentality shift, awareness, commitment and responsibility to break with deep cultural patterns and ‘doing business as usual’, all respondents argue. A respondent (Macro-1) comments that there is still “a huge amount of work to be done before we can start transitioning effectively to that kind of system”. The respondent is referring to current linear practices. One respondent (Meso-6), who is in the beginning (optimization) of the lower-level transition acknowledges its ignorance:

I knew already for a while that behind the scenes there were negative circumstances concerning impact on environment and exploitation in the production in the sector. I actually knew this already for a while but I did not do much about it.

Barriers in lack of technological or industry specific know-how occur (Rademaekers *et al.*, 2011). Since the high level of complexity and a variety of knowledge is available, this results in asymmetric information problems. With as result that intrinsic motivation to undertake steps towards CE is crowded-out, one respondent confirmed:

“It is difficult to seriously start and communicate it, if you have limited knowledge. That is why I did not do much about it.”

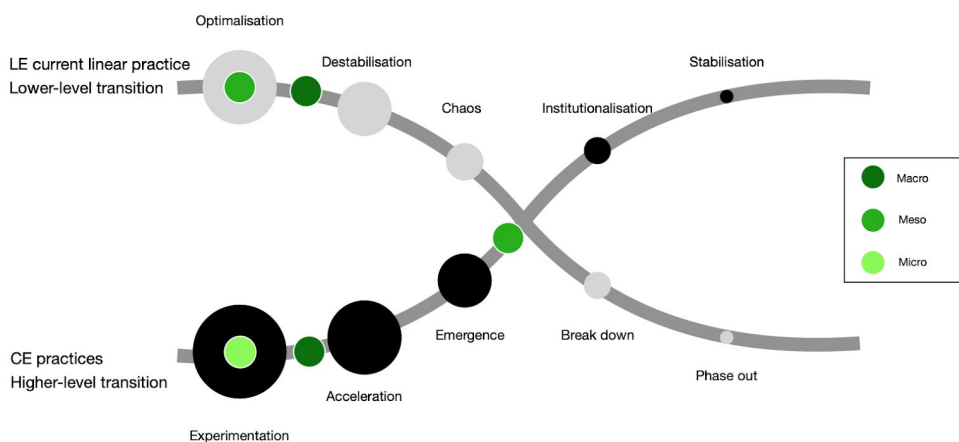


Figure 13: Overview of Lower & Higher level transition in the T&C industry in NL (own elaboration)

The perceived level of transition towards CE differs per level (Figure 13). In the *sociotechnical landscape* the level of transition is recognized in the lower-level transition as going towards destabilisation with e.g. the developments of the AGT. At the same time

higher level transition going towards acceleration is taking place with the developments of the DCTV. In the *sociotechnical regimes* the lower level transition is still in the optimization phase and the high level transition in the emergence phase with for example the CtC consortium. In the *niche-innovations* level, the transition is with the higher-level transition in the experimentation phase. The perceived level of transition has been established during the data collection phase.

4.4 Niche-innovations

4.4.1 What kind of CE innovations are identified by stakeholders in the T&C industry in NL?

Edquist defines innovations as (1997, p. 1): “new creations of economic significance”. Innovations are market failures because of the external ‘unpriced’ benefits and information problems (Towse, 2019). The identified CE niche innovations in the T&C industry in NL are categorised in technical and cultural innovations. The technical innovations focus mainly on R8 strategy Recycle (up or down-cycling) and R7 Repurpose. Based on the participant observations, DA and interviews, most technological innovations take place in the frontier sectors denim and workwear.

Cultural innovations focus on R0 Refuse, R1 Rethink and R2 Reduce and R7 Repurpose. R3 (Re-use), R4 (Repair), R5 (Refurbish), R6 (Remanufacture) R9 (Recover) from the R9 strategies (Potting *et al.*, 2017) (Table 3, p. 31) are not identified in this study. The following section highlights several examples. The input of recycling (up/down cycling) is reverse logistics or take back systems (Figure 3, p. 33).

- **Technological innovations**

New denim deal from the DCTV, R8: Upcycling

An example of the development towards a dominant innovation system is the new denim deal from the DCTV. The DCTV is collaborating with The House of Denim in Amsterdam, the recycling industry in Zaanstad (e.g. Wieland recycling (Fibersort project)) textile sorters in Twente and spinning factories in Turkey for the set up of a

circular ‘closed loop’ supply chain in order to increase recycled content in jeans from post-consumer textiles waste, one respondent (Macro-2) explains.

Collaboration of Sympany and Saxcell, R8: Upcycling

SaXcell is a collaboration between Saxion University, five inventors, Sympany, WeVoTex and three Turkse textile companies: Ugurlular, Modeko and Selin Tekstil. The role of Sympany in the collaboration is shareholder and textiles collector and sorter. By Sympany sorted post-consumer cotton textiles waste (textile sorter) is up-cycled in high quality cotton fiber pulp with chemical recycling by Saxcell (textiles recycler). Resulting in a production of 100 kg fiber pulp per day (sympany.nl, 2020). The Turkish textile companies process the recycled fibers in new textiles.

UPSET Textiles, R8: Upcycling

With innovative ‘organic’ recycling technology, 100% cotton textile waste is processed into 100% recycled yarns. With UPSET Textiles 40 million kilogram recycled cotton, around 50 million kilogram CO₂ and around 200 billion liter of water is saved, a respondent (Meso-3) states.

- **Combination of cultural and technical innovations**

i-did & Frankenhuis (R7: Repurpose)

The collaboration between i-did (social enterprise with local production) and Frankenhuis (textiles recycle) results in high end recycled fibers composed of post-consumer textiles waste from commercial partners. The recycled fibers are repurposed into felt and used in the production of bags, accessories and upholstery.

By Sympany By Kuyichi jeans (R8: Upcycling)

Sustainable fashion brand Kuyichi collaborated with textiles sorter Sympany and launched 1600 pieces of By Sympany By Kuyichi jeans. The project has been collaborated with Recover (recycled yarn producer), Tejidos Royo (specialized in certified jeans) and SARP (certified sustainable jeans producer). The composition consists of 20% regained textile fibers from post-consumer textiles jeans waste, collected by Sympany. 10% Of the revenue is dedicated to tailoring education of young women in Malawi (www.bysympany.nl, 2020).

- **Cultural innovations**

The hereunder mentioned innovations have in common: questioning, redefining and trying to create awareness for the position of the designer and fashion design and urge for a mentality shift and collaboration in the transition towards CE. The cultural innovations function as a dialogue for change in the industry focussing on the symbolic value of fashion, two respondents mention (Micro-8& -9). Klamer (2017) refers to this in his value-based approach as sense-making activities. Cultural innovations are related to *creative commons*, an inclusive open-source social phenomenon acting as an artistic conversion, where participants share and co-create (Klamer, 2017), this is where sense-making activities take place. Both respondents argue that personal purpose and values strongly influence their practice and underline the importance of cultural supportive networks. In Throsby's (2017) Cultural Sustainable Development, *interconnectedness* is essential which emphasizes that economic, social, cultural and environmental systems should not be seen separately; rather a holistic approach is needed. The following cultural innovations define how *interconnectedness* creates cultural value.

Hacked-by (R0 Refuse, R1 Rethink, R2 Reduce, R7: Repurpose)

Hacked-by is an independent design label, led by two experienced fashion designers developing innovative and environmentally positive design solutions with problem solving ability without losing their design signature. The label collaborates with fashion conglomerates and brands to repurpose industry dead-stock in the fashion industry. Over the past years, the label has pioneered in re-distributed manufacturing systems with local production, scalability of repurposing design methods and production, user involvement with consumers, retail concepts and supply on demand. Based on a collaboration with an international fashion conglomerate, the business model of Hacked-by can be implemented in different countries with local designers and production facilities and is therefore open-source, the respondent (Micro-9) emphasises.

JOIN Collective Clothes (R0 Refuse, R1 Rethink, R2 Reduce, R7: Repurpose)

JOIN Collective Clothes is a Fashion as a Service (FAAS) project that developed an inclusive open-source modular fashion system. JOIN is an example of a *creative commons*. JOIN is implemented in a series of workshops, digital available garment patterns, performative installations and exhibitions which invites participants and designers to participate in the co-creation and community building aspect of the project. During the process of co-creation, knowledge is exchanged and values are internalized (Klamer, 2017).

4.4.2 How do stakeholders perceive the role of innovation in the transition towards CE in the T&C industry in NL?

One of the main barriers considering the supply side involves the absence of ‘green’ suppliers (Rizos *et al.*, 2016). The Netherlands is lacking or has limited capacity of core T&C industry units in the supply chain (production of fibers, spinners, weavers, knitters, dyeing facilities, clothing production and recycling) (Köppchen, 2014), 4 respondents agree. Therefore, the role of innovation and funding or investment thereof is essential, to develop a strong base of ‘green’ suppliers and core elements of the T&C industry in NL in the transition towards CE.

Currently, most essential technological constraints occur in the complexity of mixed materials or textiles blends, 4 respondents and DA state. Resulting in not only the focus on product longevity but also on the level of recyclability of a fashion product. The respondents acknowledge that process and product innovation in the design and production phase (design for disassembly, use of circular design methods, mono stream material use) are essential for the transition towards CE in the supply chain. Substantially, the demand for chemical recycling⁵, is high. Based on the participant observations and interviews, it becomes clear that innovation in chemical recycling is worldwide still in an early stage, though Saxcell is able to recycle cotton chemically in NL.

⁵“Chemical recycling most often refers to a recycling route in which the polymers are depolymerised (in the case of synthetic polymer fibres derived from petrochemicals, such as polyester) or dissolved (in the case of natural or synthetic cellulosic fibres, such as cotton and viscose). Having thus been disassembled to molecular levels, monomers or oligomers are repolymerised, and polymers respun into new fibres.” (Sandin & Peters, 2018, p. 354)

Innovation is a collective effort, the CtC case study and examples of innovations demonstrates which does not only limit itself to NL alone, the international supply chain also has an important role to play. All respondents indicate the importance of networks, sharing knowledge, collective effort in multi-level and multi-actor dynamics and shared purpose in the innovation and transition process. CE requires a shift from shareholder value to stakeholder value, two respondents (Macro-1 & Meso-3) mention. Additionally, a respondent (Micro-8) mentions that in NL an open climate for experimentation, rethinking current linear practices in the T&C industry in NL. This corresponds with developments in the *socio-technical landscape* and *sociotechnical regime*.

4.7 Preliminary effects of Covid-19 crisis on the transition

The Covid-19 crisis is according Walmsley (2019) a form of ‘reactive change’: a force that is suddenly imposed on the world. Transition is defined as a restructuring of societal systems (Rotmans & Loorbach, 2009). The reactive change or disruption of the Covid-19 crisis has an effect on the restructuring of societal systems, especially in the globalised supply chain of the T&C industry. This section is aimed to provide an overview of the preliminary effects of the Covid-19 crisis on the transition towards CE in the T&C industry in NL. The respondents demonstrate that reactive change requires flexibility and resilience. Second, it is argued by the respondents that there is a bilateral perspective with both positive and negative effects. Positive immediate effects are: time for reflection, prioritization towards CE and rethinking and reinventing of current (linear) practices. Three respondents express that there is higher capacity for CE innovations in the industry because other business activities have been put on hold, resulting in an increase in the production of face masks and medical workwear. Another respondent (Meso-5) mentions that the crisis increased the deglobalization in the global supply chain which has led to an intensification in self-sufficiency of the Dutch T&C industry. As a follow up, the crisis eased local collaborations and put an emphasis on the importance of collaboration for the transition towards CE in the T&C industry.

Nonetheless, the crisis primary effect is on the level of financial liquidity that businesses have, several respondents tell. The reduction of the level of liquidity has an

effect on financial decision making and crisis management, remediation and, a diminished, focus on sustainability and CE. Fashion conglomerates face high overhead costs which has result in the first negative effects on the global supply chain with order cancellations in production counties. The respondents accordingly appeal for responsible buying behaviour and innovative and resilient approach towards the current situation in the T&C industry. Due to non existing foreign trade, textile sorters in NL currently are stuck with high levels of post-consumer textiles waste which accelaters the urge for local CE recycling innovations. The current crisis has disrupted current systems in the T&C industry entirely and the effects will be apparent in the coming time.

5. Conclusion

This study has explicated an analysis of the process of transition towards CE in the T&C industry in NL. In this study, the multi-level-perspective (MLP) of the transition theory has been applied which intent is to align transition outcomes between advancements at multiple levels. The levels are: *sociotechnical landscape*, *sociotechnical regimes* and *niche-innovations*. Accordingly, this study has aimed to investigate how multi-level dynamics interact in the transition towards CE in the T&C industry in NL.

In order to answer the first research question: **How is the transition towards CE implemented, in the case of the T&C industry in NL?**, the MLP provided a structure.

The transition towards CE is implemented in the T&C industry in NL as followed. Concerning the level of transition, there is a distinction made between higher- and lower-level transition. Lower-level transition corresponds with current linear practices and higher-level transition with CE practices. In the *socio-technical landscape* regulatory policies tools such as AGT and DCTV are utilized. The AGT focuses on lower-level transition and the DCTV on higher-level transition. From the *sociotechnical regime*, a lobby (primarily by waste management stakeholders) is taking place for a fiscal policy instrument: the EPR. Figure 8 and 9 on page 59 explain the application of the EPR. The EPR obliges the industry to work towards a closed loop system in the T&C industry in NL. A tax discount (reward) on the use of recycled content incentivises the industry to work towards CE supply chain. Another policy tool applied in the transition is direct or indirect government funding.

The *socio-technical regime* with intermediary organisations has a central position in coordinating regulatory policy measures and reduction of asymmetric information problems, for example the DCTV. Furthermore, in the Dutch T&C industry a variety of multi-stakeholder initiatives are present and active (table 9). Through those multi-stakeholder initiatives which function mainly in the beginning of the supply chain, leverage, collaborations and supplier relations become more substantial and increase the level of transition towards CE in the T&C industry. It is argued that everyone in society is contributing to the sociotechnical regime (Geels *et al.*, 2007). Nonetheless, active

engagement of consumers or citizens is still lacking. Technical *niche-innovations* are curated and accelerated by the *socio-technical regime* through the multi-actor dynamics of intermediary organizations. The case study of the Textile Network and CtC consortium as *innovation commons* serves as an example of this.

In the *niche-innovations*, which serve as incubators, a distinction is made between technical and cultural innovations. The technical innovations focus mainly on R8 strategy Recycle (up or down-cycling) and R7 Repurpose whereas cultural innovations focus on R0 Refuse, R1 Rethink and R2 Reduce and R7 Repurpose. Most technological innovations take place in the frontier sectors denim and workwear. The cultural innovations act as *creative commons* where sense-making activities take place (Klamer, 2017). Further, the cultural innovations do not interact with intermediary organisations in the *socio-technical regime* nor with the *socio-technical landscape*.

The lack of a core T&C industry in NL is seen as a driver for innovations to accelerate the transition towards CE. Further, the technological constraints related with mixed materials (textiles blends) acts as a stimulator for innovations in the T&C industry in NL. Innovation does not stand on its own, it is a collective effort in multi-level and multi-actor dynamics. That is how the transition is implemented in the T&C industry in NL.

The second research question: **Who are the stakeholders involved in the transition process towards CE, why are they involved and what for?** has been answered by the use of the Value Mapping Tool (VMT), in order to advance connections, contrast, compare and identify between different levels of the MLP.

	Socio technical landscape	Sociotechnical regime	Niche-innovations
Key stakeholders	National governments, EU/ EC/ global governance institutions	Intermediary organisations, SMEs, fashion brands & conglomerates, textile waste management actors, science/ academia	Artists, independent designers, textile experts, inventors
Purpose	With radical transparency and a global standardised environmental impact measurement reduction of asymmetric information problems and environmental impact is aimed for. Increased social and environmental responsibility can be achieved with active engagement of all stakeholders along the value chain, including citizen/ consumers.	In multi-stakeholder collaborations with a shared mission, due diligence and resource efficiency and higher leverage is achieved. By incremental and radical innovations such as reverse logistics in closed-loop circular supply chains. With the focus on environmental and social responsibility.	By rethinking and unconventional thinking, fashion, deep cultural patterns and the role of the designer is questioned and redefined. With open-source radical innovations is aimed to create awareness and urge for a mentality shift and collaboration with the involvement of users to create an open dialogue for a sustainable future.
Value captured	multi-actor & multi-level dynamics, government policy	recycle: up & down cycling, cross sectoral exchange, pilot testing, business cases, economic competence + market oriented, scalability, (practical) product focus	co-creation, community building, circular design methods, sense-making activities, interconnectedness, cultural value, creative commons
Value uncaptured	global industry standards, environmental impact measurement	lack of circular design methods	lack connection landscape & regime, lack of financial & human resources
Value destroyed	length of governmental processes, bureaucracy	competition, protectionism, lock-in of existing linear technologies, lack of transparency	lack of interaction with multi-level dynamics
Value surplus	industry specific knowledge systems-thinking	high amount of industry specific knowledge, technical know-how, network relations, facilitation of joint investment, intrinsic motivation	creativity, artistic, problem solving attributes, co-creation, creation, unconventional thinking, intrinsic motivation
Value absence	creativity, lack of connection with niche innovations, generalisation	industry standards, technological & financial constrains	Industry standards, scale up
Value opportunity	macro political developments, effective governance	effective governance, trust, commitment	alternative valuation, inspiration/vision for the future

Table 10: Value Mapping Tool (own elaboration)

First of all, the key stakeholders in the levels of the MLP differ quite substantially, from large governmental institutions and waste management actors to independent designers and inventors. Second, the purpose vary per layer in that the *socio-technical landscape* aims for a global standardized environmental impact measurement system and radical transparency throughout the whole supply chain, whereas in the *socio-technical regime* in multi-stakeholder collaborations coordinated by intermediaries, with increased leverage and a market-oriented focus resource efficiency and CE closed-loop supply chains is aimed to reach with incremental and radical innovations. With the *niche-innovations*, the focus is primary on radical innovations, breaking with deep cultural patterns by rethinking the current system. The VMT exposes the differences between the levels and illustrates the shortcomings in the transition towards CE in the T&C industry in NL. Every level requires a different approach and can simply not be compared with the same measures.

Policy implications in the socio-technical landscape

Although it is argued that there is still a lack of government support and effective legislation (Parker *et al.*, 2009; Calogirou *et al.*, 2010; Rizos *et al.*, 2016), the *socio-technical landscape* has reached a point where there seems to be enough government support and legislation. The task now is to coordinate existing policy measures in an adequate way. First, in the *socio-technical landscape*, the lack of interaction with the niche-innovations, length of policy development procedures and need for generalisation hinder the process of transition towards CE.

Second, it is argued that nationally centered policy is a barrier for the transition towards CE in the global supply chain. An example is the government restrictions concerning high import duties. Therefore, nationally centered policy could possibly crowd out intrinsic motivation for undertaking efforts in the transition towards CE in the T&C in NL. In addition, it is advocated for a global standardized environmental impact measurement system.

Third, the Dutch policy measures are developed by different ministries (I&W & Foreign Affairs), this could lead to disincentives and lack of effective coordination which hinders the transition.

Fourth, the participation to the AGT is without obligation, which can be a barrier in the transition to CE since it does not incentivise the T&C industry to work towards CE. However, intrinsic motivation is not hindered by obligation or monetary boundaries for the participation of the AGT.

Fifth, transition processes do not happen suddenly. The transition towards CE in the T&C industry has started with the collapse of the Rana Plaza factory in 2013. Which means that policy developments require a long-term perspective. The AGT has a time span of 5 years and is running out by 2021, the DCTV has funding for 2020. The AGT and DCTV join forces in the Dutch Sustainable Textiles Pact and the fiscal policy measure EPR could be a potential solution for funding the activities of the Dutch Sustainable Textiles Pact. Figure 8 & 9 on page 61 provide an overview of the current situation and potential future scenarios of government policy in the T&C industry in NL.

Sixth, a point of discussion in the current debate on the EPR is the tax paid per produced item by the Dutch T&C industry. This again focuses on the limitations of national boundaries. Although the Dutch T&C industry is situated in NL, almost all production takes place abroad. Furthermore, international T&C companies, active in the Dutch T&C industry, do not have to pay tax over produced goods, which creates disincentives and a comparative advantage over the Dutch T&C industry by the international T&C industry. Thus, it remains unclear what kind of restrictions are going to be applied to regulate the fiscal policy measure effectively. A consumer tax on T&C items sold could elevate the comparative advantage. Nonetheless, this requires further research.

Socio-technical regime

At the same time, *socio-technical regime* requires a global standardized environmental impact measurement system, radical transparency reduction of asymmetric information problems and effective policy measures to facilitate transition processes. Partnerships and collaborations between different industry partners play an important role in tackling various sustainability issues (Googins & Rochlin, 2002; Neergaard *et al.*, 2009; Kant Hvass, 2014). Further, barriers in lack of technological or industry specific know-how occur (Rademaekers *et al.*, 2011). The role of intermediaries, intermediaries organisations and effective multi-stakeholder collaborations is therefore fundamental in transition

towards CE. Though, table 9 (p. 65) illustrates that there is an abundance in intermediary organizations in the T&C industry in NL. Though these intermediary organizations are necessary to increase the leverage of SME's and create a vigorous cooperation group which results in a dominant system of CE T&C innovations in NL. The dominant system accelerates the transition. Trust is an important factor in collaboration.

The case study of the Textiles Network and CtC consortium presents itself as a perfect example of how networks, cross sectoral exchange, multi-stakeholder collaborations and CE innovations. The role of the intermediary in an intermediary organization is to act as matchmaker, map and keep overview of the current developments in the T&C industry, act as knowledge partner, advocate and facilitate network partners with challenges.

The CtC consortium functions as *innovation commons* and regulates its governance by the ambition statement. Several projects evolved from pilot/idea phase to a potential scalable prototype. In the process of collaboration, the consequence is that the level of transparency between network partners reduces and competitiveness and protectionism increases. The role of the intermediary is to identify needs and provide useful direction during the innovation process. That eventually resulted in 'conscious collaboration', an attempt to create a mutual agreement which aligned incentives between network partners. It is recognized by the interviewees that in other collaborations the same process is taking place.

It is important to consider the limitation of partners to which a multi-stakeholder initiative is beneficial. An abundance of partners affects the decisiveness and consequently the transition towards CE. It is also important that the values and purpose of partners are aligned. The intermediaries role is to act as curator in this process. Additionally, cartel formation could take place in the situation of the CtC consortium. It is the intermediaries and government task limit cartel formation and provide a structure for even competition. Overall, it is also recognized that design partners or fashion brands are still in the minority in multi-stakeholder collaborations in the T&C industry. This is considered as a barrier in the transition process.

Niche-innovaties

In the niche-innovations, a division between technical and cultural innovations has resulted in the identification of the different functions of innovations in the transition to CE in the T&C industry. The technical innovations, both radical and incremental are being curated by intermediary organisations which also influence policy. Whereas cultural (radical) innovations or *creative commons* have a different role. They create an open dialogue for the role of the designer and provide a new framework for circular design. In these sense-making activities, cultural value is created via *interconnectedness*. This proves the value of culture in the transition towards CE.

Reflection on the theory

As far as known, the transition theory (TT) and the Multi-Level-Perspective (MLP) (Loorbach *et al.*, 2017; Rotmans & Loorbach, 2009; Geels & Schot, 2007) have not been applied in empirical research on the T&C industry. Although the TT is primarily used in core technical industries, the MLP has provided a practical and useful framework for the analysis of the study and underlined the value of culture in transition towards CE in the T&C industry in NL. The TT also proved to be an effective tool in understanding the transition process towards a new paradigm: Circular Economy. Since CE is both a technical closed loop principle (circular supply chain) as well as collaboration and breaking with deep cultural patterns. The study verifies that the realisation towards the value of culture (Klamer, 2017) and *interconnectedness* (Throsby, 2011; 2017) in sustainability is needed. Furthermore, a multi-level perspective has been applied to this study, which allows us to delve deeper in governance, networks, collaborations and innovation in the T&C industry on different levels. The research has substantiated the value of the theoretical perspective on the role of cultural intermediaries. The role of intermediaries (Lavanga, 2018) became essential in the understanding of how these concepts are connected and played an important role in the further development of the analysis. Further, the research gives substance to crowding-out effect & intrinsic motivation theory (Frey & Jegen, 2001) which provided justifications for the barriers and drivers in the transitioning process.

Reflection on the methods

A triangulation approach with the qualitative and ethnographic research methods has been used in order to compile a comprehensive view on the matter and increase the confidence, greater validity and credibility of data collection. Qualitative research underlines the existence of multiple realities, which is why the method is used for this study. The participant observations approved that concepts and theory could emerge from data and allow an open mind on the outline of the research. Through the participant observations and the non-probability purposive sampling method the units of analysis have been established. The CE transition indicators have been proven to be helpful in the operationalization of variables. Since decently measuring the progress of the CE transition is challenging (Potting *et al.*, 2017). The program Atlas.ti has been used because of the systematic and thorough approach to qualitative data analysis of the program. The analysis of narrative data requires for a large part structuring and defining categories (Renner & Taylor-Powell, 2003), that is why is chosen to use the VMT for the analysis. Overall, the conceptualisation of theory and methods has led to thought provoking conclusions in the transition process towards CE in the T&C industry in NL.

6. Limitations

Regardless of the analysis on the transition process towards CE, this study is not free of limitations. The study has its limitations in both internal and external validity, reliability and replicability. In addition, the case study of the Textile Network is difficult to generalise repeatable because of the small population. Nevertheless, the case study serves an exemplary case. The choice for the case study results in the consequence that random sampling methods are not used. A set of different interviewees and a different setting for the participant observations could have given a different perspective. The disadvantage of qualitative and ethnographic research is that the methods are rather time consuming due to intensive collection, transcription of data and analysis phases. The use of the triangulation approach was useful for increasing the quality of the research, but resulted in a large amount of data to be analysed. The feasibility for this study had its constraints. The scope of this study is limited due to the fact it is a Masters thesis and has its time constraints. The MLP, use of program Atlas.ti and the VMT have been helpful in the structuring and analysis of the data. The replicability of this study is in danger

because of the choice for the case study and in-depth semi-structured interviews. However, the use of the CE transition indicators increased the replicability. The internal validity related to causality can be narrow in qualitative research. Yet the use of the MLP has deemed to reduce the problems with internal validity. Likewise the VMT has been proven to be an effective tool to limit issues with the internal validity. With the external validity, questions are raised whether the results of a study can be generalized beyond the specific research context. In the case of this study there is chosen for a specific sector: the T&C industry and a specific country: NL. The transition towards CE can be studied in a different sector, it is not limited to the T&C industry. Further, the transition towards CE can be studied in different countries in the T&C industry or in other industries.

7. Further research and recommendations

First of all, the societal relevance of research in CE is significant. Since we are reaching planetary boundaries, future research could contribute to the current debate on how to develop ‘closed loop’ circular supply chains in a regenerative economy in order to overcome resource scarcity and all social and cultural aspects that go along with it. A cross-comparison of the transition process in the T&C industry between different countries or other cultural industries could provide interesting new insights. Research with other methods, such as a quantitative survey with the CE transition indicators among a larger sample in the T&C industry could lead to a more generalized view on the transition process.

This study has been an exploratory study of the transition process towards CE in the T&C industry in NL. This study has aimed to study the three levels of the MLP but further research into one specific layer could lead to a deepening of the research. Research on the implications of innovation and policy and the assessment thereof is desirable. This study has demonstrated how important multi-stakeholder collaboration is in the innovation processes which lead to a dominant system and greater levels of transition. However further research in how the dominant system functions and what the role of intermediaries in the process of transition would be is preferable.

This study has touched upon the value of culture in sustainability or CE development. However further research on for example how *creative commons* differ from *innovation commons* and what their role is in the transitioning process towards CE could

be developed. This could perhaps lead to new insights on how intrinsic motivation is playing a role in CE development. The role of the consumer / citizen in the fashion/T&C industry has not been touched upon in this study, which could be further developed. Likewise further research in the role and process of radical transparency and traceability in relation to digitalisation in the transition towards CE is needed. The study acknowledges the need for circular design methods, but further research in the barriers towards implementation could be useful. All in all, we can conclude that research in this field further research is needed and versatile yet challenging and promising, since it is serving a good cause.

8. Bibliography

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Appendix A: Interview guide

Interviewee	
Location, date/time	
Target group	Professionals in the T&C industry in the Netherlands. Divided over the Multi-level-perspective (MLP) macro (<i>sociotechnical landscape</i>), meso (<i>sociotechnical regimes</i>) and micro (<i>niche-innovations</i>).
Report	This research is conducted for academic purposes for the thesis research for the master Cultural Economics & Entrepreneurship at the Erasmus University of Rotterdam. The research is carried out by master student Maartje Janse. The thesis supervisor is Dr. Mariangela Lavanga.
Procedure	<ul style="list-style-type: none"> - Introduce yourself and ask the interviewee to introduce himself. - As interviewee you don't have to answer to questions - Interviewee can notify when the interview need to stop or pause at any time -The interview will be recorded and will only be used for academic purpose, do you give permission to that? - Tell the interviewee there are no right or wrong answers we are looking just for your experiences and opinions.
Nr	Question
Theme:	Existing industry structures / knowledge on CE
1	Do you know what circular economy is? / What is CE for you?
2	If yes, how did you learn about circular economy?
3	Do you participate in or lead circular economy related initiatives? If yes, how important is that for you?
4	Which aspects of CE do you apply to your business/professional life?
5	Do you use measurable circular economy targets in your business/professional life? If yes, which ones?
6	To what extent is your innovation function(s) (R&D, R&I, or any functions that develop new products and services) geared toward designing materials/products/services along circular economy principles?
7	If yes, what are these? Define in the pre-production stage, production, use, end-of-life stage
8	What % of your products (by mass) are designed along circular economy principles?
9	Are you aware of the material footprint, chemical use, water use, emissions levels of your business?

10	Have you considered moving to CE revenue models with increased reuse of products and components, or models based on providing a service rather than offering a product?
11	Are processes for identifying, assessing, and managing risks related to the transition to a circular economy, as well as the business opportunities that result from the transition, integrated into your organisational risk management?
12	What are the main barriers and possibilities you identify in the transition towards CE in the T&C industry in NL?
13	At what level are you able to improve circularity in the T&C industry in NL?
Theme:	Stakeholders
14	Are all relevant product chain partners actively involved in realising CE solutions?
15	To what extent do you engage with suppliers to increase sourcing based on circular economy principles?
16	How can various stakeholders overcome problems concerning knowledge transfers in your opinion?
17	Is there a clear vision among product chain partners of the pursued circularity strategy?
18	Does this circularity strategy structure the activities of the product chain partners?
19	How do you think an increase in transparency and traceability can be created in the T&C in NL?
20	Are collaborating companies investing sufficiently?
21	Are there monitoring frameworks for the effectiveness in multi-stakeholder processes that support the achievement of the sustainable development goals in NL?
Theme:	Transition
22	Is there resistance against CE solutions in the T&C in NL?
23	If yes, what kind of resistance?
24	Do you think that sufficient action is being taken to overcome resistance against CE solutions in the T&C in NL?
25	What factors do you think are important in the transition towards CE in the T&C industry in NL?
26	Is the level of knowledge exchange on CE solutions high enough in the product chain?
27	Do you think there is sufficient funding available for realising CE solutions in NL?
28	Do you identify green early-stage investments in the T&C sector in NL and what is the monetary value of those investments?

29	If we consider the linear economy as ‘old regime’ and the circular economy as ‘new regime’ (see image), at what stage are we with the ‘old regime’ and at what stage are we with the ‘new regime’?
30	Could you give an indication from 0-10 at what stage the transition in CE of the T&C industry in NL currently is?
Theme:	Governance
31	What role could policies play in the transition process to a circular economy in the T&C industry in The Netherlands in your opinion?
32	What do you think of the current mechanisms in place to enhance policy coherence of sustainable development in NL?
33	What kind of (policy) instruments would you consider to use in the transition?
Theme:	Alternative value creation
34	What is for you the main reason to contribute to the transition towards CE in T&C in NL?
35	How would you redefine the value proposition in the transition into CE in T&C industry in the Netherlands?
36	Considering the current situation with the Corona Covid-19 crisis, do see challenges and or possibilities for the future in the T&C industry with regards to CE?
	To round it up, do you have any questions yourself, or would you like to add something?
	Thank you very much for your time and your knowledge, this interview was very valuable!

Appendix B: Overview of interviewees

Participant	int. date & time	case	age	gender	level of education	place of residence	back ground	occupation	overview of material coll	measuring in (interview guide, analysis inst)
Holly Syrett	08-04-'20, 11.00	macro	+30	female	BA AMFI fashion and branding	Amsterdam	British / Dutch	Project Manager Higg Transparency at Sustainable Apparel Coalition and transferred during the research to Senior Sustainability Manager at, Global Fashion Agenda	interview (skype)	interview guide, LinkedIn profile
Pals Brust	08-04-'20, 17.00	meso	+50	male		Haarlem	Dutch	Co-founder Upset Textiles Co-founder of Sympact, 38 years of experience at C&A, director of store operations	participant observations, interview (skype)	interview guide, LinkedIn profile, company website
Francisco van Benthum	09-04-20, 08.30	micro	+40	male	BA Fashion Design ArtEZ, MA fashion design ArtEZ	Amsterdam	Dutch	Creative director + co-founder Hacked-by	interview (skype)	interview guide, LinkedIn profile, company website
Michiel van Yperen	10-04-'20, 10.00	macro	+40	male	Wageningen university, teaching sciences	Utrecht	Dutch	Transition manager MVO Nederland	participant observations, interview (skype)	interview guide, LinkedIn profile
Fioen van Balgooi	14-04-'20, 9.30	meso	+30	female	BA Fashion design at HKU, MA Fashion design focus on textiles	Utrecht	Dutch	Facilitator and network manager MVO Nederland	participant observations, interview (skype)	interview guide, LinkedIn profile
Zoé Daemen	15-04-'20 9.30	meso	+25	female	BA fashion communication, HKU	Utrecht	Dutch	CR manager at Kuyichi	interview (skype)	interview guide, LinkedIn profile
Ellen Sillekens	28-04-'20, 16.00	meso	+40	female	BA 3D design, HKU	Utrecht	Dutch	Innovation manager at Sympany & Circo trainer	participant observations, interview (skype)	interview guide, LinkedIn profile
Pascal Penning	21-04-'20 14.00	micro	+40	male	Fysiotherapist	Leende	Dutch	Owner PB Protection	interview (skype)	interview guide, LinkedIn profile
Anouk Beckers	28-04-'20 10.00	micro	+25	female	BA Social Psychology, BA Fashion design Rietveld Academy	Amsterdam	Dutch	Owner Join Collective clothes	interview (skype)	interview guide, LinkedIn profile

Appendix C: Consent request form for interviews

CONSENT REQUEST FOR PARTICIPATING IN RESEARCH

FOR QUESTIONS ABOUT THE STUDY, CONTACT:

Maartje Janse, Marowijnestraat 3A 1058 VS, Amsterdam, mwjanse@gmail.com, 0650870802

DESCRIPTION

You are invited to participate in a research about the transition to CE in the T&C industry in the Netherlands. The purpose of the study is to understand what factors influence the transition and how value is refined in the process of the transition.

Your acceptance to participate in this study means that you accept to be interviewed and to be observed while you are in your professional role.

In general terms:

- The interview questions will be related to circular economy, transition processes stakeholders, policy and value creation in the T&C industry in the Netherlands
- your participation in the experiment will be related to your knowledge about the topics
- My observations will focus on the multi-level-perspective, values, transition processes and circular economy in the T&C industry in the Netherlands.

Unless you prefer that no recordings are made, I will use a mobile recorder for the interview.

You are always free not to answer any particular question, and/or stop participating at any point. Every time I want to accompany you in any activity such as business meetings, I will ask you your permission again.

RISKS AND BENEFITS

As far as I can tell, there are no risks associated with participating in this research. Yet, you are free to decide whether I should use your name or other identifying information such as name / job occupation / institution / company not in the study.

If you prefer, I will make sure that you cannot be identified, by pseudonym / general identification / only mentioning age / gender.

I will use the material from the interviews and my observation exclusively for academic work in relation to the master thesis held by the Erasmus University of Rotterdam, master Cultural Economics & Entrepreneurship. The thesis will be filed in a digital database for master theses and will not be published online or offline. If there is a request to do so, I will contact you and we will discuss the possibilities.

TIME INVOLVEMENT

Your participation in this study will take approximately one hour.

You may interrupt your participation at any time.

PAYMENTS

There will be no monetary compensation for your participation.

PARTICIPANTS' RIGHTS

If you have decided to accept to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You have the right to refuse to answer particular questions. If you prefer, your identity will be made known in all written data resulting from the study. Otherwise, your individual privacy will be maintained in all published and written data resulting from the study.

CONTACTS AND QUESTIONS

If you have questions about your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact –anonymously, if you wish– thesis supervisor: Dr. Mariangela Lavanga, faculty Erasmus School of History, Culture and Communication (email: lavanga@eshcc.eur.nl)

SIGNING THE CONSENT FORM

If you sign this consent form, your signature will be the only documentation of your identity. Thus, you DO NOT NEED to sign this form. In order to minimize risks and protect your identity, you may prefer to consent orally. Your oral consent is sufficient.

I give consent to be audiotaped during this study:

Name:

Signature:

Date:

I prefer my identity to be revealed in all written data resulting from this study

Name:

Signature:

Date:

This copy of the consent form is for you to keep.

Appendix D: Notes of Participant Observations

Log internship at MVO Nederland

Date	Place	Tasks	Notes
06-12-'19	office MVO	understanding operational systems, meeting team + MVO staff, reading internal documents working on blog: how sustainable fashion can benefit from digitalization	Fioen van Balgooi: Knowledge manager Textiles Network Michiel van Yperen: transition manager. structured work environment, clear tasks description, quite some personal input, orienting in ICT systems.
13-12-'19	office MVO	continue on blog: how sustainable fashion can benefit from digitalization. blog 'modediegoedzit', fashion covenant topics	orienting in ICT systems, continuing and finishing digitalization blog.
18-12-2019		Clean & Unique meeting → specialized partners, textile producers, fashion brands, etc. Promoted MVO and at internship report on the meeting	
20-12-'19	office MVO	Clothes the Circle meeting blog 'modediegoedzit' fashion covenant topics	Attending CtC meeting, (see document 'Notulen'). informative meeting with updates of consortium partners. Meeting after with Ellen Sillekens of Sympany (textile sorting company) and Circo circular design workshop leader. Planned a meeting for 13th of January at Sympany. continued with writing notes on the meeting
27-12-'19		Holiday	
03-01-'20	home	blog 'modediegoedzit' fashion covenant topics	Working on blogs on topics of the covenant sustainable fashion with topics 'forced labour' and 'animal welfare'. Interesting topics and gained insights on best practices in this area
10-01-'20	office MVO	blog 'modediegoedzit' fashion covenant topics tasks for NE20 event checking network list	-worked on a blog with covenant sustainable fashion topic 'gender equality', -worked on the NE20 presentation for the breakout session 'De textielsector daagt je uit'. -Checked the acquisition list on correct contact details / names. -worked on the digitalisation blog - got introduced to members of the DCTV project. Got in contact with Puck Middelkoop from Circle Economy
13-01-2019	Sympa ny	meeting with innovation manager Ellen Sillekens	Meeting to discuss if and how my master thesis can be used to collaborate with textile sorter Sympany. Notes are developed

17-01-'20	office MVO	tasks for NE20 event acquisition list list with circular organisations for DCTV	Finishing the powerpoint of NE20 event, finished the acquisition list, started with gathering contact details for the list with circular organisations in NL for Puck Middelkoop of Circl Economy, for DCTV
23+24/01/'20	event NE20	NE20 event Thursday → meeting Friday: notes meeting list with circular organisations for DCTV	Assisted with the break out session: "The textiles sector challenges you!". 3 pitches of network members with their challenges and 3 rounds with feedback from participants. Talked to several interesting industry players during the event.
31-01-'20	office MVO	list with textile innovations for Fioen list with circular organisations for DCTV	working on a list and doing research on most innovative and new textile innovations worldwide. Very interesting to see what is happening now. (external document)
07-02-'20		Clothes the Circle meeting , working on the notes of the meeting	having a flu, not at MVO
14-02-'20	office MVO	Clothes the Circle meeting notes	working on the CtC meeting notes from an audio file. working on the acquisition list for the Textiles Network from their Insightly network system.
21-02-'20	office MVO	blog 'modediegoedzit' fashion convenant topics	Working on the Textiles innovation list. Working on blog themes for 'modediegoedzit' Working on DCTV circular innovations list
28-02-'20	office MVO	blog 'modediegoedzit' fashion convenant topics	Working on blog post for 'modediegoedzit'. Meeting with Fioen about internship
06-03-'20	Day off to prepare for investors meeting circular business model for festival organisation		
13-03-'20	workin g from home (corona virus)	blog 'modediegoedzit' fashion convenant topics blog on CFG investors meeting textiles innovation list	Meeting with Fioen & Michiel about internship tasks + master thesis research. documents on the Network Textiles, vision of MVO Nederland.
17-03-20		call with Shirley Justice & Fioen	call about financial and other agreements in collaborative work environments with lawyer and network manager/ facilitator, see notes.
20-03-'20		assist with agreement collaborative work environment textiles innovation list blog on CFG investors meeting	Clothes the Circle meeting (canceled because of coronavirus)
27-03-'20		translate blog digitalisation working on funding application for circular	meeting with Fioen on developments in the Textiles Network. List with challenges for the partners. Talking about funding application process

		production chain. conscious contracting at the CtC	
03-04-'20		blog 'modediegoedzit' fashion covenant topics translate blog digitalisation finish	meeting with Fioen on developments in the Textiles Network. Talking about funding application, challenges etc.
10-04-'20		blog 'modediegoedzit' fashion covenant topics textiles innovation list	Interview with Michiel for master thesis. Interview with Pals Brust (08-04-2020)
17-04-'20		blog 'modediegoedzit' fashion covenant topics	Interview with Fioen for master thesis (14-04-2020). Meeting with Fioen about developments at Network Textiles. New partner, + Sympany has challenges with Coronavirus.
24-04-'20		finish blog 'modediegoedzit' fashion covenant topics	Interview with Pascal Penning from PB Protection, on recommendation of Fioen for master thesis (21-04-2020). Meeting with other interns of MVO to talk about experiences.
1-05-'20		Clothes the Circle meeting make notes of meeting finish translation of blog	Meeting with Fioen & Michiel about experiences internship Interview with Ellen Sillekens (Sympany) (28-04-2020)

Appendix E: List of documents for DA

1. POSITIONERING 2020_COMMUNICATIE- EN CONTENTSTRATEGIE FINAL
2. Jaarplan 2020 MVO Nederland
3. 191023 Jaarplan 2020 MVO Netwerk Textiel
4. 191204_Samenvatting jaarplan 2020 MVO netwerk textiel
5. 20190821_AmbitiedocCtC_terondertekening
6. 20191204 Technische Unie Proposal FINAL-compressed
7. Notities break out sessie NE20 event
8. Circulaire koplopers
9. Model projectplan Circulaire ketenprojecten 2020
10. Uitdagingen netwerk Textielpartners
11. Commerciële samenwerkingsafspraken
12. 20200327CtC_subsidie
13. 20191115 Clothes the Circle verslag
14. 20191220 Clothes the Circle verslag
15. 20200107 Clothes the Circle verslag
16. 20200501 Clothes the Circle verslag

Appendix F: Operationalisation of variables

Operationalization					Research methods/ Data source		
Measures	Indicators, theory				P O	D A	I Q
Concepts/Dimension(s)	Indicator(s)	source	Indicator(s)	source			
TT: Systems thinking	technological change, innovations	Loorbach et al (2017), Geels & Schot (2007), Handke,	17.6.1 Number of science and/or technology cooperation agreements and programmes in NL, by type of cooperation	SDI		x	
			17.7.1 Total amount of approved funding for developing countries to promote the development, transfer, dissemination and diffusion of environmentally sound technologies	SDI		x	x
			Total R&D, Technology developments (number of inventions, registered with patents), International collaboration on technology development (number of co-inventions between countries, with or without patents) , technology diffusion (number of inventions with patent).	GGI	x	x	x
			1.2 Total R&D personnel and researchers (% of total employment) 1.3 Total value of green early-stage investments (USD/capita)	RE	x	x	x
			<u>3. Eco-innovation outputs</u> 3.1 Eco-innovation related patents (per million population)	RE		x	
			Supporting research and innovation Eco-innovation index	RM	x		
			<u>Mobilisation of means</u> Is there sufficient funding for realising CE solutions?	PBL			
						<u>Knowledge development</u> - Does the available knowledge suffice to develop CE solutions (with regard to technology, patents, consumer and chain actor behaviour)?	PBL
		Bathelt et al	Activities Knowledge exchange - Is the level of knowledge exchange on CE solutions high enough in the product chain?	PBL	x		x
TT: Multilevel dynamics: Higher-level transition	Acceleration	(Loorbach, et al, 2017)	- Is sufficient action being taken to overcome resistance against CE solutions?	PBL			x
TT: Multilevel dynamics: Lower-level transitions	Optimization	(Loorbach, et al, 2017)	Are there specific physical means limiting the realisation of CE solutions?	PBL			
	Destabilisation		<u>Overcoming resistance</u>	PBL			

			- Is there resistance against CE solutions (among product chain partners, or in the form of regulatory barriers)?				
TT: multi-actor dynamics			- Are all relevant product chain partners actively involved in realising CE solutions?	PBL			x
			Giving direction to search (vision, expectations of governments and core-actors, regulations) - Is there a clear vision among product chain partners of the pursued circularity strategy? - Do product chain partners broadly share this circularity strategy? - Does this circularity strategy structure the activities of the product chain partners?	PBL			
			5a. To what extent do you engage with suppliers to increase sourcing based on circular economy principles?	C			
Meta	TT	MLP, Sociotechnical landscape (macro)					
	Policy & CSR	Geels & Schot (2007)	17.14.1 Number of mechanisms in place to enhance policy coherence of sustainable development in NL	SDI	x	x	x
			17.16.1 Number of reporting progress in multi-stakeholder development effectiveness monitoring frameworks that support the achievement of the sustainable development goals in NL	SDI	x	x	x
			12.1.1 Number of amount of sustainable consumption and production (SCP) national action plans or SCP mainstreamed as a priority or a target into national policies	SDI		x	
			12.4.1 Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement	SDI	x	x	x
			12.5.1 National recycling rate, tons of material recycled	SDI		x	
			12.a.1 Amount of support to developing countries on research and development for sustainable consumption and production and environmentally sound technologies	SDI		x	
			Government R&D budgets <u>Taxes and subsidies</u> : environmental tax related revenue, effective carbon rates, support for fossil fuels	GGI		x	
			<u>1. Eco-innovation inputs p. 32</u> 1.1 Governments environmental and energy R&D appropriations and outlays (% of GDP)	RE		x	
			Environmental tax revenues, Energy taxes	RM		x	
			Governance: standard-setting framework, policy and institutional framework, infrastructures, civil society in governance	CDI S	x	x	x
Meta	TT	MLP, Sociotechnical regime (meso)					

Creative Industries: cycles of creation, production and distribution of goods and services	knowledge-based creative activities, revenues from trade and IPR	(UNCTAD, 2008, 13)	Circular activities: This refers to the level of remanufacturing, sharing and other relevant activities.	CEI	x	x	x
T&C industry: textiles industry	yarn, textiles and fabrics	(European Parliament, 2019)	Pre-manufacturing: Minimize energy consumption during pre-production and production; Minimizing Material Content; Minimizing Material Consumption; Selection of Non-toxic and Harmless Resources; Selecting Non-toxic and Harmless Energy Resources; Select Renewable and Bio-compatible Materials; Select Renewable and Bio-compatible Energy Resources.	EPI			
			8.4.1: Material footprint, material footprint per capita, and material footprint per GDP	SDI		x	
			8.4.2: Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP	SDI		x	
			1. Use both materials (renewable and non-renewable) suitable for technical cycle, as well as materials (renewable) suitable for biological cycle that are 'consumed' or otherwise degraded during use in business processes	C		x	x
			2. Use only materials (renewable and non-renewable) suitable for technical cycle in business processes	C		x	x
			3. Use only materials (renewable) suitable for biological cycle that are 'consumed' or otherwise degraded during use in business processes	C		x	x
			The total annual mass of inflow materials (metric tonnes) -Materials (renewable and non-renewable) suitable for the technical cycle -Materials (renewable) suitable for the biological cycle that are 'consumed' or otherwise degraded during use	C			
			6a. For materials (renewable and non-renewable) suitable for the technical cycle, what % of your materials inflow (physical material that comes into your manufacturing processes) is: • Non-virgin (including reused and recycled products and materials) • Virgin but renewable and regeneratively sourced • Virgin but renewable and sustainably sourced (this category pertains to sustainably sourced material, but such that falls short of being regenerative) other • Data not available	C			

			6b. For materials (renewable) suitable for biological cycle that are 'consumed' or otherwise degraded during use, what % of your ingredients/materials inflow is: -Both sourced from by-products/waste streams, and originally from either regeneratively OR sustainably sourced virgin materials • Sourced from by-products/waste streams • Virgin but renewable and regeneratively sourced • Virgin but renewable and sustainably sourced (this category pertains to sustainably sourced material, but such that falls short of being regenerative) • None of the above • Data not available	C			
			6c. What % of energy (electricity, heat, and fuel) for your operations is from renewable sources?	C			
T&C industry: clothing industry	the production of garments		<u>Production</u> - Is the overall (primary and secondary) consumption of materials by companies decreasing? - Do companies use fewer substances which are hazardous to human health and ecosystems? - Is production moving towards lower levels of waste generation? - Are companies moving to CE revenue models with increased reuse of products and components, or models based on providing a service rather than offering a product?	PBL			
			7a. What % (by mass) of your total outflow of materials (renewable and non-renewable) suitable for the technical cycle is waste or byproducts that go to landfill or incineration (and are therefore not recirculated)?	C			
			7b. What % (by mass) of your total outflow of materials (renewable) suitable for the biological cycle that are 'consumed', or otherwise degraded during use, is waste or byproducts that go to landfill or incineration (and are therefore not recirculated)?	C			
			7l. Do you have a plan in place for the end of life of your PPE assets (property, plant, and equipment: physical assets with a use period of one year or more) that adheres to circular economy principles?	C			
			Manufacturing and Design: Minimizing Scraps and Discards; Engage more consumption-efficient systems; Minimizing Materials Consumption During the Product Development Phase; Minimize energy consumption during pre-production and production; Minimize energy consumption during product development; Designing for Reliability (related to assembly operations). Distribution and Packaging: Minimizing or avoid Packaging.	EPI			
			Facilitating Upgrading and Adaptability;	EPI			

			Increasing the durability of the product; Engage systems of flexible materials consumption; Minimizing Materials Consumption During Usage; Select systems with energy-efficient operation and use stage; Engage dynamic consumption of energy; Facilitating Maintenance; Facilitating Repairs; Facilitating Cleaning.				
			End-of-Life Adopting the Cascade Approach; Selecting Materials with the Most Efficient Recycling Technologies; Identifying Materials; Minimizing the Overall Number of Different Incompatible Materials; Facilitating End-of-life Collection and Transportation; Provide collection and processing of the product at its end of life;	EPI e			
			Facilitating Remanufacturing; Facilitating Re-use; Facilitating Cleaning; Facilitating Disassembly.	EPI			
Meta	TT	MLP: Sociotechnical regime (meso)					
Existing industry structures: Culture	short-life cycles, high volatility, low predictability, high impulse purchasing		5b. To what extent do you engage with customers on advancing circular economy topics?	C			
			5c. To what extent do you engage with policymakers to support the transition to a circular economy? 1. No interactions involving circular economy as a topic 2. Ad-hoc interactions involving circular economy as a topic (e.g. how policy can enable circular economy business practices) 3. Ad-hoc interactions involving circular economy as a topic AND a plan in development to increase engagement 4. Regular engagement with policymakers involving circular economy as a topic 5. Regular engagement with existing results to accelerate the transition to a circular economy (e.g. through informing policies in your industry)	C			
			5d. To what extent do you engage with external investors/ financiers on circular economy topics? 1. No interactions involving circular economy as a topic 2. Ad-hoc interactions involving circular economy as a topic 3. Ad-hoc interactions involving circular economy as a topic AND a plan in development for a programme on circular economy specific financing 4. Ongoing programme on circular economy specific financing	C			
			5e. Do you participate in or lead circular economy related initiatives? Select 'lead' or 'participate' for all that apply	C			

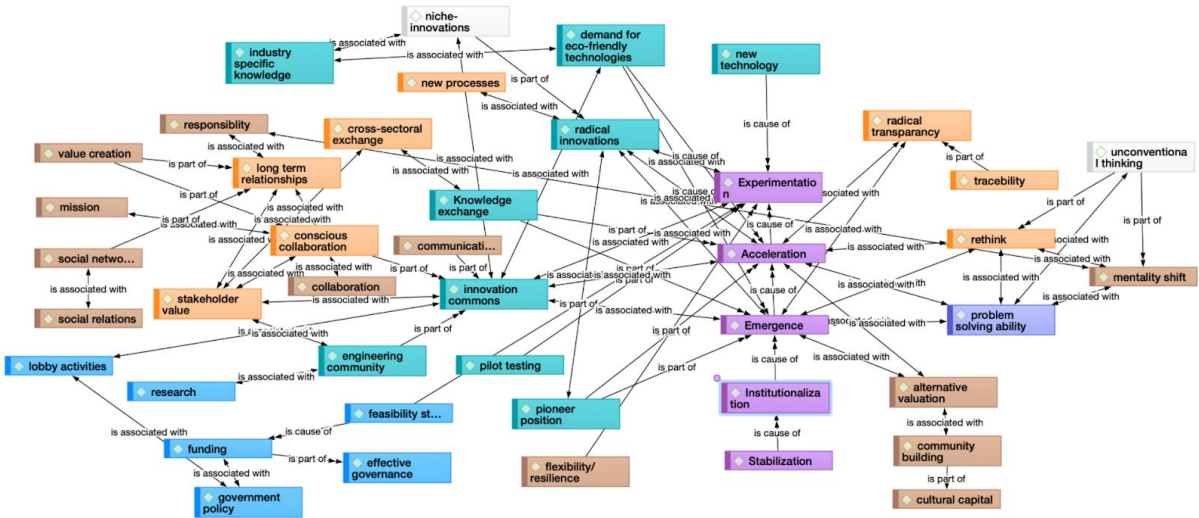
		Geels & Schot (2007). (Buchel <i>et al</i> , 2018)	4b. To what extent are processes set up to support a circular business model?	C			
			<u>2. Eco-innovation activities</u> 2.1 Firms having implemented innovation activities aiming at a reduction of material input per unit output (% of total firms) 2.2 Firms having implemented innovation activities aiming at a reduction of energy input per unit output (% of total firms) 2.3 ISO 14001 registered organisations (per million population)	RE			
			3c. In which functions do you have at least half a full time equivalent role dedicated to circular economy implementation (can be distributed amongst multiple individuals)? Please select or note all that apply. 1. Innovation (incl. design) 2. Corporate strategy 3. Supply chain management (incl. procurement) 4. Production (plant or process) management 5. Sales and marketing 6. Account management (customer relations) 7. Circular economy/sustainability function or equivalent 8. Other(s)	C			
			Organisational behaviour: Material flow accounting in organisations, remanufacturing, use of recycled raw materials, eco-innovation, per capita statistics (e.g. reduction in waste generation per capita)	IFA CE			
	CSR/ Policy		1b. Are processes for identifying, assessing, and managing risks related to the transition to a circular economy, as well as the business opportunities that result from the transition, integrated into your organisational risk management?	C			
	CSR/ Policy		1c. Is your strategy aligned with becoming more circular?	C			
	CSR/ Policy		1d. Do you have measurable circular economy targets?	C			
Existing industry structures, Practices: How the industry behaves			1f. Do you have a circular economy implementation plan?	C			
			General Activities: Minimize energy consumption during transportation and storage; Provide information to users and treatment facilities.	EPI			
Meta	TT	MLP: Technological landscapes (micro)					
	Technology & Fiber:		eco-innovation indexes	CEI	x		
			7e. What % (by mass) of your materials (renewable and nonrenewable) suitable for the technical cycle are in products that have a programme in place to prolong their initial use or increase the intensity of use? -Product design related programme (e.g. design maximising product lifespan,	C			

			materials selection process to maximise lifespan, product(s) proven to last longer than industry benchmark) <ul style="list-style-type: none"> • Business model related programme (e.g. takeback/refurbishing scheme) • No programme in place to prolong product initial use or increase the intensity of use 				
Circular design methods			2a. To what extent is your innovation function(s) (R&D, R&I, or any functions that develop new products and services) geared toward designing materials/products/business models along circular economy principles? 1. Support for circular economy innovation not planned 2. Reviewed innovation function to prepare for circular economy innovation 3. Implementing changes to innovation function to support circular economy innovation projects 4. Circular economy innovation projects are live 5. All aspects of innovation work have circular economy built into them	C			
			7c. What % of your products (by mass) are designed along circular economy principles?	C			
			<u>CE design</u> - What is the present lifespan of a product and has it increased compared to its original lifespan? - Have products become easier to disassemble? - Does the design foresee the use of recycled materials? - Are the components designed for high-grade recycling (without increasing environmental pressure)?	PBL			
			Use and maintenance: Intensifying Use; Optimizing product functionality; Designing for Reliability; Designing for Appropriate Lifespan;	EPI			
			Environment For all product groups (over the whole life cycle of a product): - Is cumulative energy consumption in MJpr decreasing per functional product unit? - Is cumulative energy consumption in MJpr decreasing for the whole sector? Environmental pressure caused by specific product groups (over the whole life cycle of a product): - Is cumulative environmental pressure decreasing per functional product unit? - Is cumulative environmental pressure decreasing for the whole sector?	PBL			
	Business models and consumer relations (FAAS)	(Buchel et al, 2018),	Experimenting by entrepreneurs - Are entrepreneurs experimenting sufficiently with CE solutions and revenue models? - Is upscaling of CE solutions already taking place?	PBL			
		7d. What % of your services (by revenue) are designed along circular economy principles?	C		x	x	

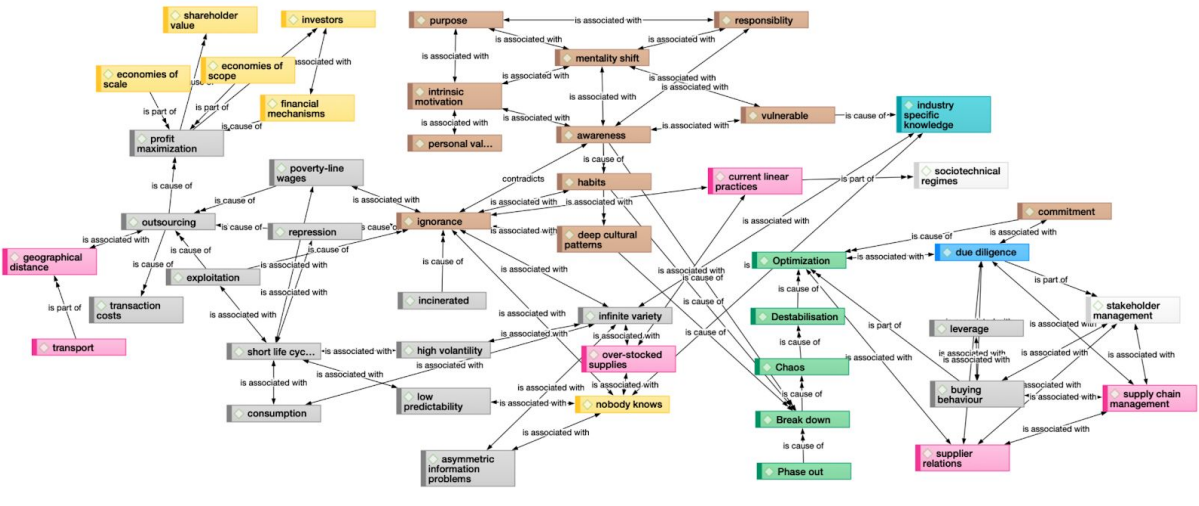
dispose	waste	Cheyne & Purdue, 1995	Waste - Is the volume of landfill decreasing in favour of incineration? - To what extent is high grade-recycling applied? - To what degree is recycling effective with regard to costs and environment?	PBL			
9R model	circular economy strategies	Potting et al, 2017	7f. What % (by mass) of your materials (renewable and nonrenewable) suitable for the technical cycle are in products that are recirculated in the following ways:	C			
	Smarter product use and manufacture		R0 Refuse: Make product redundant by abandoning its function or by offering the same function with a radically different product	C			
			R1 Rethink: Make product use more intensive (e.g. through sharing products, or by putting multi-functional products in the market)	C			
			R2 Reduce: Increase efficiency in product manufacture or use by consuming fewer natural resources and materials	C			
	Extend lifespan of product and its parts		R3 Re-use: Re-use by another consumer of discarded product which is still in good condition and fulfils its original function 7g. For products that are recirculated through reuse, how many average uses do your products have before reaching end of life?	C			
			R4 Repair: Repair and maintenance of defective product so it can be used with its original function				
			R5 Refurbish: Restore an old product and bring it up to date				
			R6 Remanufacture: Use parts of discarded product in a new product with the same function.				
	Useful application of materials		R7 Repurpose: Use parts of discarded product in a new product with a different function.				
			R8 Recycle: Process materials to obtain the same (upcycling) or lower (downcycling) quality				
R9 Recover: Incineration of materials with energy recovery							

Appendix G: Atlas.ti Networks

Higher-level transition:



Lower-level transition:



- [Acceleration] [Break down] [Chaos] [Circular Economy] [Circular] [DCTV] [Distribution] [Emergence] [Experimentation] [Institutionalization] [Knowledge exchange] [LCA] [NDA] [Optimization] [PaaS] [PaaS] [PaaS] [DME] [Textiles Network] [Accessibility] [Active engagement] [Addictive consumption] [Agentic]
- [alternative valuation] [asymmetric information problems] [availability of technology] [awareness] [balancing future benefits] [benchmarking] [Bilateral perspective] [Biodiversity] [block chain] [buying behaviour] [Carbon footprint] [Certification]
- [chain director role] [chemical recycling] [circular design perspective] [closed loop] [collaboration] [collaborative consumption] [collective] [commitment] [communication] [community building] [compare] [competitive advantage]
- [competitiveness] [complexity in mixed materials] [complexity in mixed methods] [conscious collaboration] [consumer behaviour] [consumption] [contractual] [convenant sustainable fashion] [corona] [corporate policy] [corporate social responsibility] [creation] [creativity]
- [credibility] [crisis management] [cross-sectoral exchange] [cultural capital] [current linear practices] [decision-making] [deep cultural patterns] [demand for eco-friendly technologies] [design] [design for disassembly] [design for longevity] [differentiation]
- [dynamic] [dynamic-cycling] [due diligence] [design techniques] [dynamic earning model] [eco-design] [economic capital] [economic competence] [economies of scale] [effective governance] [engineering community] [environmental capital]
- [environmental impact] [environmental impact measurement] [environmental sustainability] [evaluation] [institutional] [extended producer responsibility] [footwear] [footwear] [fashion as a service] [fashion industry]
- [flexibility issues] [financial constraints] [financial mechanisms] [flexibility/resilience] [funding] [geographical distance] [global] [government policy] [green washing] [habits] [high impulse purchasing] [high volatility]
- [incentive alignment] [inclusiveness] [increase standard of living] [individual choices] [industry specific knowledge] [industry standard] [infrastructure] [infrastructure] [informal sphere] [innovation commons]
- [intellectual property rights] [interconnectedness] [intermediaries] [intrinsic motivation] [investors] [knowledge-based activities] [labour] [leverage] [lifecycle activities] [local] [long term relationships] [long-life product cycles]
- [probability] [low prices of virgin materials] [macro-political developments] [make or buy] [market-oriented] [materiality checklist] [material recovery] [media attention] [medical workwear] [mentality shift] [mission] [modular design] [multi-actor dynamics] [multilevel dynamics]
- [dynamic] [dynamic] [network/partner structure] [new materials] [new processes] [new products] [niche-innovations] [nobody knows] [non-wearable textile waste] [open source] [opportunity] [organic materials] [orientation phase] [outsourcing] [over-stocked supplies]
- [ownership relationships] [systemic technological developments] [percentage of recycled content] [personal values] [personalized relationships] [pilot testing] [pioneer position] [post-consumer textiles waste] [post-production textiles waste] [pre-consumer textiles waste]
- [problem solving ability] [process management] [product service systems] [production] [production on demand] [profit maximization] [protection] [purpose] [radical innovations] [radical transparency] [re-distributed manufacturing perspective] [re-use] [reusable] [recycle]
- [recycled yarn] [regulation] [remuneration] [reintegration] [repression] [repurpose] [reputational] [research] [researching] [reshoring] [resource efficiency] [resource efficient technologies] [resource inefficiency] [responsibility] [retailer] [rethink] [reverse logistics] [reverse engineering] [second-hand]
- [shareholder value] [sharing revenues/risks] [slow fashion] [social capital] [social norms] [social networks] [social relations] [social responsibility] [sociotechnical landscape] [sociotechnical regimes] [stakeholder management]

[stakeholder value] [stock levels of inventory] [supplier relations] [supplier] [supply chain management] **[sustainability transition]** [trade-offs] [transition facilitation] [transport] [trust] [unconventional thinking] [unique] [up-cycling] [upcycling] [usage] [user involvement] [value creation] [value proposition] [waste management] [waste reduction] [water footprint] [workwear]

Atlas.ti code list

Col or	Name	Grounde dness	Density	Groups
●	stakeholder value	45	6	Circular economy
●	radical transparency	42	4	Circular economy
●	new processes	33	4	Circular economy
●	recycle	29	9	Circular economy
●	rethink	29	6	Circular economy
●	post-consumer textiles waste	24	5	Circular economy
●	reverse logistics	18	4	Circular economy
●	cross-sectoral exchange	15	2	Circular economy
●	ownership relationships	15	1	Circular economy
●	post-production textiles waste	15	5	Circular economy
●	conscious collaboration	15	6	Circular economy, Cultural barriers/drivers
●	textile sorters	13	8	Circular economy
●	long term relationships	12	6	Circular economy
●	repurpose	12	3	Circular economy
●	up-cycling	12	8	Circular economy
●	increase standard of living	9	0	Circular economy
●	long-life product cycles	9	11	Circular economy
●	chain director role	8	0	Circular economy
●	re-distributed manufacturing perspectives	8	2	Circular economy
●	resource efficiency	8	1	Circular economy
●	second-hand	8	2	Circular economy
●	Circular Economy	7	6	Circular economy
●	new products	7	1	Circular economy
●	non wearable textile waste	7	0	Circular economy
●	waste management	7	3	Circular economy
●	certification	6	0	Circular economy
●	closed loop	6	6	Circular economy
●	collaborative consumption	6	2	Circular economy
●	product service systems	5	1	Circular economy
●	re-use	5	1	Circular economy
●	new materials	4	1	Circular economy
●	reshoring	4	1	Circular economy
●	pre-production textiles waste	2	4	Circular economy
●	remanufacture	2	1	Circular economy
●	regenerative	2	0	Circular economy
●	co-creation	1	0	Circular economy
●	granulate	1	0	Circular economy
●	production on demand	1	1	Circular economy
●	reduce	1	1	Circular economy
●	refuse	1	1	Circular economy
●	traceability	1	1	Circular economy
●	recover	0	1	Circular economy
●	refurbish	0	1	Circular economy

●	repair	0	1	Circular economy
Col or	Name	Grounde dness	Density	Groups
●	circular design perspective	39	0	Circular fashion
●	complexity in mixed materials	18	0	Circular fashion, Technological barriers/drivers
●	recycled yarn	17	0	Circular fashion
●	problem solving ability	16	5	Circular fashion
●	industry standard	15	0	Circular fashion
●	CtC	14	0	Circular fashion
●	creativity	12	0	Circular fashion
●	fashion as a service	12	0	Circular fashion
●	fashion industry	11	0	Circular fashion
●	Textiles Network	10	0	Circular fashion
●	workwear	10	0	Circular fashion
●	felt	8	2	Circular fashion
●	chemical recycling	7	2	Circular fashion
●	modular design	7	0	Circular fashion
●	textiles industry	6	0	Circular fashion
●	design for longevity	5	0	Circular fashion
●	slow fashion	4	0	Circular fashion
●	design for disassembly	3	0	Circular fashion
●	denim	2	0	Circular fashion
●	dyeing techniques	2	0	Circular fashion
●	percentage of recycled content	2	1	Circular fashion
●	fabrics	1	0	Circular fashion
●	functional	1	0	Circular fashion
●	mechanical recycling	1	0	Circular fashion
●	organic recycling	1	2	Circular fashion
●	personalisation	1	0	Circular fashion
Col or	Name	Grounde dness	Density	Groups
●	conscious collaboration	15	6	Circular economy, Cultural barriers/drivers
●	collaboration	61	1	Cultural barriers/drivers
●	alternative valuation	44	3	Cultural barriers/drivers
●	awareness	35	8	Cultural barriers/drivers
●	responsibility	32	4	Cultural barriers/drivers
●	mentality shift	26	8	Cultural barriers/drivers
●	value creation	26	2	Cultural barriers/drivers
●	deep cultural patterns	19	3	Cultural barriers/drivers
●	user involvement	16	0	Cultural barriers/drivers
●	commitment	15	2	Cultural barriers/drivers
●	cultural capital	14	1	Cultural barriers/drivers
●	intrinsic motivation	14	4	Cultural barriers/drivers
●	purpose	14	3	Cultural barriers/drivers
●	communication	13	1	Cultural barriers/drivers
●	flexibility/resilience	13	1	Cultural barriers/drivers
●	habits	13	3	Cultural barriers/drivers

●	social networks	11	2	Cultural barriers/drivers
●	trust	11	0	Cultural barriers/drivers
●	credibility	10	0	Cultural barriers/drivers
●	personal values	10	1	Cultural barriers/drivers
●	symbolic	10	0	Cultural barriers/drivers
●	inclusivity	9	0	Cultural barriers/drivers
●	community building	8	2	Cultural barriers/drivers
●	ignorance	7	10	Cultural barriers/drivers
●	decisiveness	6	0	Cultural barriers/drivers
●	social capital	6	0	Cultural barriers/drivers
●	social relations	6	1	Cultural barriers/drivers
●	urge	6	0	Cultural barriers/drivers
●	active engagement	5	0	Cultural barriers/drivers
●	mission	5	1	Cultural barriers/drivers
●	personalized relationships	5	0	Cultural barriers/drivers
●	value proposition	5	0	Cultural barriers/drivers
●	reputational	4	0	Cultural barriers/drivers
●	holistic	3	0	Cultural barriers/drivers
●	informal sphere	3	0	Cultural barriers/drivers
●	media attention	3	0	Cultural barriers/drivers
●	accessibility	2	0	Cultural barriers/drivers
●	ego	2	0	Cultural barriers/drivers
●	green washing	2	0	Cultural barriers/drivers
●	recognition	2	0	Cultural barriers/drivers
●	social inertia	2	0	Cultural barriers/drivers
●	balance	1	0	Cultural barriers/drivers
●	power	1	0	Cultural barriers/drivers
●	vulnerable	1	3	Cultural barriers/drivers
●	societal changes	0	0	Cultural barriers/drivers
●	use	0	0	Cultural barriers/drivers
Col		Grounde		
or	Name	dness	Density	Groups
●	incentive alignment	45	0	Economic barriers/drivers
●	trade-offs	37	0	Economic barriers/drivers
●	economic competence	29	0	Economic barriers/drivers
●	financial mechanisms	26	2	Economic barriers/drivers
●	financial constraints	16	2	Economic barriers/drivers
●	balancing future benefits	13	0	Economic barriers/drivers
●	economies of scale	13	1	Economic barriers/drivers
●	nobody knows	12	5	Economic barriers/drivers
●	benchmarking	9	0	Economic barriers/drivers
●	differentiation	8	0	Economic barriers/drivers
●	shareholder value	8	1	Economic barriers/drivers
●	competitive advantage	6	0	Economic barriers/drivers
●	collecting	4	1	Economic barriers/drivers
●	dynamic earning model	4	0	Economic barriers/drivers
●	investors	4	2	Economic barriers/drivers
●	sharing revenues/risks	4	0	Economic barriers/drivers

●	capital intensive	2	0	Economic barriers/drivers
●	economic capital	2	0	Economic barriers/drivers
●	economic growth	1	0	Economic barriers/drivers
●	entrepreneurial spirit	1	0	Economic barriers/drivers
●	facilitation of joint investment	1	0	Economic barriers/drivers
●	free riding	1	0	Economic barriers/drivers
●	security	1	0	Economic barriers/drivers
●	economies of scope	0	1	Economic barriers/drivers
Col		Grounde		
or	Name	dness	Density	Groups
●	environmental impact	45	0	Environmental
●	environmental impact measurement	30	0	Environmental
●	LCA	12	0	Environmental
●	environmental sustainability	7	0	Environmental
●	environmental capital	5	0	Environmental
●	water reduction	5	0	Environmental
●	biodiversity	4	0	Environmental
●	natural resources	2	0	Environmental
●	water conditions	2	0	Environmental
Col		Grounde		
or	Name	dness	Density	Groups
●	effective governance	56	2	Governance
●	government policy	41	2	Governance
●	funding	30	3	Governance
●	social responsibility	30	0	Governance
●	covenant sustainable fashion	18	0	Governance
●	DCTV	18	0	Governance
●	regulation	13	0	Governance
●	extended producer responsibility	11	0	Governance
●	research	10	1	Governance
●	lobby activities	8	2	Governance
●	corporate policy	7	0	Governance
●	intellectual property rights	6	0	Governance
●	contracting	5	0	Governance
●	sustainable education	5	0	Governance
●	due diligence	4	7	Governance
●	open source	4	0	Governance
●	CO2 tax	3	0	Governance
●	evaluation	3	0	Governance
●	NDA	3	0	Governance
●	fair practice	2	0	Governance
●	feasibility study	2	2	Governance
●	researchers	2	0	Governance
●	consumption tax	1	0	Governance
●	cradle to cradle	1	0	Governance
●	import duties	1	0	Governance
Col		Grounde		
or	Name	dness	Density	Groups
●	Emergence	18	12	Higher-level transition

●	Experimentation	17	8	Higher-level transition
●	Acceleration	11	12	Higher-level transition
●	Institutionalization	2	3	Higher-level transition
●	Stabilization	0	2	Higher-level transition
Col or	Name	Grounde dness	Density	Groups
●	Break down	14	5	Lower-level transition
●	Chaos	8	2	Lower-level transition
●	Destabilisation	2	2	Lower-level transition
●	Optimization	2	5	Lower-level transition
●	Phase out	0	1	Lower-level transition
Col or	Name	Grounde dness	Density	Groups
●	market-oriented	25	0	Market barriers/drivers
●	asymmetric information problems	15	2	Market barriers/drivers
●	buying behaviour	11	5	Market barriers/drivers
●	competitiveness	10	0	Market barriers/drivers
●	leverage	9	1	Market barriers/drivers
●	protection	8	0	Market barriers/drivers
●	consumption	7	2	Market barriers/drivers
●	outsourcing	6	6	Market barriers/drivers
●	upscaling	6	0	Market barriers/drivers
●	high volatility	4	2	Market barriers/drivers
●	individual choices	4	0	Market barriers/drivers
●	high impulse purchasing	3	0	Market barriers/drivers
●	make or buy	3	0	Market barriers/drivers
●	profit maximization	3	6	Market barriers/drivers
●	transaction costs	3	1	Market barriers/drivers
●	addictive consumption	2	0	Market barriers/drivers
●	exploitation	2	3	Market barriers/drivers
●	incinerated	2	1	Market barriers/drivers
●	infinite variety	2	6	Market barriers/drivers
●	low predictability	2	2	Market barriers/drivers
●	Rana Plaza	2	0	Market barriers/drivers
●	repression	2	3	Market barriers/drivers
●	resource inefficiency	2	0	Market barriers/drivers
●	poverty-line wages	1	3	Market barriers/drivers
●	short life cycles	1	6	Market barriers/drivers
●	patents	0	0	Market barriers/drivers
Col or	Name	Grounde dness	Density	Groups
●	interconnectedness	36	0	Operational barriers/drivers
●	supply chain management	36	4	Operational barriers/drivers
●	current linear practices	32	3	Operational barriers/drivers
●	local	22	0	Operational barriers/drivers
●	production	22	0	Operational barriers/drivers
●	global	20	0	Operational barriers/drivers
●	creation	18	0	Operational barriers/drivers
●	consumer behaviour	17	0	Operational barriers/drivers

●	geographical distance	15	2	Operational barriers/drivers
●	supplier relations	12	4	Operational barriers/drivers
●	overstocked supplies	10	3	Operational barriers/drivers
●	down-cycling	6	4	Operational barriers/drivers
●	suppliers	6	0	Operational barriers/drivers
●	intermediaries	5	0	Operational barriers/drivers
●	retailers	5	0	Operational barriers/drivers
●	SME	5	0	Operational barriers/drivers
●	stock levels of inventory	4	0	Operational barriers/drivers
●	distribution	3	0	Operational barriers/drivers
●	lead-times	3	0	Operational barriers/drivers
●	agents	2	0	Operational barriers/drivers
●	transport	2	1	Operational barriers/drivers
●	robust infrastructure	1	0	Operational barriers/drivers
Col		Grounde		
or	Name	dness	Density	Groups
○	government policy - effective governance	22	0	Smart codes
○	effective governance - funding	9	0	Smart codes
○	conscious collaboration - innovation commons	8	0	Smart codes
○	DCTV - government policy	8	0	Smart codes
○	covenant - effective governance	7	0	Smart codes
○	effective governance - covenant	7	0	Smart codes
○	sustainability transition - effective governance - government policy	7	0	Smart codes
○	government policy - funding	6	0	Smart codes
○	DCTV - effective governance - government policy	5	0	Smart codes
○	EPR - lobby activities	4	0	Smart codes
○	effective governance - intrinsic motivation	3	0	Smart codes
○	conscious collaboration - competition	1	0	Smart codes
○	CtC- collaboration	1	0	Smart codes
Col		Grounde		
or	Name	dness	Density	Groups
●	complexity in mixed materials	18	0	Circular fashion, Technological barriers/drivers
●	innovation commons	58	10	Technological barriers/drivers
●	knowledge-based activities	27	0	Technological barriers/drivers
●	industry specific knowledge	26	5	Technological barriers/drivers
●	pioneer position	22	3	Technological barriers/drivers
●	radical innovations	19	6	Technological barriers/drivers
●	Knowledge exchange	18	3	Technological barriers/drivers
●	demand for eco-friendly technologies	15	4	Technological barriers/drivers
●	technological constraints	15	0	Technological barriers/drivers
●	availability of technology	13	3	Technological barriers/drivers
●	pilot testing	6	1	Technological barriers/drivers
●	resource efficient technologies	6	0	Technological barriers/drivers
●	block chain	4	0	Technological barriers/drivers
●	complexity in mixed methods	3	0	Technological barriers/drivers
●	eco-design	3	0	Technological barriers/drivers

●	engineering community	3	3	Technological barriers/drivers
●	low prices of virgin materials	2	0	Technological barriers/drivers
●	patterned technological developments	2	0	Technological barriers/drivers
●	incremental innovations	1	0	Technological barriers/drivers
●	technological change	1	0	Technological barriers/drivers
●	QR code	1	0	Technological barriers/drivers, Transition theory
●	new technology	0	1	Technological barriers/drivers
Col or	Name	Grounde dness	Density	Groups
●	QR code	1	0	Technological barriers/drivers, Transition theory
○	sustainability transition	133	5	Transition theory
○	transition facilitation	58	0	Transition theory
○	multi-actor dynamics	50	0	Transition theory
○	corona	44	0	Transition theory
○	unconventional thinking	41	3	Transition theory
○	stakeholder management	35	4	Transition theory
○	sociotechnical landscape	34	0	Transition theory
○	niche-innovations	30	3	Transition theory
○	crisis management	27	0	Transition theory
○	multilevel dynamics	22	0	Transition theory
○	macro-political developments	17	0	Transition theory
○	system thinking	15	0	Transition theory
○	network/partner structure	14	0	Transition theory
○	process management	14	0	Transition theory
○	sociotechnical regimes	14	1	Transition theory
○	orientation phase	9	0	Transition theory
○	bilateral perspective	7	0	Transition theory
○	compare	7	0	Transition theory
○	maturity checklist	3	0	Transition theory
○	facemasks	2	0	Transition theory
○	medical workwear	2	0	Transition theory
○	opportunity	2	0	Transition theory
○	future perspectives	1	0	Transition theory
Col or	Name	Grounde dness	Density	Groups
○	unique	89	0	

Col or	Name	Grounde dness	Density	Groups
●	stakeholder value	45	6	Circular economy
●	radical transparency	42	4	Circular economy
●	new processes	33	4	Circular economy
●	recycle	29	9	Circular economy
●	rethink	29	6	Circular economy

●	post-consumer textiles waste	24	5	Circular economy
●	reverse logistics	18	4	Circular economy
●	cross-sectoral exchange	15	2	Circular economy
●	ownership relationships	15	1	Circular economy
●	post-production textiles waste	15	5	Circular economy
●	conscious collaboration	15	6	Circular economy, Cultural barriers/drivers
●	textile sorters	13	8	Circular economy
●	long term relationships	12	6	Circular economy
●	repurpose	12	3	Circular economy
●	up-cycling	12	8	Circular economy
●	increase standard of living	9	0	Circular economy
●	long-life product cycles	9	11	Circular economy
●	chain director role	8	0	Circular economy
●	re-distributed manufacturing perspectives	8	2	Circular economy
●	resource efficiency	8	1	Circular economy
●	second-hand	8	2	Circular economy
●	Circular Economy	7	6	Circular economy
●	new products	7	1	Circular economy
●	non wearable textile waste	7	0	Circular economy
●	waste management	7	3	Circular economy
●	certification	6	0	Circular economy
●	closed loop	6	6	Circular economy
●	collaborative consumption	6	2	Circular economy
●	product service systems	5	1	Circular economy
●	re-use	5	1	Circular economy
●	new materials	4	1	Circular economy
●	reshoring	4	1	Circular economy
●	pre-production textiles waste	2	4	Circular economy
●	remanufacture	2	1	Circular economy
●	regenerative	2	0	Circular economy
●	co-creation	1	0	Circular economy
●	granulate	1	0	Circular economy
●	production on demand	1	1	Circular economy
●	reduce	1	1	Circular economy
●	refuse	1	1	Circular economy
●	traceability	1	1	Circular economy
●	recover	0	1	Circular economy
●	refurbish	0	1	Circular economy
●	repair	0	1	Circular economy
Col or	Name	Groundness	Density	Groups
●	circular design perspective	39	0	Circular fashion
●	complexity in mixed materials	18	0	Circular fashion, Technological barriers/drivers
●	recycled yarn	17	0	Circular fashion
●	problem solving ability	16	5	Circular fashion
●	industry standard	15	0	Circular fashion
●	CtC	14	0	Circular fashion

●	creativity	12	0	Circular fashion
●	fashion as a service	12	0	Circular fashion
●	fashion industry	11	0	Circular fashion
●	Textiles Network	10	0	Circular fashion
●	workwear	10	0	Circular fashion
●	felt	8	2	Circular fashion
●	chemical recycling	7	2	Circular fashion
●	modular design	7	0	Circular fashion
●	textiles industry	6	0	Circular fashion
●	design for longevity	5	0	Circular fashion
●	slow fashion	4	0	Circular fashion
●	design for disassembly	3	0	Circular fashion
●	denim	2	0	Circular fashion
●	dyeing techniques	2	0	Circular fashion
●	percentage of recycled content	2	1	Circular fashion
●	fabrics	1	0	Circular fashion
●	functional	1	0	Circular fashion
●	mechanical recycling	1	0	Circular fashion
●	organic recycling	1	2	Circular fashion
●	personalisation	1	0	Circular fashion
Col		Grounde		
or	Name	dness	Density	Groups
●	conscious collaboration	15	6	Circular economy, Cultural barriers/drivers
●	collaboration	61	1	Cultural barriers/drivers
●	alternative valuation	44	3	Cultural barriers/drivers
●	awareness	35	8	Cultural barriers/drivers
●	responsibility	32	4	Cultural barriers/drivers
●	mentality shift	26	8	Cultural barriers/drivers
●	value creation	26	2	Cultural barriers/drivers
●	deep cultural patterns	19	3	Cultural barriers/drivers
●	user involvement	16	0	Cultural barriers/drivers
●	commitment	15	2	Cultural barriers/drivers
●	cultural capital	14	1	Cultural barriers/drivers
●	intrinsic motivation	14	4	Cultural barriers/drivers
●	purpose	14	3	Cultural barriers/drivers
●	communication	13	1	Cultural barriers/drivers
●	flexibility/resilience	13	1	Cultural barriers/drivers
●	habits	13	3	Cultural barriers/drivers
●	social networks	11	2	Cultural barriers/drivers
●	trust	11	0	Cultural barriers/drivers
●	credibility	10	0	Cultural barriers/drivers
●	personal values	10	1	Cultural barriers/drivers
●	symbolic	10	0	Cultural barriers/drivers
●	inclusivity	9	0	Cultural barriers/drivers
●	community building	8	2	Cultural barriers/drivers
●	ignorance	7	10	Cultural barriers/drivers
●	decisiveness	6	0	Cultural barriers/drivers
●	social capital	6	0	Cultural barriers/drivers

●	social relations	6	1	Cultural barriers/drivers
●	urge	6	0	Cultural barriers/drivers
●	active engagement	5	0	Cultural barriers/drivers
●	mission	5	1	Cultural barriers/drivers
●	personalized relationships	5	0	Cultural barriers/drivers
●	value proposition	5	0	Cultural barriers/drivers
●	reputational	4	0	Cultural barriers/drivers
●	holistic	3	0	Cultural barriers/drivers
●	informal sphere	3	0	Cultural barriers/drivers
●	media attention	3	0	Cultural barriers/drivers
●	accessibility	2	0	Cultural barriers/drivers
●	ego	2	0	Cultural barriers/drivers
●	green washing	2	0	Cultural barriers/drivers
●	recognition	2	0	Cultural barriers/drivers
●	social inertia	2	0	Cultural barriers/drivers
●	balance	1	0	Cultural barriers/drivers
●	power	1	0	Cultural barriers/drivers
●	vulnerable	1	3	Cultural barriers/drivers
●	societal changes	0	0	Cultural barriers/drivers
●	use	0	0	Cultural barriers/drivers
Col		Grounde		
or	Name	dness	Density	Groups
●	incentive alignment	45	0	Economic barriers/drivers
●	trade-offs	37	0	Economic barriers/drivers
●	economic competence	29	0	Economic barriers/drivers
●	financial mechanisms	26	2	Economic barriers/drivers
●	financial constraints	16	2	Economic barriers/drivers
●	balancing future benefits	13	0	Economic barriers/drivers
●	economies of scale	13	1	Economic barriers/drivers
●	nobody knows	12	5	Economic barriers/drivers
●	benchmarking	9	0	Economic barriers/drivers
●	differentiation	8	0	Economic barriers/drivers
●	shareholder value	8	1	Economic barriers/drivers
●	competitive advantage	6	0	Economic barriers/drivers
●	collecting	4	1	Economic barriers/drivers
●	dynamic earning model	4	0	Economic barriers/drivers
●	investors	4	2	Economic barriers/drivers
●	sharing revenues/risks	4	0	Economic barriers/drivers
●	capital intensive	2	0	Economic barriers/drivers
●	economic capital	2	0	Economic barriers/drivers
●	economic growth	1	0	Economic barriers/drivers
●	entrepreneurial spirit	1	0	Economic barriers/drivers
●	facilitation of joint investment	1	0	Economic barriers/drivers
●	free riding	1	0	Economic barriers/drivers
●	security	1	0	Economic barriers/drivers
●	economies of scope	0	1	Economic barriers/drivers
Col		Grounde		
or	Name	dness	Density	Groups
●	environmental impact	45	0	Environmental

●	environmental impact measurement	30	0	Environmental
●	LCA	12	0	Environmental
●	environmental sustainability	7	0	Environmental
●	environmental capital	5	0	Environmental
●	water reduction	5	0	Environmental
●	biodiversity	4	0	Environmental
●	natural resources	2	0	Environmental
●	water conditions	2	0	Environmental
Col		Grounde		
or	Name	dness	Density	Groups
●	effective governance	56	2	Governance
●	government policy	41	2	Governance
●	funding	30	3	Governance
●	social responsibility	30	0	Governance
●	covenant sustainable fashion	18	0	Governance
●	DCTV	18	0	Governance
●	regulation	13	0	Governance
●	extended producer responsibility	11	0	Governance
●	research	10	1	Governance
●	lobby activities	8	2	Governance
●	corporate policy	7	0	Governance
●	intellectual property rights	6	0	Governance
●	contracting	5	0	Governance
●	sustainable education	5	0	Governance
●	due diligence	4	7	Governance
●	open source	4	0	Governance
●	CO2 tax	3	0	Governance
●	evaluation	3	0	Governance
●	NDA	3	0	Governance
●	fair practice	2	0	Governance
●	feasibility study	2	2	Governance
●	researchers	2	0	Governance
●	consumption tax	1	0	Governance
●	cradle to cradle	1	0	Governance
●	import duties	1	0	Governance
Col		Grounde		
or	Name	dness	Density	Groups
●	Emergence	18	12	Higher-level transition
●	Experimentation	17	8	Higher-level transition
●	Acceleration	11	12	Higher-level transition
●	Institutionalization	2	3	Higher-level transition
●	Stabilization	0	2	Higher-level transition
Col		Grounde		
or	Name	dness	Density	Groups
●	Break down	14	5	Lower-level transition
●	Chaos	8	2	Lower-level transition
●	Destabilisation	2	2	Lower-level transition
●	Optimization	2	5	Lower-level transition
●	Phase out	0	1	Lower-level transition

Col or	Name	Grounde dness	Density	Groups
●	market-oriented	25	0	Market barriers/drivers
●	asymmetric information problems	15	2	Market barriers/drivers
●	buying behaviour	11	5	Market barriers/drivers
●	competitiveness	10	0	Market barriers/drivers
●	leverage	9	1	Market barriers/drivers
●	protection	8	0	Market barriers/drivers
●	consumption	7	2	Market barriers/drivers
●	outsourcing	6	6	Market barriers/drivers
●	upscaling	6	0	Market barriers/drivers
●	high volatility	4	2	Market barriers/drivers
●	individual choices	4	0	Market barriers/drivers
●	high impulse purchasing	3	0	Market barriers/drivers
●	make or buy	3	0	Market barriers/drivers
●	profit maximization	3	6	Market barriers/drivers
●	transaction costs	3	1	Market barriers/drivers
●	addictive consumption	2	0	Market barriers/drivers
●	exploitation	2	3	Market barriers/drivers
●	incinerated	2	1	Market barriers/drivers
●	infinite variety	2	6	Market barriers/drivers
●	low predictability	2	2	Market barriers/drivers
●	Rana Plaza	2	0	Market barriers/drivers
●	repression	2	3	Market barriers/drivers
●	resource inefficiency	2	0	Market barriers/drivers
●	poverty-line wages	1	3	Market barriers/drivers
●	short life cycles	1	6	Market barriers/drivers
●	patents	0	0	Market barriers/drivers
Col or	Name	Grounde dness	Density	Groups
●	interconnectedness	36	0	Operational barriers/drivers
●	supply chain management	36	4	Operational barriers/drivers
●	current linear practices	32	3	Operational barriers/drivers
●	local	22	0	Operational barriers/drivers
●	production	22	0	Operational barriers/drivers
●	global	20	0	Operational barriers/drivers
●	creation	18	0	Operational barriers/drivers
●	consumer behaviour	17	0	Operational barriers/drivers
●	geographical distance	15	2	Operational barriers/drivers
●	supplier relations	12	4	Operational barriers/drivers
●	overstocked supplies	10	3	Operational barriers/drivers
●	down-cycling	6	4	Operational barriers/drivers
●	suppliers	6	0	Operational barriers/drivers
●	intermediaries	5	0	Operational barriers/drivers
●	retailers	5	0	Operational barriers/drivers
●	SME	5	0	Operational barriers/drivers
●	stock levels of inventory	4	0	Operational barriers/drivers
●	distribution	3	0	Operational barriers/drivers
●	lead-times	3	0	Operational barriers/drivers

●	agents	2	0	Operational barriers/drivers
●	transport	2	1	Operational barriers/drivers
●	robust infrastructure	1	0	Operational barriers/drivers
Col or	Name	Grounde dness	Density	Groups
○	government policy - effective governance	22	0	Smart codes
○	effective governance - funding	9	0	Smart codes
○	conscious collaboration - innovation commons	8	0	Smart codes
○	DCTV - government policy	8	0	Smart codes
○	covenant - effective governance	7	0	Smart codes
○	effective governance - covenant	7	0	Smart codes
○	sustainability transition - effective governance - government policy	7	0	Smart codes
○	government policy - funding	6	0	Smart codes
○	DCTV - effective governance - government policy	5	0	Smart codes
○	EPR - lobby activities	4	0	Smart codes
○	effective governance - intrinsic motivation	3	0	Smart codes
○	conscious collaboration - competition	1	0	Smart codes
○	CtC- collaboration	1	0	Smart codes
Col or	Name	Grounde dness	Density	Groups
●	complexity in mixed materials	18	0	Circular fashion, Technological barriers/drivers
●	innovation commons	58	10	Technological barriers/drivers
●	knowledge-based activities	27	0	Technological barriers/drivers
●	industry specific knowledge	26	5	Technological barriers/drivers
●	pioneer position	22	3	Technological barriers/drivers
●	radical innovations	19	6	Technological barriers/drivers
●	Knowledge exchange	18	3	Technological barriers/drivers
●	demand for eco-friendly technologies	15	4	Technological barriers/drivers
●	technological constraints	15	0	Technological barriers/drivers
●	availability of technology	13	3	Technological barriers/drivers
●	pilot testing	6	1	Technological barriers/drivers
●	resource efficient technologies	6	0	Technological barriers/drivers
●	block chain	4	0	Technological barriers/drivers
●	complexity in mixed methods	3	0	Technological barriers/drivers
●	eco-design	3	0	Technological barriers/drivers
●	engineering community	3	3	Technological barriers/drivers
●	low prices of virgin materials	2	0	Technological barriers/drivers
●	patterned technological developments	2	0	Technological barriers/drivers
●	incremental innovations	1	0	Technological barriers/drivers
●	technological change	1	0	Technological barriers/drivers
●	QR code	1	0	Technological barriers/drivers, Transition theory
●	new technology	0	1	Technological barriers/drivers
Col or	Name	Grounde dness	Density	Groups

●	QR code	1	0	Technological barriers/drivers, Transition theory
○	sustainability transition	133	5	Transition theory
○	transition facilitation	58	0	Transition theory
○	multi-actor dynamics	50	0	Transition theory
○	corona	44	0	Transition theory
○	unconventional thinking	41	3	Transition theory
○	stakeholder management	35	4	Transition theory
○	sociotechnical landscape	34	0	Transition theory
○	niche-innovations	30	3	Transition theory
○	crisis management	27	0	Transition theory
○	multilevel dynamics	22	0	Transition theory
○	macro-political developments	17	0	Transition theory
○	system thinking	15	0	Transition theory
○	network/partner structure	14	0	Transition theory
○	process management	14	0	Transition theory
○	sociotechnical regimes	14	1	Transition theory
○	orientation phase	9	0	Transition theory
○	bilateral perspective	7	0	Transition theory
○	compare	7	0	Transition theory
○	maturity checklist	3	0	Transition theory
○	facemasks	2	0	Transition theory
○	medical workwear	2	0	Transition theory
○	opportunity	2	0	Transition theory
○	future perspectives	1	0	Transition theory
Col or	Name	Grounde dness	Density	Groups
○	unique	89	0	