**UNIVERSITY OF VAASA**

**FACULTY OF BUSINESS STUDIES**

**DEPARTMENT OF MANAGEMENT**

Patricia Carolina Garcia Martin

**THE CIRCULAR ECONOMY IN THE FASHION INDUSTRY:**

**IMPLICATIONS AND CHALLENGES FOR ITALIAN SMEs**

Master's Thesis in
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## ABBREVIATIONS

CA: Competitive Advantage

CE: Circular Economy

CP: Cleaner Production

CR: Corporate Responsibility

CSC: Circular Supply Chain

CSCM: Circular Supply Chain Management

CSR: Corporate Social Responsibility

EPR: Extended Producer Responsibility

FSC: Forward Supply Chain

GSC: Green Supply Chain

GSCM: Green Supply Chain Management

GST: General Systems Theory

LCA: Life Cycle Assessment

PLC: Product Life Cycle

RBV: Resource Based View

RSC: Reverse Supply Chain

SC: Supply Chain

SCM: Supply Chain Management

SME: Small and Medium Enterprise

SSC: Sustainable Supply Chain

SSCM: Sustainable Supply Chain Management

TBL: Triple Bottom Line

UK: United Kingdom

**UNIVERSITY OF VAASA**
**Faculty of Business Studies**
**Author:** Patricia Carolina Garcia Martin
**Topic of the Thesis:** The Circular Economy in the fashion industry: implications and challenges for SMEs
**Name of the Supervisor:** Adam Smale
**Degree:** Master of Science in Economics and Business Administration
**Bachelor's/Master's Programme:** International Business
**Year of Entering the University:** 2014
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**ABSTRACT**
Current business practices and consumption patterns within the fashion industry have driven this sector towards the first positions in the ranking of most polluting economic systems. The situation has reached a point where mainstream sustainable practices cannot cope with the problem, leading the path to a new approach, the Circular Economy. This novel term aims to change the conception from recycling to reusing, closing the loop of economic systems transforming waste into inputs in a continuous circling of materials.

The present document studies the implications of the Circular Economy from the perspective of the most representative companies in the fashion industry, small and medium enterprises. The objective is to answer the questions regarding how these companies integrate the Circular Economy in their supply chain management practices, and which challenges they encounter in the process. Thus, it comprises an explorative research aiming to provide the bases for the discovery of new knowledge on the matter.

Data collection is based on semi-structured interviews with seven small and medium enterprises in Italy. Information is then analysed and contrasted with existing literature on the topic leading to reliable and valid answers to the questions.

Findings show how there is a difference between the relevance of Circular Economy aspects depending on the nature of the closing loop. In other words, the integration of the approach is directly related with the nature of the companies' resources, being these new or reused. At the same time, it also affects the challenges, originated within the upstream component of the chain for those organizations regenerating resources from other industries; whereas being the downstream component the main source of difficulties for those small and medium enterprises using new eco and bio resources.

# 1. INTRODUCTION

On average, a person spends around €800 per year on clothing items (Allwood, Laursen, Malvido & Bocken 2006), meaning an increase on their wardrobe storage of about 35kg, which is more than what is allowed per bag on a transnational commercial flight (Delta 2016).  Nowadays, women own 4 times more fashion items than they did in 1980, whereas fashion companies have moved from offering summer and winter lines to up to 18 different collections during one single year (Ethical Fashion Forum 2016). Fashion has become a fast consumption item, where consciousness is left behind in favour of quantity and variety. None will think of buying the same lamp in three different colours, as having one already fulfils the need for light on the bedside table. However, when it comes to clothes, pieces of garment can become obsolete just like mechanical objects, remaining on the top of the shelf for ages, while new ones replenish the front lines. As the Waste Resource Action Program (WRAP 2012) mentions in their report "*Valuing our clothes*", an average household in the UK owns more than €5000 on clothes, with about 30% of them not being used for over a year.

The worldwide value of the garment industry is estimated to be €1.3 trillion, being the women's wear alone worth €497 billion, in comparison to the men's wear at €322 billion. In 2000, the number of people working on fashion related activities was near 20,000 million; in just four years, this number has triplicate, being more than 60,000 million employed. (Stotz & Kane 2015.) But the numbers that characterise this market do not only come from economical figures; there is also another side of the coin, a side neglected or unknown by many. This industry holds the second position on the race for pollution (Ditty 2015), with an environmental impact only surpassed by the oil industry.

1.1. Fashion Industry: where glamour meets obnoxiousness

Fashion represents a stylish and glamorous industry where the final product is the focus of attention; whereas the amount of procedures, people, and resources required to produce a single item, as well as their effects on the ecosystem tend to remain behind

the scenes. In order to provide a simple vision of the situation, the following paragraphs contain a synthetic description of the steps followed by a cotton T-shirt, from harvest to disposal.

The first phase involves the agricultural activity needed to obtain the fibres. Cotton, even though fully biodegradable, is the land for 25% of the world's fertilizers, pesticides and herbicides (Chen & Burns 2006). Chemical substances that become, in some degree, part of the garment in contact with users' skin. Besides, the cultivation of this crop is known to be water intensive (Allwood, Laursen, Malvido & Bocken 2006), gradually reducing the natural water reserves which can be a major threat in drought areas.

The second step comprises the T-shirt manufacturing, characterised by finishing procedures that affect human health and can lead to vast amounts of wastewater pollution (Savin & Butnaru 2008; Challa 2015). For instance, in order to achieve a nice and bright blue T-shirt, Azo dyes, a highly contaminant type of textile colorant, are generally used during the dying process (The Parliamentary Office of Science and Technology 2014). Studies have demonstrated the link between this colorant and carcinogenic risks for the population (The Parliamentary Office of Science and Technology 2014; Akarslan & Demiralay 2015). Besides, dying is one of the phases that produces more textile effluent (Savin & Butnaru 2008; Das 2015), or in other words, polluted water with high concentration of toxic components derived from the activity of textile plants. Dying one tone of textile produces 200 tons of wastewater (Greer, Keane & Lin 2010), quantity that is enough to fulfil 1000 household bathtubs.

The next step on the chain follows the purchase, and comprises the consumer use and maintenance of the T-shirt. Doing the laundry requires about 60% of the total energy consumption used during the garment's lifecycle (Claudio 2007). Considering the amount of clothes per person and the average capacity of a household washing machine, this process can occur several times a week and even every day, becoming the main contribution to the industry's carbon footprint. In words of WRAP (2012) researchers, household emissions of carbon dioxide from textile washing and drying represent the equivalent to driving a car for almost 10,000 kilometres.

Finally, the disposal phase also represents a major concern. Post-consumer waste accounts for 64% of the total solid waste in comparison to the 32% diverted during the manufacturing processes (WRAP 2012). With a rate of disposal almost equal to the rate of consumption, the purchase of a new T-shirt implies the disposal of an "old" one, regardless of its actual condition or usability. There are four possible pathways for the unwanted T-shirt, which may be recycled, reused, incinerated or discarded into landfills (WRAP 2012). Cotton is one of the hardest materials to be recycled due to the presence of chemical dyes and other fibres (Chen & Burns 2006). Thus, even though, the T-shirt may be transformed into rags or fibre stuffing (Claudio 2007), this option remains at the queue as final destiny for the garment.

Regarding reusing procedures, second hand commercialisation within the country or in developing countries prevail as main destiny for the item. Inside a developed country, the evolution of technologies has facilitated the private reselling of clothes, with platforms such as eBay (eBay Inc. 2016) and applications like Depop (Depop 2016) targeting this need. However, due to the high volume of clothing available to resell per year, only 15% (Claudio 2007; WRAP 2012) actually happens to be repurchased. Figures are astonishing, providing an imbalanced scenario, where even if those clothes were given for free, there will not be enough people to take them (Claudio 2007). Despite second hand retailers' efforts, trying to resell something that everyone owns and can be purchased for a similar price as a new one, seems like a lost battle.

On the other hand, the T-shirt could likely be repurchased by a citizen of a developing country in one of the many markets, such as Nairobi's Gikomba Market (Crowe 2014), that commercialise piles of clothing from developed countries. Nevertheless, the style and shape of occidental clothes do not always fit with the taste and needs of different cultures. Studies on body mass index (Finucane, Stevens, Cowan, Danaei, Lin, Paciorek, Singh, Gutierrez, Lu, Bahalim, Farzadfar, Riley & Ezzati 2011) and waist circumference (Fernández, Redden, Pietrobelli & Allison 2004) show how there are substantial differences related to individuals' ethnicity. Also, the rise of local brands such as RBS, aiming to become the African version of the European fast fashion Zara (Eytan 2015), contribute to the decrease in demand of used clothes in these populations.

Consequently, one of the most probable destinies for the piece is to grow the size of the mountains of clothes that populate the landfills. As expressed by Allwood et al. (2006), from the total annual clothing and textile solid waste, 75% awaits its turn to decompose in dumping grounds. This situation leads to the emission of contaminant substances such as methane, ammonia and leachate, affecting air, ground and water (Dissanayake & Sinha 2012). It is estimated that cotton takes 1 to 5 months to fully decompose (Delaney 2013), period in which pollution will progressively harm the environment. Every day, not only cotton, but nylon, polyester, and other materials arrive to the landfills, contributing to this dangerous circle without apparent cease.

1.2. Current sustainable practices: limitations

Within the fashion industry, companies and institutions have promoted and implemented measures to reduce these consequences. For instance, one of the most well-known firms regarding sustainable practices is the Swedish brand H&M and its Conscious Foundation. The fashion brand has developed and implemented several initiatives with the aim of reducing its impact. One of them is their commitment on increasing the use of organic instead of regular cotton to minimize the environmental effect (Diderich 2013; Edelson 2015), which has been applauded both inside and outside fashion frontiers (Wilson 2013; Shen 2014; Greenpeace 2015). Another action comprises its garment collecting program, where customers can bring their no longer wanted clothes to the store (H&M 2016a); initiative also replicated by other fashion labels such as Levi Strauss & Co. (Levi Strauss & Co. 2015) or American Eagle Outfitters (American Eagle Outfitters 2013).

Nonetheless, the overall effect of these practices is hindered by their unilateral focus and lack of integration. Despite H&M efforts, from all the cotton used during manufacturing, only 21% happens to be organic (H&M 2016b). Contingency theory claims that organizational structure, strategy and environment must fit with each other in order to successfully achieve objectives (Griffin & Pustay 2013). Thus, the main drawback resides on the fact that the organization has tried to modify their sourcing method without actually modifying the rest of the components that affect this activity.

Also, clothing take-back schemes have been questioned to be a pure marketing strategy rather than a real sustainable concern. Main arguments claim that there is a lack of transparency regarding what is done with the recovered used clothes (Fletcher & Cuoco 2015), enforcing the loose strategic link of the practice. Besides, in the case of H&M, each bag of clothes brought back to the store leads to a discount voucher, to be used only on purchases of €30 or more (Gillies 2012), favouring the, ironically, unconscious fast fashion purchasing habits.

Regarding institutions, the European Union runs an Eco-label scheme that aims, through independent evaluation, to inform about products meeting a certain environmental criteria (European Commission 2016a). According to the European Commission DG Environment News Alert Service (2012), Eco-labelling in the textile industry is a way to help consumers make eco-friendly choices. However, the awarded organisations get the certification on a voluntary basis, which does not imply that owning the label is synonym of best choice for the conscious consumer. Besides, license holders may be awarded with the sign due to their outstanding performance on single environmental causes, such as using only chemical free raw materials (European Commission 2016b), whereas other sections of their supply chain remain anonymous.

But the European Union label is not the only standard setter regarding Eco-labels. According to Ecolabel Index (2016), there are currently 463 of these categorizations, with more than 100 targeting textile products (Nagurney, Yu & Floden 2015). They include both globally recognized labels, such as Better Cotton Initiative and Oeko-Tex Standard, as well as regional labels, like the AIAB Bio Fibre label in Italy (Nicholas Institute for Environmental Policy Solutions 2010). Considering that each label focuses on a specific environmental issue, with some of them containing overlapping criteria, their final contribution towards fashion sustainability lacks of effectiveness.

This view has been supported by previous research (D'Souza, Taghian, Lamb & Peretiatko 2007; Marsh 2012; Schleenbecker & Hamm 2013; Brécard 2014; Scott & Vigar-Ellis 2014) showing the confusion and misunderstanding of consumers about the differences and benefits associated with this type of environmentally friendly designations. Other scholars (D'Souza 2004; Gulbrandsen 2005; Clancy, Gunilla,

Fröling & Peters 2015) further appoint that efforts made to obtain the label do not necessarily imply an integral change, but partial improvements. As stated by Clancy et al. (2015), clothing eco-labels do not take into account all the stages of the product life cycle, leaving a gap that weakens its potential. There is a need for expansion that covers both upstream and downstream processes so recognition is given to an integrated environmentally respectful organization.

## 1.3. Why is CE the choice?

There is, thus, a need for a complete restructuration of the fashion industry, which allows organizations to not only reduce the waste, but to eliminate it. And that includes all parties and activities having a stake on the process. An approach that tries to satisfy this need is the Circular Economy (CE), where the focus does not come from solving current environmental inefficiencies, but on a complete reshaped model from design to consumption, and back to production. In simple terms, the CE works on the bases of a closed loop, where waste is eliminated from the process through its redesign and regeneration. (Ellen McArthur Foundation 2013; Ghisellini, Cialani & Ulgiati 2015; Lieder & Rashid 2016.) For instance, taking the example of a company that produces T-shirts, in very simple terms, the process comprises the transformation of fibres into the final product to then, commercialize it. After that, the customer will use the product for a period of time until he/she decides to dispose of it. At this point, instead of throwing it away, the user can bring it back to the store, where the organization can re-sell the product as it is, use it within another process or even provide it to a different company to be reused. Thus, the CE proposes to close the loop, where product life cycles are enlarged through its continuous circling within the system, reducing the need for new resources at the time that waste becomes an input. This way, the limitedness of the above mentioned sustainable practices is substituted by a circular joint action.

The Ellen McArthur Foundation (2013) is currently one of the main institutions within this field, and as stated on their report "*Towards the Circular Economy*", the implementation of CE will lead to substantially higher benefits for organizations, consumers and economies in general, than mainstream linear sustainable activities. For

instance, the analysis considers that, within an initial introductory phase, the input costs in the European Union could be reduced by €300 million per year. Besides, it is not a limited practice applicable to one sector or type of product, but an open and scalable model no matter the product life cycle length. In the same line, WRAP (2013) is at the head of the change within the UK, promoting the swift towards re-inventing, re-defining, and re-thinking environmental patrons and patterns. On their annual report (WRAP 2015), the organization highlights the benefits of a CE in contraposition to a linear model, and show evidence in different sectors including the textile.

Supporting the potential of CE, several international and national bodies provide action plans, regulations and financial resources, enhancing the need for organizations to engage in the implementation of such practices. For instance, the Circular Economy Package, led by the European Commission (2016c), establishes an action plan to be accomplished by 2030, that includes the reform of various environmental legislative proposals to meet the objectives of CE. In the same line, Eco-Innovation has developed a collaborative action with several organizations in the promotion of the EcoProFabrics project, aimed at closing the loop and reducing the textile sector environmental impact (European Commission 2016d). On a national level, the Netherlands deserves a special mention for their work on the Realisation of Acceleration of a Circular Economy project, launched back in 2014, and wishing to place CE as a governmental centrepiece during 2016 (Circle Economy 2016). Also, award programs, such as The Circulars (2016), recognize the efforts of those enterprises whose performance has been outstanding according to the CE principles.

## 1.4. The research

Consequently, it seems appropriate to tackle the mentioned environmental effects of the fashion industry through the CE approach rather than the well known and predominantly applied corporate sustainable practices. Being a relatively new term, several authors have tried to illuminate the path of organizations trying to move from the linear to the circular model. For instance, some authors (Andersen 2007; Preston 2012; George, Lin & Chen 2015) have tried to explain the functioning of a CE through

general application models and approaches. Other scholars (Ghisellini, Cialani & Ulgiati 2015; Lieder & Rashid 2016) have developed a collection of the existent CE literature, mainly characterised by empirical analysis on Chinese based companies (Yuan, Bi & Moriguichi 2006; Geng, Zhu, Doberstein & Fujita 2009; Mathews & Tan 2011; Wu, Shi, Xia & Zhu 2014) and specific industrial sectors (Sun & Tang 2010; Son, Zhang, Wang & Li 2011; Liu & Bai 2014; Fleming & Zils 2014; Lieder & Rashid 2016).

However, when it comes to the fashion industry, CE is a topic that has not been widely covered yet. On the one hand, most of the studies have focused on the consumer side, analysing consumption patterns and customer perceptions (Shen, Wang, Lo & Shum 2012; Kang, Liu & Kim 2013; Pookulangara & Shephard 2013; McNeill & Moore 2015). The fact that consumption affects the way organizations manage their environmental footprint is a widely accepted statement (Bergeron & Barbaro-Forleo 2001; McDonald & Oates 2006; Ottman, Stafford & Hartman 2006; Laroche; Paulraj 2009). The final objective is to make profits, and if customers do not care about the origin of a garment, or about the litres of water needed to produce the T-shirt they are wearing, may weaken the company's motivation to implement a CE.

But, an effective change cannot come from the customers' voice by itself; organizations need to have the will to be that change. The blue ocean strategy (Kim & Mauborgne 2015) shows how it is possible to design a business model that does not try to satisfy the current market needs, but that creates those market needs. This other side of the coin is defended by scholars (Grankvist & Biel 2007; Sandhu, Ozanne, Smallman & Cullen 2010) supporting the view of the company as the trigger for the successful implementation of environmental practices.

In this line, existing literature have explored the way textile organizations are transforming mainstream practices using their supply chain as a base. One of the earlier studies, conducted by de Brito et al. (2008), concludes that there is a need for a complete reorganisation of fashion companies, where integration and collaboration is crucial. But they left the door open for further research regarding the implications of a sustainable development regarding the current fast fashion trends. This gap has been

partially fulfilled by case studies, where specific issues such as sustainable performance (Li et al. 2014; Jakhar 2015), take-back schemes (Dissanayake & Sinha 2015) or sustainable risks (Giannakis & Papadopoulos 2016) of fashion organizations comprise the focus of the analysis. Other authors have focused on the role of collaborative relationships within supply chains (SCs). For example, the analysis of greening policies across apparel SCs developed by Ghosh & Shah (2012) concludes that cooperation between SC partners leads to a greater greening performance. Conclusions drawn from these studies help the reader on the understanding of separate implications of a sustainable approach for the SC in fashion. However, it is important to note that the concept of CE is not addressed in a direct way. Thus, there is not a clear delimitation that states how organizations implement a CE in fashion.

The CE involves a change from the design of garments until its consumption, including after sales and return. Consequently, there is a need for research that throws light from an integrative perspective, in order to achieve a holistic understanding of how CE and fashion are combined. In order to do this, the present document analyses the CE approach from the perspective of supply chain management (SCM) aspects. Findings aim to provide a complete vision on how the CE influences each step of the chain, as well as, its interrelation with other actors along the process. The aim is to reduce the current lack of knowledge regarding a clear vision on how the fashion industry applies a CE approach, and more precisely, on how it influences each of the activities that take place from resource acquisition to product commercialization and disposal.

On the other hand, the majority of the empirical research has focused on big corporations, such as Patagonia, Levi Strauss & Co, Marks & Spencer (Hvass 2014) or Adidas (Ghosh & Shah 2012). However, even though these brands usually come to the mind of consumers when thinking about fashion, this industry is mainly composed by small and medium enterprises (SMEs). In the European Union, small organizations represent 90% of the workforce and close to 60% of the value (European Commission 2016e). There is, thus, an unexplored area about the implementation of a CE for this type of organizations. Being of such relevance within the fashion industry, SMEs represent a huge opportunity for the CE in terms of potential economic savings and environmental improvements. Identifying how SMEs approach the concept of a closed

loop will provide a better understanding of which is the appropriate path that can lead to an effective and successful zero waste policy. Besides, approaching the study from the point of view of fashion SMEs provides an insight that can be used as a base for the majority of the market.

Hence, in order to fulfil these gaps, the object of this research is to investigate which are the main issues that fashion SMEs find to implement a CE approach along the activities of the value chain. In other words, the main objective is to provide an insight of the challenges associated with a CE. SMEs can encounter different constraints on each process and identifying them is the first step to overcome them.

One of the main challenges of this study is the fact that SMEs are less willing to share information due to the strong market competition which can hinder the possibilities of obtaining deep data about their organizational practices. Another difficulty relies on the lack of previous research, as the CE is a recent topic that is still on the first stages of development. Current knowledge about its implications and advantages is not widespread within the fashion industry, where corporate social responsibility keeps being used as a marketing tool, acting on the surface of the problem.

## 1.5. Aim and Research Questions

The aim of this document is to explore the implications and challenges of a CE approach for SMEs within the fashion industry.

To accomplish the objective, answers to the following research questions will be provided:

RQ 1: How is the circular economy being integrated into (SME) supply chains in the fashion industry?

RQ 2: What are the main supply chain management challenges faced by SMEs in the implementation of the Circular Economy approach?

1.6. Structure

The document comprises seven chapters organized as follows. The current chapter, introduction, starts with a description of the negative impacts of the fashion industry and how sustainable growth requires a switch from linear to circular models. Then, the second chapter analyses the origins and characteristics of the circular economy, providing a general definition. On the third place, fashion SCM practices are analysed in the light of a CE approach, providing an overview of drivers, challenges and enabling factors. Following, the fourth chapter provides a summary of current literature and a simple framework representing the integration of a CE approach with a fashion SC, in order to facilitate the comprehension of the analysis. After that, methodological considerations and data treatment are explained. The sixth chapter contains the results of the empirical part and a discussion of findings. Finally, the study concludes with the theoretical and managerial implications as well as the limitations and further research identified.

# 2. CIRCULAR ECONOMY: THE PATH TO ZERO WASTE

The CE as a concept is still on the first stages of development. Practitioners have referred to some of the principles that CE entails, using different terminologies and research frameworks, but a standard definition is still missing. For instance, Andersen (2007) signals the importance of setting a price to externalities as a way of improving the environmental quality in a closed loop. Other authors, such as George, Lin & Chen (2015), developed a CE model where environmental quality can only be improved through environmental self-renewal rate or recycling ratio.

However, even though current literature on CE is not extensive, it is possible to identify some common characteristics that can lead to a generally accepted definition. The following sections contain an analysis of the most representative paperwork on CE, which can be divided into four main topics. The first one, origins, refers to the factors that have led to the emergence of CE as the required method to achieve sustainable growth. Then, roots contain the theoretical and scientific base of the CE. On a third place, a combined description that frames the topic is provided. And finally, a differentiation between CE and mainstream sustainable approaches is analyzed.

## 2.1. Origins: Why is CE needed?

As mentioned by Andersen (2007), any economic activity implies the emergence of unwanted externalities, which may be both positive and negative. Regarding the negative side, environmental external effects take much of the responsibility associated to the impediment of sustainable development. Some of the effects mentioned by Andersen (2007) include the excessive extraction of resources and the production of high amounts of residues difficult to be absorbed by the bio-system. The current economic model is based on continuous growth and input intensive (Ghisellini, Cialani & Ulgiati 2016), which combined with the increasing population will no longer be sustainable (Ellen McArthur Foundation 2013).

This view is supported by other scholars (Ellen McArthur Foundation 2013; George et al. 2015; Lieder & Rashid 2016) who defend the need to find a solution to the depletion of resources, which in many cases are scarce, and to the generation of any kind of waste during industrial processes. As portrayed by Hvass (2014) on his research about post-retail alternatives to waste within the fashion industry, textile inputs' availability is decreasing whereas textile effluent and waste is increasing favoured by a throw-away consumption pattern. He also appoints that by 2025 there would be eight million people in need of clothing, demand that will not be satisfied unless there is a change in current business models. The conclusions of the study look towards closing the loop as the way to achieve a sustainable growth.

But these issues are not the only wakeup call that motivated economies and organizations to think of alternatives to the mainstream linear models. Preston (2012) provided an overall vision of CE, addressing the evolution of the economy from mass production systems to just in time models. It is shown how the increase on flexibility comes accompanied by increase dependence on scarce resources, which in turn leads to high price volatility and intense competition. Preston's (2012) opinion on prosperity is linked to the introduction of new value creation models that allow companies to reduce the pressures related to price variations. Similarly, the report on CE made by the Ellen McArthur Foundation (2013) reflects the need of eliminating the current interdependence between sales revenues and material inputs as the path to future economic growth. Another vision is provided by Zaman (2015) when analyzing zero waste management practices. In this case, the shortage of landfill areas is presented as the incentive to implement a zero waste policy aimed at increasing the resource circling capacity of materials.

On the other hand, externalities also refer to unintended negative social effects. Although the majority of the attention regarding CE is placed on the environmental impact, social issues are also addressed by the closed loop model. Thereby, the investigation on sustainable apparel value chains developed by Martin (2013) takes fast fashion patterns as the challenge to sustainable development. This trend includes accelerating product life cycles and off-shoring strategies. According to the report, one of the social externalities involved the poor working conditions and unfair salaries that

predominate in many factories located in developing countries. As mentioned by Martin (2013), news such as the Rana Plaza incident place big fashion labels in the public eye, which asks for complete redesign of such business chains.

Summarizing, from an environmentally and socially conscious perspective, CE arises as the way to provide a solution towards the resource depletion and price volatility, waste generation, landfill shortage, and off-shoring impact on communities. Thus, according to the above mentioned authors, the origin of a closed loop system is backed on ethical choices and corporate social responsibility (CSR), in other words, doing the right thing to obtain the right results. But, other school of thinking supports the opinion of economic benefits as the main propeller of a CE. For example, the research developed by Wilson (2015) about the prospects of a CE in the Scottish textile industry shows how organizations are driven by profitability and CSR is considered a secondary impulse to the redesign of their business models.

It is possible to conclude that, whereas the CE movement have been originated as a response to the externalities of the current economic growth system, proven market success is the only way that it can evolve. The main reason relies on the fact that replication will only occur when CE pioneers achieve sustainable growth backed with commercial success (Preston 2012) or return on investment (Ghisellini et al. 2016). Therefore, negative externalities and economic opportunities represent the source of the switch from linear to circular models.

2.2. Roots: Background theories

The CE comprises a whole new framework entailing the environment, society and organizations. It does not focus on a single issue but on the economic progress including all actors, processes, impacts and consequences. Thus, such a complete vision is born from the basics of several parent theories. According to the literature analysed, these roots can be classified into seven schools of thinking. First of all, and considered as an umbrella paradigm, CE is deeply linked with the notion of industrial ecology. This science portrays a symbiotic relationship between materials, energy and production

processes, meaning that product waste has to keep circling transformed into new inputs (Andersen 2007; Preston 2012; Ellen McArthur Foundation 2013; George et al. 2015; Zaman 2015; Lieder & Rashid 2016; Ghisellini 2016). Industrial ecology derives from ecological economics (Preston 2012), which is usually confronted in literature with the perspective of environmental economics. As mentioned by Andersen (2007), the ecological view focuses on the physical side, whereas environmental economics is based on economic observations. According to the Ellen McArthur Foundation (2013), CE does not design industrial systems to minimize the effects of nature's restrictions, but to fit and be developed according to them. This view is further appointed by Ghisellini et al. (2016), who consider that CE emerges as a response against the neoclassical environmental economics which takes into consideration economic and natural environments as separate systems. The final objective of CE is not to maximize economic profit while decreasing environmental impacts, but to maximize the positive relationship between economic and environmental systems.

Consequently, the General Systems Theory (GST) represents the second science underlying the CE approach, which stands for the belief that the whole defines the performance of its parts and not vice versa (Ghisellini et al. 2016). George et al. (2015) addresses the systemic approach of CE by portraying a model that considers economic waste and economic resources within the same scheme, rather than separate issues. Also Lieder & Rashid (2016) point out the relationship between economic advantages, resource scarcity and environmental impacts, and how CE leads to improved outcomes in comparison to linear models. Similarly, Preston (2012) highlights how the implementation of a CE requires systemic changes that go beyond unitary firms involving the whole SC.

Tightly linked to the GST, it is possible to find the Extended Producer Responsibility (EPR) theory (Hvass 2014), which supports the integration of all upstream and downstream practices and actors within the CE, as well as the reverse logistics, leading to a holistic and symbiotic system. Following this view, the Life Cycle Assessment (LCA) coexists as the third pillar sustaining CE. Zaman (2015) shows how zero waste management takes into consideration the whole life of products, from extraction as resource, until disposal or regeneration. Thus, the design of CE is developed on the

basis of the relationship among economic and environmental systems – GST –, requiring involvement of all actors and processes along the SC – EPR – and considering product implications from extraction until disposal including reverse logistics – LCA –.

From another perspective, thermodynamics laws are also presented as a base for the development of a CE (Andersen 2007, Ghisellini et al. 2016). The first law claims that energy and material remain constant within a closed loop (Andersen 2007), whereas the second law refers to the fact that both available energy and material are in continuous degradation (Ghisellini et al. 2016). Thus, the higher the circulation of both components within a given industrial system, the lesser will be the influence of such degradation. This type of industrial system has also been linked with the phenomenon of lean manufacturing and green engineering (Martin 2013; Zaman 2015; Ghisellini et al. 2016). On the one hand, literature signals how SC rationalization (Martin 2013) and Cleaner Production (CP) (Ghisellini et al. 2016) support the CE objective of accomplishing economic results through not only minimum waste, but positive environmental impact.

Besides, SC rationalization can also be linked to the views of scholars that identify efficient resource use as one of the bases of CE (Ghisellini et al. 2016; Lieder & Rashid 2016). For instance, Lieder & Rashid (2016), show how the management of critical materials can be improved with the implementation of a CE thanks to the focus on a rational use of resources considering environment and social conditions. On the other hand, authors such as Zaman (2015) mention the role of green engineering in the application of zero waste patterns such as those portrayed by CE. Also, in order to achieve a holistic CE implementation, new models have to be implemented, which demand for an integrative redesign of industrial systems. Several researchers have stated the importance of this issue through a variety of terminology such as design for environment (Ho et al. 2012), green design (Ghisellini et al. 2016), or regenerative design (Ellen McArthur Foundation 2013), highlighting the symbiotic and interrelated aspects of CE, from design to closing the loop.

Finally, a last but not least important CE root can be found in the principles of performance economy (Ellen McArthur Foundation 2013). CE envisions a different form of managing material, eliminating the concept of waste, and maximising its life time through the reintroduction in the industrial system. This new conception calls for changes involving all actors along the SC, from providers of resources until final consumers. This last link of the chain is the focus of the so called performance economy which, as mentioned in the foundation's report (Ellen McArthur Foundation 2013), argues about the importance of selling services rather than products. As explained by Ghisellini et al. (2016), CE's implementation asks for a change in consumption patterns where access is prioritized over ownership. Diverse commercialisation forms such as leasing or renting goods appear to be the key to ensure products' return to the system, and thus, its continuous circling.
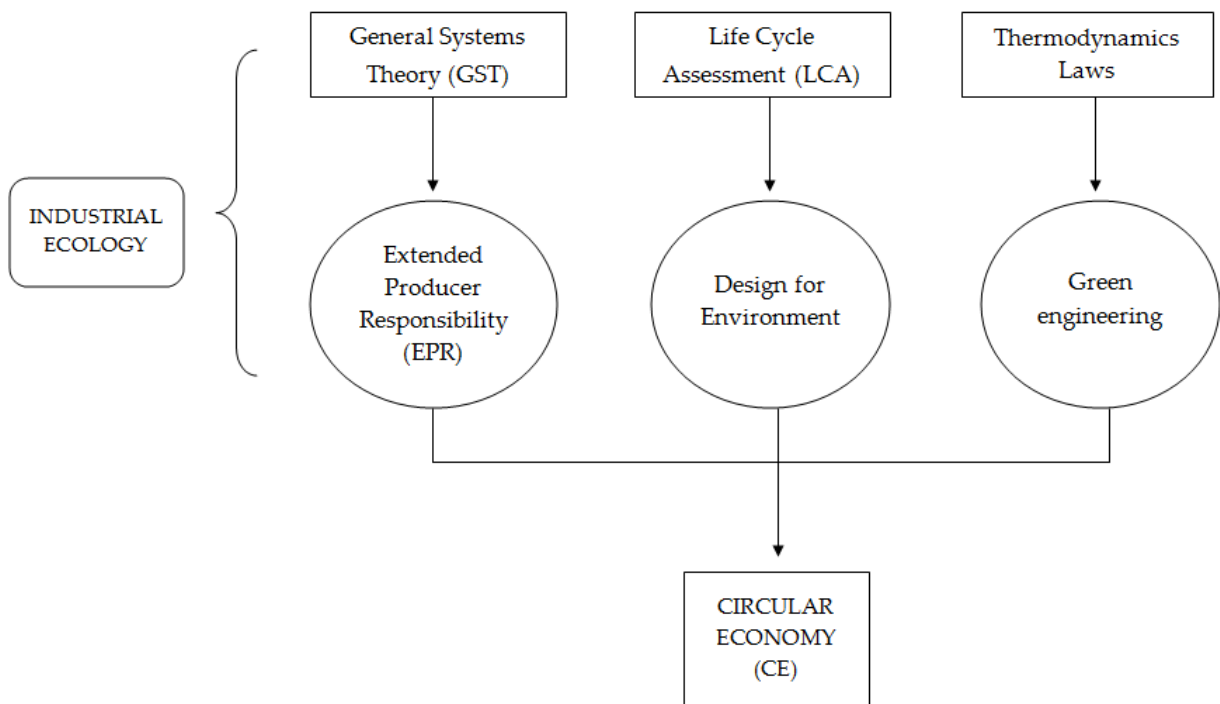


**Figure 1.** Circular Economy roots.

Recapitulating, the roots of CE are synthesized within the umbrella term of industrial ecology. This philosophy is characterised by the consideration of natural and economic systems in a symbiotic way. Then, two perspectives take most of the relevance for the development of a CE framework. The first one is the GST, which at the same time is linked with the EPR and the LCA. These schools of thinking set the bases of the integrative and holistic view of the CE. The thermodynamics laws account for the other half of the representation, whose conclusions lead to the CE implications of lean manufacturing and green engineering. These sciences relate to the CP methods, rationalization of resource usage and new design patterns embedded in the CE approach. As a final point, the future prospects of a CE are linked with the paradigm of performance economy, where ownership is relegated against other forms of consumption implying consumers as users rather than buyers.

## 2.3. Definition: Aim and principles

An important part of the research done on CE stands for the formulation of a throughout description that provides a meaningful understanding of what and how this approach represents the right path towards a sustainable development. In this sense, regeneration, quality and redesign appear to be highlighted in the majority of CE analyses (Preston 2012; Ellen McArthur Foundation 2013; George et al. 2015; Zaman 2015; EPEA Switzerland 2016; Lieder & Rashid 2016). Regeneration refers to the crucial role of reusable materials and renewable energies to lead the change from open to closed-loop models. In words of Preston (2012), CE considers waste as an input, transforming the negative externalities of industrial systems into economic opportunities. In other words, the cyclical life of products imply that materials are restored in the intermediate phase of their consumption (Zaman 2015), reducing the need of resource extraction from nature, and thus, the economic effects of input price volatility. Likewise, the use of renewable energies and cleaner production systems aims for the division of prosperity from resource consumption (Preston 2012), which will allow economic growth without breaking nature's limits.

This characteristic can be linked to two of the CE principles presented by the Ellen McArthur Foundation (2013) as representative of closed loop models. The first one is acknowledged as "*design out waste*", which stands for neither recycle nor disposal, but disassembly and reuse of materials. And the second one, "*rely on energy from renewable sources*", is based on the fact that every activity runs on some type of energy so finding renewable options represents the start to successfully close the circle.

Then, quality stands as the centre of CE models where production, use and recovery activities are meant to conserve materials' attributes as long as possible in order to ensure multiple circling loops over their life time (EPEA Switzerland 2016). As extracted from the CE model developed by George et al. (2015), environmental quality is directly linked with environmental self-renewal, which can be rephrased as the direct positive relation between nature's and resources' quality. The better the inputs are conserved along their life cycle, the higher the possibility for them to be reinserted in the system, and thus, the lower the negative impact on nature. To do so, each component is classified into biological and technical nutrients, being the first ones environmentally harmless, in contraposition to the dangerous aspect of the technical parts (Lieder & Rashid 2016). This division entails that once a material reaches the end of the chain, biological nutrients are sent back to the nature system where they merge with the ecosystem; whereas technical nutrients are processed and reinserted into the industrial system as many times as its quality allows.

Closely linked to this process it is possible to find one more principle nominated by the Ellen McArthur Foundation (2013). In this case the name given is "*waste is food*", which summarizes how biological parts are sent back to the biosphere through restorative loops, and technical parts are processed and reused, sometimes obtaining even higher quality materials, also known as *upcycling*.

Moving to the last factor defining CE, redesign means a whole new conception for industrial systems, where all aspects, from extraction, production to delivery, as well as all inputs and outputs, and all actors involved, have to be taken into consideration from a closed circular perspective (Ellen McArthur Foundation 2013; EPEA Switzerland 2016). This characteristic represents the concept of *biomimicry*, which refers to the fact

that nature systems are the place where CE models absorb the knowledge and inspiration to design out waste, to find the appropriate renewable energy sources, and to effectively manage biological and technical nutrients. Besides, interdependencies within and among systems also play a substantial role on the CE shaping (Ghisellini et al. 2016). In this case, two principles portrayed in the McArthur's report (2013) sustain the importance of the appropriate design for new CE models. On the one hand, "*build resilience through diversity*" refers to how CE is based on adaptive designs that fit the natural environment rather than focusing on stable efficiency, becoming stronger against possible external turnarounds. On the other hand, "*think in systems*" explains how CE elements are considered in terms of their relationships and interdependence with environment and society. It is believed that integration, flow and connection favour regenerative conditions on the long term.

In order to provide a complete definition of CE, it is worth to mention the way the model creates value, or as stated by the Ellen McArthur Foundation (2013), the sources of power of the closed loop. The foundation's report identifies four ways that lead to economic growth in line with environmental prosperity. In the first place, the "*power of the inner circle*" shows how the tighter the circle the faster the product can be reused, and thus, the less the impact of resource extraction. The underlying attribute is the regeneration capacity of a circular model, aiming for the elimination of waste. But, the benefits derived from shortening and reducing the distance between the steps of the supply chain should be balanced with the advantages portrayed by a globalized economy. For instance, as mentioned in the OECD's (2013) report on global value chains, developing economies can benefit from entering such systems strengthening their domestic capabilities and trade opportunities; whereas developed economies may benefit from network creation and new technologies. Thus, an organization reducing the distance between supply, production and distribution processes may experience the advantages of increasing its efficiency reducing SC timeframes and resource dependence; but also the disadvantages of decreasing its effectiveness loosing the positive aspects of being within a global network.

Then, the "*power of circling longer*" represents the benefits of maximising the number of consecutive circles a product goes through, as well as of maximising the time spent

in one circle. This source of value is directly dependent on the maintenance of material quality, as the better the condition, the higher the possibility of longer circulation within the system. In the same line, the "*power of pure circles*" refers to how uncontaminated materials help maintaining system and growth quality. However, a possible downside derived from this power arises for the product intermediaries as it may lead to the decrease of their bargaining power. For instance, taking an extreme example, if all cotton T-shirt producers agreed to switch from regular to organic cotton, regular cotton providers could decide to change their harvesting techniques to adapt to the organic requirements; which would increase organic cotton competition decreasing the bargaining power of already established producers.
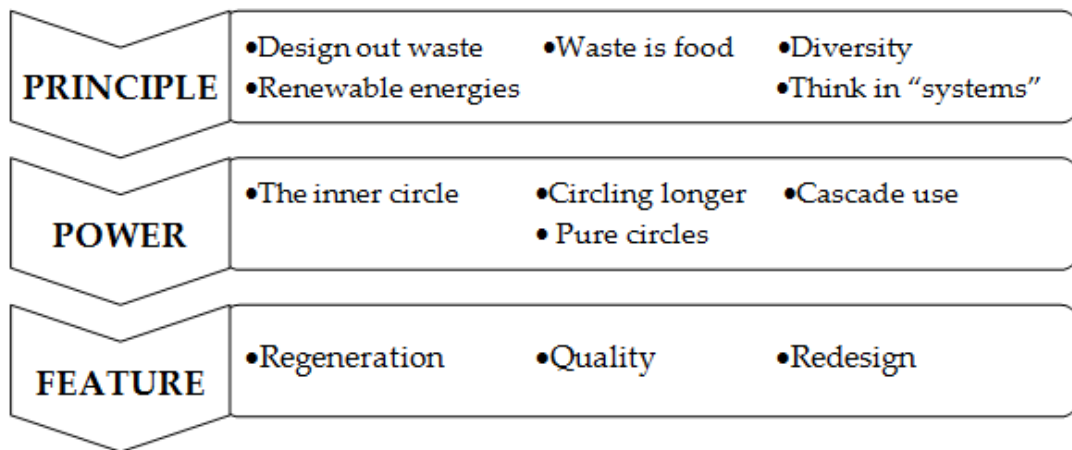


**Figure 2.** The CE defined: features, principles and power.

Finally, the "*power of cascade use*" leads to the maximum exploitation of materials through reuse diversification. In other words, it refers to the advantages of designing a product in a way that its technical nutrients are meant to be reused both within the industrial system where it was produced as well as in different independent systems. For instance, a cascade can occur when after a coat is disposed of and returned to the shop (fashion retailer SC system), it is disassembled and the feathers are reused to fill in a pillow (home ware producer SC system). Redesign and green engineering constitute the main enablers of this type of sequence.

To sum up, the CE approach can be defined as a regenerative model that aims to close the loop of industrial systems by maximising the life cycle of materials through product (biological and technical nutrients) and process (cleaner production and renewable energies) redesign using nature as source of inspiration (*biomimicry*).


2.4. CE: What is new?

Sustainable development occurs whenever economies, industries, sectors or individual organizations experiment a balanced growth in relation with the economic, social, environmental and technical systems where they are embedded (Ghisellini et al. 2016). This objective can be accomplished through several pathways, but the CE, as presented by many practitioners (Preston 2012; Ellen McArthur Foundation 2013; Hvass 2014; Zaman 2015; Ghisellini et al. 2016; Lieder & Rashid 2016), represents a revolutionary approach in the field. For example, Preston (2012) shares how CE stands for a mindset shift, where sustainable development starts to be seen as a source of competitive advantage rather than a merely ethical choice. The view of sustainability as economic source is also recognised by Hvass (2014) in terms of the evolution that takes place from mainstream sustainable practices, mainly focused on reducing harmful impacts of upstream activities, to CE practices, where the design phase is already directed towards the creation of positive externalities to favour economic growth. Based on CE literature, the novelty of this approach can be divided into three main dimensions, namely roots, focus and design. A summary of main differences can be seen on the **Table 1.** below.

First of all, as seen in previous sections, CE is born upon the basis of ecological economics, whilst linear sustainable approaches are characterised by environmental economics principles. This distinction sets the pathway towards the second CE novelty, its objective. Whereas mainstream approaches focus on quantity, CE drives the attention towards quality (EPEA Switzerland 2016). This differentiation is framed by the Ellen McArthur Foundation (2013) as the swift from eco-efficiency towards eco-effectiveness. Instead of reducing waste impact through end-of-life recycling techniques (*downcycling*), the CE aims to design products whose final destination is to be reused (*upcycling*). Thus, CE implies the introduction of complete life cycle strategies (Hvass

2014), where each phase is directed towards quality conservation in order to ensure the maximum rotation of materials along the system. Thus, the focus is no longer reducing waste at the end of the chain, but eliminating it through the continuous circulation of lasting-quality-designed products.

**Table 1.** A comparison between linear and circular sustainable approaches.

| LINEAR MODEL | CIRCULAR MODEL |
| --- | --- |
| Environmental Economics | Ecological Economics |
| Eco-efficiency | Eco-effectiveness |
| Quantity | Quality |
| Recycle | Reuse |
| Downcycling | Upcycling |
| Product Disposal (end-of-life) | Regenerative Design (whole life cycle) |
| Environmental impact | Biomimicry |

Accordingly, design stands as the third variation encountered in CE models. Both roots and focus imply a holistic redesign of current practices, where forward and reverse SC implications are taken into account (Lieder & Rashid 2016). Closing the loop implies a new way of thinking, targeting sustainable development from resource extraction to resource regeneration. Besides, these new models are developed according to nature (Ghisellini et al. 2016), also known as *biomimicry* explained in the previous section. In sum, CE merges with the environment instead of fighting its constraints.

# 3. SUSTAINABLE GROWTH: FASHION SUPPLY CHAIN

The apparel industry constitutes one of the more complex sectors regarding the amount of activities, time, skills and actors required to transform inputs into ready to use products. As pointed out by Jakhar (2015) on his research of sustainable supply chains (SSCs) in the apparel industry, there are many intermediaries between the provider of raw material and the final user, which makes this chain one of the largest and more divided in the world. For instance, the author mentions that on average one piece of clothing takes up to 16 weeks only to be produced. Thus, managing all the processes and relationships involved while trying to minimize the negative environmental impact is not an easy task.

Many practitioners have centred their efforts on helping managers develop this activity, by providing models and recommendations based on the study of several aspects of the supply chain. Among the different research carried out, it is possible to differentiate four main recurrent topics, namely motives, practices, enablers and challenges. The first one refers to the reasons that push or pull the organization towards the implementation of an environmentally friendly SC. Then, other authors analyse the SC practices that are commonly used to achieve a sustainable output which, depending on the dimension chosen as starting point, may be closely linked to the mainstream sustainability theory or to the CE approach. Enablers are based on the study of the driving forces that facilitate the achievement of the sustainable objective. On the other hand, challenges in terms of both, harming aspects that need to be solved through changes in the SC, and actual barriers to the achievement of the solution, are also portrayed in several articles.

The following paragraphs show a critical review of the different studies containing each of the topics in order to provide a clear view for the current research.

3.1. Motives: Why care?

To begin with the initial reasons that move companies towards a sustainable management of the SC, de Brito et al. (2008) pursued an investigation regarding the sustainability of fashion retail supply chains in Europe. They used the stakeholder view of the SC as a base for the development of surveys with suppliers, manufacturers, retailers, etc. within the fashion industry. Their results identify three main motives that drive organizations towards a greener SC. The first reason can be seen as a pull motive, coming from the legal framework that forces them to get involved. Another external motive is the opportunity of achieving a competitive advantage (CA), where the firm is motivated towards the achievement of differentiation that will allow them to better compete in the market. Finally, corporate responsibility (CR) is identified as the third reason. In this case, it is a push motive, where firms internally look for the approach that better allows them to integrate environmental and social issues together with business objectives.

This division is also supported by Caniato et al. (2012) as part of their research framework where motives were classified as internal, market and context. As a result of interviews with two international and three small fashion organizations pursuing a sustainable supply chain, the authors extracted several conclusions regarding the importance of each motive for each company category. Regarding push factors, CR in terms of values appeared to be of importance for both organizational types, like pointed out by de Brito et al. (2008). Nevertheless, internal costs were found to be of importance only for the small firms. Same occurs with the market drivers, where external pressure was not relevant in the case of international companies but for the small ones. It seems logic as the smaller the size the closer they need to be to consumers and therefore, the higher the risks against a market turnaround.

This idea is supported by Li et al. (2014) in their study about governance of SSCs in the fashion industry; where they signalled as main pull motive the consumers' role based on the need-hierarchy theory. They established a five stage hierarchy according to the purchasing feelings that a product may provoke to final users, starting by the search for general functionality up to search of a specific brand. The higher the consumer position

in the hierarchy, the more difficult would be to satisfy it. Sustainable SMEs in the fashion industry target their products to market segments that are located at the top of this hierarchy, as they are known to be highly concerned with ethical and environmental issues (Caniato et al. 2012; Formentini & Taticchi 2016), becoming a major driver in the management of the SC.

On the other hand, according to Caniato et al. (2012) the final pull factor, legal regulations, was not rated as relevant for any company, as opposed to the de Brito et al. (2008) assumption. Caniato et al. (2012) explain this result due to two main reasons; firstly, the organizations interviewed were pursuing a proactive approach going beyond the regulations, and secondly, the isolated character of environmental laws in the fashion industry. The first reason is also shared by Formentini & Taticchi (2016), who portrayed a classification of firms regarding their sustainability positioning from higher to lower commitment and integration, as leaders, practitioners and traditionalists. According to the interviews developed within several industries including fashion, leaders showed a deeper understanding as well as implementation of sustainable practices, whereas traditionalists did not explicitly include sustainable practices in their SCs. Thus, the first ones were less likely to be challenged by environmental regulations as they were already aware of them, whereas traditionalists did not have the ability to respond as fast and efficiently.

Another study that investigates SSCs motives was developed by Ho & Choi (2012). This research is based on the Hong Kong fashion industry, where they identified four main categories of reasons leading to SSCs. These categories can also be divided into push and pull factors, with social well-being as internal source, and economic prosperity, governance and environmental stewardship as external sources respectively. Social well-being can be linked to the concept of CSR in the sense that tries to align strategic goals with social and environmental concerns. In this case, corporate values play an important role on the shaping of the SCM.

Conversely, economic prosperity pushes the organization towards environmentally sustainable practices in the aim of achieving CAs, such as attracting new customers or reducing costs (Ho & Choi 2012). As observed by Caniato et al. (2012) from the

interviews developed with small fashion retailers, the fact of changing their business model to become a fully sustainable firm allowed them to attract the market niche that hold strong environmental values. Their conclusion goes in line with the resource based view (RBV) of the firm that, as drawn upon by Formentini & Taticchi (2016) from a sustainable perspective, relies on the appropriate management of assets and capabilities available to be the way for the achievement of CAs.

In the same line, governance as expressed by Ho & Choi (2012) refers to governmental pressures in the form of regulations and standards to be followed by the industry. It is important to note here that this consideration differs from the meaning given by other researches about governance in SSCs (Li et al. 2014; Formentini & Taticchi 2016). These scholars analyse governance regarding managerial decision making mechanisms, thus treating it as a push factor. Regarding governance as legal order, Ho & Choi (2012) share the same vision of Caniato et al. (2012), as recognize that there has been a change from reactive practices towards integration with the business strategy. It is possible to conclude thus, that the power of legislation as main driver of SSCs in the fashion industry has decreased overtime as organizations are taking a more proactive role over compliance.

An additional category mentioned in this study (Ho & Chi 2012) is the environmental stewardship in the means of scarcity of natural resources. The notion extends to the use of water, lands, energy or the carbon footprint that happens along the SC. Ho & Choi (2012) recognize that, among 84 countries, Hong Kong is ranked as the fifth city with major number of fashion organizations holding the Oeko-Tex certification regarding their eco friendly performance. Therefore, pull motives do not only come from legal or market drivers but also in the form of nature's pressures.

To sum up, fashion firms' motives to implement a SSC can be classified into push or pull factors, depending on the external or internal origin respectively. The external division contains market, legal and natural drivers; whereas the internal side comprises corporate responsibility in terms of management values. Market drivers are further divided into stakeholders' pressures (i.e. customers, suppliers, NGOs) and CA opportunities (i.e. new customers, cost reductions). Legal drivers refer to the norms,

laws, regulations and standards that shape the sustainability approach in the fashion industry; whereas natural drivers originate from the scarcity of inputs and pollution of processes. Finally, as internal driver, CR refers to the intrinsic corporate values, including corporate culture and managerial ethical perspectives as well as corporate governance.

**Table 2.** Motives to follow a sustainable approach to fashion SCM.

| | DRIVERS | MOTIVES | MODERATORS |
|---|---|---|---|
| **EXTERNAL** | Market push | •Stakeholders' pressures <br><br> •Market opportunities | •Stakeholder View <br> •Competitive Advantage (CA) <br> •Resource Base View (RBV) |
| | Legal & Natural forces | •Regulations and norms <br> •Resource scarcity | •Company's sustainable positioning |
| **INTERNAL** | Company pull | •Corporate values <br> •Managerial perspectives <br> •Corporate governance | •Business Ethics (BE) <br> •Corporate Responsibility (CR) <br> •Company's culture |

3.2. Practices: How to make it?

Empirical research has also been done regarding the ways fashion firms try to reduce the environmental impact caused by their activities. Several practices have been identified to be implemented within the SCM to achieve the objective of harm reduction. As referred by de Brito et al. (2008) there is not a unified vision regarding SCM and business sustainability. But there are some common points that allow for comparison and classification of the extant literature.

First of all, the notion of triple bottom line (TBL) is commonly used as an umbrella term to shape the understanding of sustainability and business practices. This theory is defined by Caniato et al. (2012) as the link between economic growth, social fairness, and environmental respect. Formentini & Taticchi (2016) further add that this consideration requires a re-design not only of the company's internal activities, but of the whole SC including all actors involved. From this common point, two main streams can be identified depending on the approach taken, based on the sustainable or the green SCM.

Sustainable supply chain management (SSCM) aims for the integration of sustainable practices that allow organizations to pursue their economic, social and environmental goals through cooperation along the SC (Seuring 2011; Diabat, Kannan & Mathiyazhagan 2014). These studies place a strong focus on the upstream activities and actors, where sourcing and relationship with suppliers prevail as main concerns. For instance, Seuring (2011) developed a research about SCM for sustainable products, using the SSCM and the product life cycle (PLC) theory as a base. His conclusions show how the company aiming for sustainable production has to deal with a larger number of suppliers, and coordination becomes a key issue.

Likewise, Jakhar (2015) highlights the importance of selecting the right supply partners and ensuring adequate flows within the chain. Caniato et al. (2012) also refer to some of the practices that characterize an environmentally sustainable fashion industry. Regarding upstream activities, the use of environmentally friendly fibres remains as the main goal. Then, within the internal part of the chain, reuse and recycling techniques, implementation of clean technologies, and process certifications are predominant choices. However, regarding downstream activities, little attention is placed on the after sales practices as well as on the final use that is given to the product. Moreover, it can be concluded that within integral activities, the importance of product design is also underestimated in favour of manufacturing processes.

From a different point of view, green supply chain management (GSCM) comprises the implementation of environmental practices through the forward and reverse logistics of the supply chain (Diabat & Govindan 2011; Wu, Ding & Chen 2012). In this case, it is

important to note that there are some confrontations regarding the conceptualization of the topic. For instance, Seuring (2011) refers to both sustainable and green concepts in an interchangeable manner, labelling the GSCM as recycling or closed-loop SC and placing it as part of the SSCM framework. Then, Ahi & Searcy (2013) argue that SSCM is an extension of a GSCM, which is also later followed by Formentini & Taticchi (2016). Nonetheless, as seen in the previous section, sustainable, green, and CE approaches do not imply the same characteristics. Supporting this idea it is possible to find Ho & Choi (2012), who note that green supply chains (GSCs) tend to follow a more cyclical route in their efforts for keeping waste outside the equation. Thus, the differentiation is made, where linear trends are left to the mainstream SSCM practices. In the same line, Wu et al. (2012) observe GSCM as cross-organizational and closed-loop practices but, in contraposition to Seuring (2011), the loop does not end with the recycling activities but with an integrated reverse logistics; rather placing GSCM as an extension of SSCM.

This additional phase also became the focus of attention of Dissanayake & Sinha (2015) research, contextualized as fashion remanufacturing. The authors provide a clarification between recycling and remanufacturing, distinguished by the final purpose of the new product. Whereas recycling is about transforming an old piece of clothing into something different, remanufacturing aims to rebuild the same product to be at least as good as the original. Within this line, Hvass (2014) studied the different post-retail activities pursued by nine fashion organizations, which can be classified in product take-back schemes and reuse practices. These companies were labelled by the author as industry's early movers, spotting the novel character of such sustainable practices.

Lastly, a different term is brought by Du, Yu & Cheng (2010), who studied the fashion SC in China under the implications of a CE. They put forward a model called Rapid Response Eco-Supply Chain, which requires considering ecological and social benefits together with the organization's economic objectives. Thus, it also implies the notion of TBL as the previous SCs. Then, in terms of SC implications, it mirrors the GSCM, as it takes into consideration all processes from fibre extraction until clothing disposal, integrating a wide number of actors forming, in words of Du et al. (2010), a network around a focal firm considered to be the manufacturer of finished apparel.

For the purpose of this research, and to avoid confusion, the SCM approach used will be the one provided by Du et al. (2010), which in practice equals the definition of GSCM provided by most researchers. Thus, this SC approach will be considered as a separate and extended version of SSCM, also based on the TBL theory thriving for the alignment of environmental, social, and economic benefits with the strategic and operational goals of the SC. Where companies take into account SC stakeholders and activities but also place an emphasis on design for environment and reverse logistics. Thus, all of the phases of the PLC theory are crucial, from the extraction of raw materials (upstream) until the consumer disposal of the clothing (downstream) and post recovery of the item (reverse).
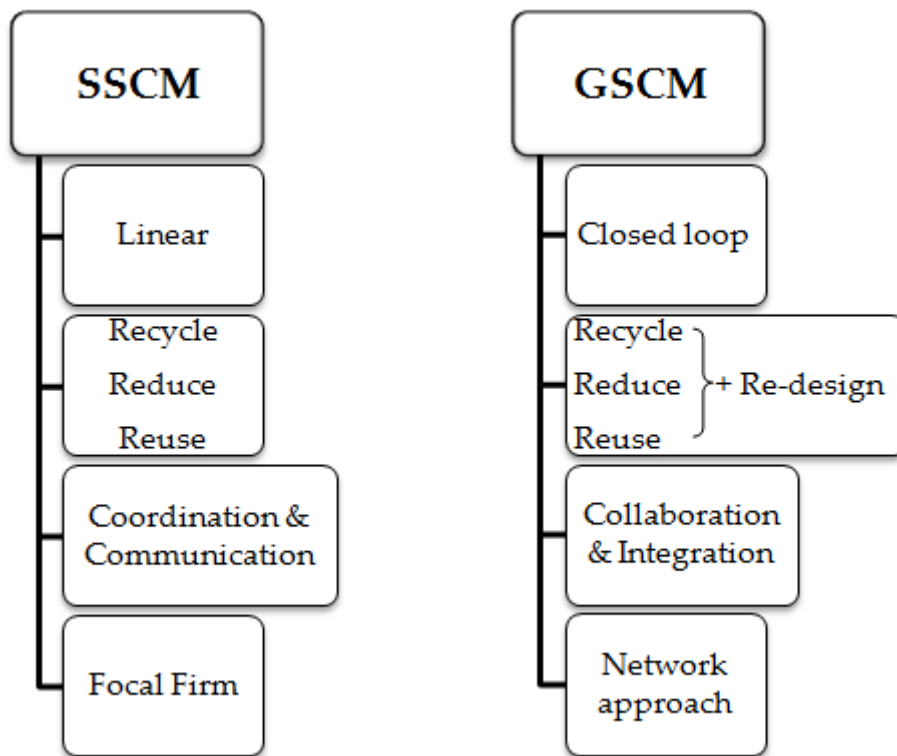


**Figure 3.** SSCM vs. GSCM.

Some of the SCM practices that have been pointed out under this conceptualization include, within the upstream SC component, assessing the reliability of suppliers in terms of raw materials' eco-friendliness (Du et al. 2010). For instance, assuring that the sourced fibres come from agricultural lands where no pesticides were used. Then, within the internal component of the SC, another practice involves the reduction of packaging and leakages (Diavat & Govindan 2011). The development of eco-friendly products, or in other words, the redesign and rethink R's portrayed in Ho & Choi (2012) study, is also a recurrent and important practice developed in the fashion GSCC (de Brito et al. 2008; Diavat & Govindan 2011; Wu et al. 2012). For example, the design of a new collection not only takes into account the fashion trends, but it moves towards a deep consideration of how the final product can support the zero waste alternatives. Moving onto the downstream component, practices include the reduction of carbon emissions derived from the transportation of items (Diavat & Govindan 2011). Besides, remanufacturing activities, such as upgrading a thrown away dress by adding new textile pieces (Dissanayake & Sinha 2015), are aimed to give a second life to obsolete clothing.

**Table 3.** Fashion sustainable SCM practices: linear and circular comparison.

| | LINEAR FOCUS | CIRCULAR FOCUS |
|---|---|---|
| **Upstream component** | •Supplier selection & coordination <br> •Environmental certifications | •Supplier selection & integration <br> •Eco-friendliness |
| **Internal component** | •Recycle & Reuse: Clean manufacturing techniques | •Reduce & Redesign: Design for environment |
| **Downstream component** | •Commercialisation: nature impact | •Commercialisation: nature fit |
| **Reverse Logistics** | *Not applicable | •Take-back schemes <br> •Reuse <br> •Fashion remanufacturing |

3.3. Enablers

This section of the literature covers the factors that facilitate the transition and implementation of a GSCM, decreasing the influence of the sustainable barriers and mitigating the effects of sustainable risks. As a generally accepted statement, a collaborative and integrated SC is revealed as the best option to accomplish a sustainable management of operations and relationships (de Brito et al. 2008; Caniato et al. 2012; Ghosh & Shah 2012; Wu et al. 2012; Seuring 2015; Giannakis & Papadopoulos 2016).

The analysis of greening policies across apparel SCs developed by Ghosh & Shah (2012) concludes that cooperation between SC partners leads to a greater greening performance. Supporting these results, there is also the study developed by Giannakis & Papadopoulos (2016), who after identifying the main risks to a sustainable SC, point out to integration as the way to successfully control and mitigate the sustainable risks derived from SC practices. A change from a sequential to a fully integrated SC through, for instance, the creation of multidisciplinary and cross-functional teams, will enable effective coordinated results (de Brito et al. 2008). Moreover, Seuring (2011) agrees that companies aiming for sustainable products are required to communicate with their SC partners in order to perform in a coordinated manner.

Other facilitator refers to the readiness of the organization for the implementation of a GSCM. In words of Wu et al. (2012), the higher the support of top and middle managers as well as the commitment of employees, the easier would be for an organization to transition towards a GSCM. Besides, an organization in possession of the appropriate environmental knowledge and technical expertise also reduces the risks of failure of GSC implementation (Wu et al. 2012). Then, an external enabler also recurrent in the literature is governmental involvement through incentives and policies. For instance, in terms of financial and structural incentives, Wu et al. (2012) refers to the reconstruction plans adopted by the Chinese government in order to support apparel companies in their ecological manufacturing processes. Also, in terms of policies, the understanding and awareness of governmental enforcement of sustainable regulations is recognized as a

dynamic capability that allows organizations to better manage the SC from a sustainable strategy (Rauer & Kaufmann 2015).
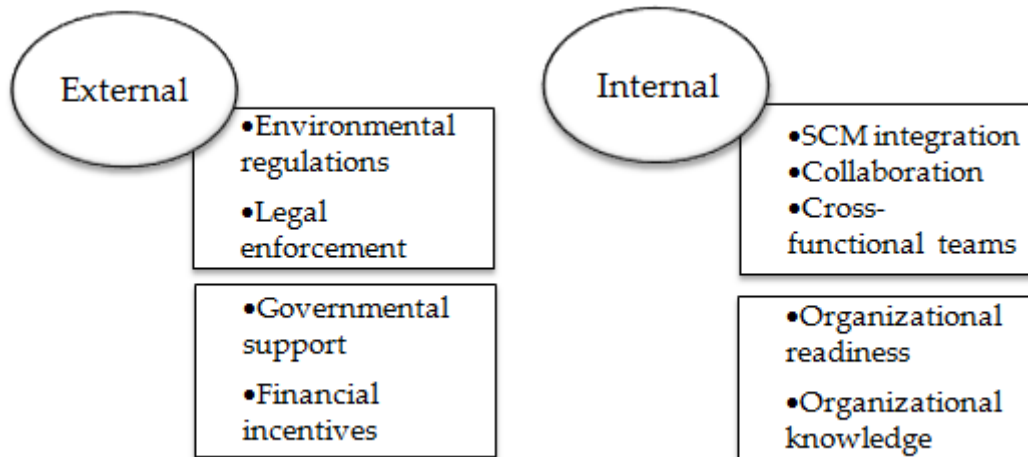


**Figure 4.** Enablers for a sustainable approach of fashion SCs.

3.4. Challenges

Finally, the topic of challenges for a sustainable approach to SCM in the fashion industry has been investigated from two main perspectives. The first one regards the problems that organizations need to tackle in order to achieve the equilibrium dictated by the TBL theory. This side of the literature can be labelled as sustainable risks, where efforts are placed on providing an overview of the environmental and social challenges within the fashion industry. The second perspective comes from the studies that analyze the problems that organizations encounter when putting in practice sustainable techniques. This aspect can be labelled as sustainable barriers, where interest is driven towards the actual issues that hinder fashion firms' sustainable management of the SC.

It is interesting to see how different authors in different times and countries coincide on the identification of which are the main issues to be solved. Starting by sustainable risks, challenges can be classified under environmental and social risks. Environmental

risks refer to those situations that have a negative effect for the natural ecosystem. Within this category, the production process is the SC activity that attracts the majority of the attention. The high energy and water consumption generated during the manufacturing, dying, and printing processes places the fashion SC at the top of sustainable risks worldwide (de Brito et al. 2008; Du et al. 2010; Diabat & Govindan 2011; Giannakis & Papadopoulos 2016). Du et al. (2010) also highlights the risk of raw material shortages in China, where even though fibre cultivation is rich, textile raw material consumption can be up to 80 times higher than in other developed countries. And Giannakis & Papadopoulos (2016) add pollution and greenhouse emissions to the list. But not only industrial processes harm the environment, the use of unnecessary packaging and product waste are also rated as important in terms of their impact on the ecosystem (Giannakis & Papadopoulos 2016).

Social risks relate to issues that directly affect organizations' stakeholders, such as employees, customers, and business partners, as well as the public administration and society in general (Giannakis & Papadopoulos 2016). In this category many of the attention has been placed on the risks suffered by employees in the fashion industry. As mentioned by de Brito et al. (2008), there has been an increasing growth on the number of employees that have lost their job positions in favour of employment in developing countries due to the companies' aim for decreasing costs. Besides, the job creation in those low cost areas has been criticised due to excessive working hours, unfair salaries and questionable health and safety conditions (Giannakis & Papadopoulos 2016). For instance, Giannakis & Papadopoulos (2016) mention the case of the Rana Plaza textile sweatshop, that collapsed in 2013 and whose employees have been recognize to be workers of several western big fashion brands.

Regarding sustainable barriers, different challenges arise depending on the processes and relationships belonging to the upstream, internal and downstream components of the fashion SC. Ghosh & Shah (2012) focus their study about apparel SCs pursuing a green product strategy on the effects that a decentralised or centralised approach have on the effectiveness of such choice. One of the main barriers mentioned refers to the conflict that may arise between suppliers and manufacturers when the last ones try to reduce their raw material consumption. Likewise, Rauer & Kauffman (2015) signalled

supplier conflicts as one of the main barriers for GSCM. In their research, they divide challenges in internal and external depending if they originate inside or outside the SC, respectively.

From their conclusions it is possible to see that the lack of transparency along the SC negatively affect the effectiveness of a GSCM approach. One of the problems arise when selecting appropriate suppliers, as information about their sustainable performance is limited, thus reducing their opportunities of choice. Besides, the lack of influence on sub-suppliers also hinders the potential for the achievement of sustainable SC goals. (Rauer & Kauffman 2015.) In the case of fashion, due to the length of the SC, this barrier can have a deeper effect as many hands are involved from the harvest of the crop until the delivery of the finished product. Thus, it is possible to conclude that supply management constitutes an important source of sustainable barriers related to the upstream component.

But suppliers are not the only actor representing a challenge for the sustainable management of the fashion SC. As pointed out by Rauer & Kauffman (2015), political influences can have a decisive impact on the way organizations think of and implement sustainable practices along the SC. For instance, each government pursues a different way of policy enforcement regarding environmental regulations. Consequently, those countries with stronger punishments would induce fashion SC members to achieve a higher commitment than countries where no threat is perceived against noncompliance. Therefore, the degree of formalization of environmental policies established by the public administration also represents a sustainable barrier, which can have an impact in the overall SC processes.

On the other hand, Harris, Robby & Dibb (2015) developed a study on the challenges faced by sustainable clothing. In this research the focus of attention is turned to the downstream component of the SC, where consumers become the central actor. The source of SSC barriers emerges from consumers' mindsets and habits, including the social pressure to follow current fast fashion trends and the conception of clothes as short term items (Harris et al. 2015). Fashion brands trying to change these notions need to pay extra attention to the marketing and after sales activities of the SC in order to

succeed. Furthermore, Rauer & Kauffman (2015) signalled as relevant endogenous barrier the lack of consensus existent among environmental regulations in different regions, as well as of standardise vision of environmental efficiency and effectiveness. Not having a common understanding on what environmental success stands for decreases the ability of companies to educate consumers in the matter. Consequently, it makes evident the sustainable barrier of consumers' disregard respect the environmental cause.

Moving to the reverse chain management, several barriers to sustainability difficult the task of minimizing fashion waste at the end of the chain. On the one hand, interviews developed by Hvass (2014) to pioneers in fashion reverse logistics showed that a main challenge arises with the stock uncertainty. This challenge is further pointed out on the conclusions of the study developed by Dissanayake & Sinha (2015). According to the authors, the remanufacturing of a clothing item starts by the collection of unwanted garments, which may come from diverse sources such as customers, wholesalers, second hand shops, etc. This diversity together with the uncertainty regarding supply quantity and frequency, places the focal firm on a disadvantageous position due to the lack of control that can be exercised. Following Hvass (2014) findings, the lack of consumer awareness also arises in this phase of the cycle. Changing consumers' mindsets is placed as a critical issue in order to achieve an optimal result from taking-back schemes and remanufacturing processes.

From another point of view, Dissanayake & Sinha (2015) findings place an emphasis on the manufacturing process of the SC. They envision fashion remanufacturing as human capital intensive. In their words, it requires highly qualified employees in possession of appropriate design and assembly skills which implies higher costs compared to the mainstream fashion manufacturing process. In contraposition to the forward chain, fashion remanufacturing starts with a given set of textiles that need to be used as the base for a new product. Thus, the design is already conditioned by the type of pieces available, increasing the complexity of the process. Higher complexity implies higher costs as usual production techniques, such as bulk cutting technologies, cannot be used. (Dissanayake & Sinha 2015.) Additionally, the lack of best practices within this type of sustainable approach in the fashion industry increases the degree of difficulty (Hvass

2014). Being dependent on human capital which, at the same time, lacks of experience and standardise models to follow, represent an important sustainable barrier.

**Table 4.** Challenges for a sustainable approach of fashion SCs.

|  | SUSTAINABLE RISKS | SUSTAINABLE BARRIERS |
|---|---|---|
| **Upstream component** | •Raw material consumption | •Supply contracts<br>•Lack of transparency |
| **Internal component** | •Water & energy consumption<br>•Employment conditions | •Environmental policies<br>•Governmental formality |
| **Downstream component** | •Waste<br>•Throw-away consumption | •Lack of common standards<br>•Consumer habits & mindsets |
| **Reverse logistics** | *Not applicable | •Supply variability<br>•Human capital dependence<br>•Lack of best practices<br>•Consumer unawareness |

# 4. CE, SCM AND FASHION SMEs: MAIN POINTS

Considering the lack of consensus within the fashion industry regarding a circular economy approach, the following section aims to first, summarize the main points provided in the theoretical analysis; then, provide a short description of the current situation regarding the CE within the fashion industry; and finish with a proposed circular SC (CSC) model for fashion SMEs, in order to frame the analysis' boundaries. The main objective is to facilitate the understanding of the empirical choices and posterior analysis, according to the theoretical background and current managerial relevance.

4.1. Theoretical background: A summary

The CE comprises a novel term, born in response to the environmental and social externalities caused by the current predominant linear production and consumption models. Rooted in the industrial ecology philosophy, a CE model proposes the consideration of economic processes within the natural system where they are embedded. The functioning is based on the elimination of waste through its re-introduction in the system as economic inputs, reducing organizations' dependence from resources as well as the associated social and environmental externalities. To do so, a complete redesign is required, integrating all actors and activities to promote the regeneration of resources along the chain.

The discussion on this model has led to the identification of main principles, powers and features characterising the closed loop. From those, quality stands out as a crucial feature required to ensure that resources remain circling as long as possible powered by "*pure circles*", within or among systems, powered by "*cascade use*". Then, an important part of research has focused on the differentiation between mainstream sustainable and circular growth. From this point of view, it is important to take into account the evolution from eco-efficiency towards eco-effectiveness, or in other words,

the change from waste reduction and material recycling to waste regeneration and material redesign.

In sum, existing literature on CE has been based on delimiting the potential and signalling the advantages of such a model in comparison to the sustainable practices commonly applied. Theoretically, environmental, social and economic benefits derived from a CE approach seem to appeal to companies, nature, and people in general. However, it is important to note that CE benefits must be taken into account with regards to the whole globalized context. There is still a need to empirically investigate the ways in which different companies can implement such a system, in order to balance its viability within diverse sectors, industries and products.

4.2. CE and fashion SCs: What do we know?

The knowledge about the implications of a CE within the context of fashion SCs is still limited. However, even though the lack of consensus about how a CE applies to fashion organizations, studies have provided some common conclusions that can be applied to this sector. First of all, some authors have focus on the reasons that companies have to move from the linear to the circular model. Findings highlighted the relevance of internal motivation and CSR as drivers to achieve the TBL equilibrium.

Also, current literature is divided between those who have studied mainstream SSCs and those who have focus their research on GSCs, from which it is possible to conclude that the latest is closely related to CE aspects, even though it still requires to be tested and developed to fulfil the need of a circular SC model of general application. However, assuming the approach of GSC as a valid reference, it is possible to identify main circular practices along the chain within the fashion industry as described in **Table 3.** One of the most relevant additions comprises the reverse logistics, which exemplifies how companies can close the loop, through the recovery of used products from clients for its posterior regeneration and reintroduction in the system.

Then, regarding the transition from one model to the other, existing studies include findings about the external and internal factors facilitating the process; such as governmental support and financial help, or collaboration between organizations and companies' previous knowledge in the area, respectively. On the other hand, many authors have focused on the other side of the coin, this being the challenges that difficult the implementation of circular processes. In this case, each component of the chain has led to the identification of some factors that limit the ability of the companies' circular management, which can be seen in **Table 4**. However, it is important to note that many of these studies have been developed from the specific perspective of one component, obviating the implications for the rest of the chain. For instance, findings on reverse logistic challenges pointed out by Dissanayake & Sinha (2015) are based on the study of reverse processes driven by UK firms, whose main activity is based on the recovery of materials. But different challenges may arise for organizations whose main activity is the production of new apparel, that it is then reintroduced within the system after consumer use.

To conclude, it is important to mention the lack of attention given to SMEs, which apart from a slight presence in some research, seem to be neglected from the fashion CE theory. Empirical cases about big corporations such as Adidas, H&M or Patagonia constitute relevant sources of information but findings cannot apply to most of the fashion market comprised by small and micro enterprises.

4.3. A Circular SC for fashion SMEs: Closing the loop

Following the theoretical review, this section aims to frame the approach providing a simple vision of a CSC model. To facilitate the conception, forward and reverse logistics are taken into consideration as separate supply chains that can be performed by the same organization or by a variety. Besides, used resources can also come from different industries, and sources, being those directly consumers or other organizations. For instance, the recovery and regeneration of unwanted clothing from customers may be developed by a material producer that then, sells the reused yarn to the fashion SME. Otherwise, the fashion SME may have their own take back scheme, as well as redesign

techniques that allow them to individually close the loop. Thus, the closed loop may occur at the upstream and downstream ends of the reverse chain, when technical nutrients are recovered, redesigned and commercialised again.

Each of the SC components reflects the main activities that take place during the cycle, just like any industrial process. An important mention must be given to the design activity, which is placed in two different components within forward and reverse chains. The main reason relies on the fact that in the forward CSC all processes are designed according to fit nature, and thus, this activity represents the first step for the fashion SME. In the case of the reverse chain, as seen in chapter 2, design activities are dependent upon the variety and uncertainty of supplies given in the upstream component. Thus, the regenerative planning cannot occur until materials are supplied.
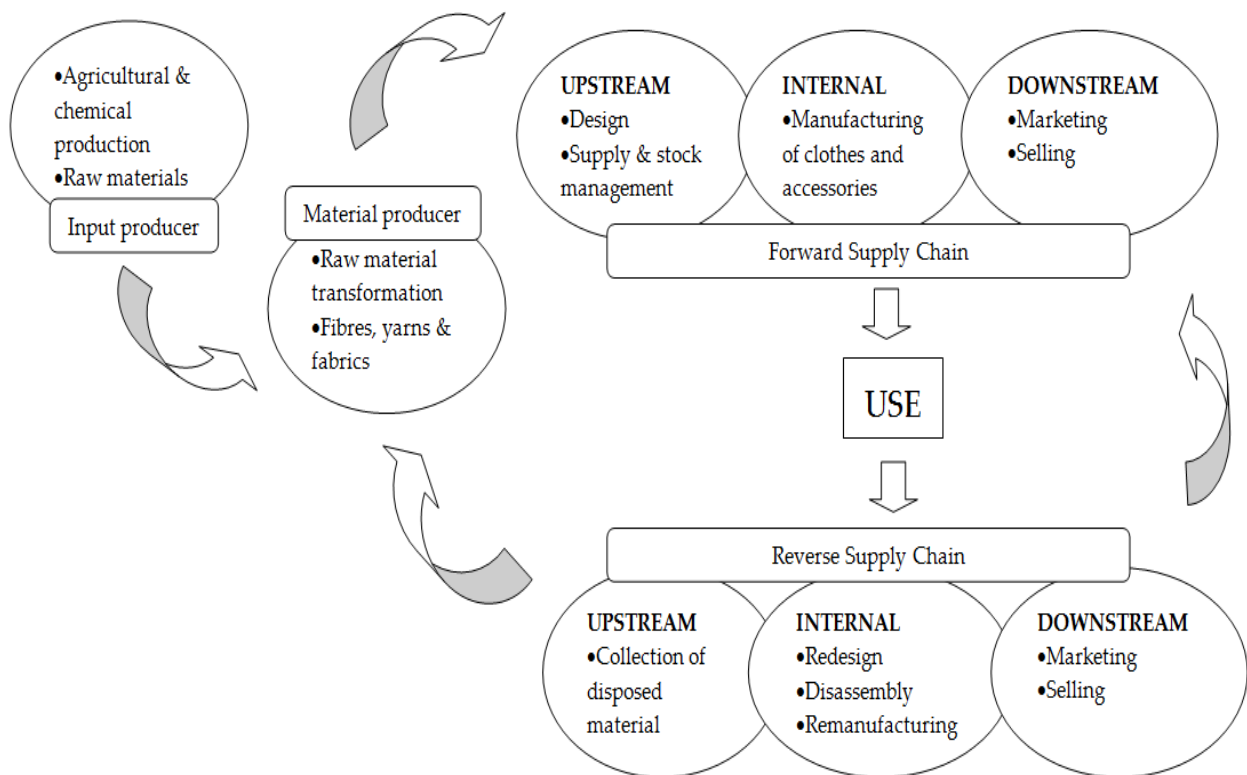
**Figure 5.** The fashion Circular Supply Chain: closing the loop.

# 5. METHOD

In order to answer the research questions proposed and accomplish the aim of the present document, several research choices have to be made. First of all, a glimpse on the underlying philosophical paradigm is given. Secondly, the research approach and purpose are explained and justified. Following, there is a description of the research strategy chosen including its main characteristics. Finally, an explanation on data collection and analysis is provided, to end with a justification on its validity.

## 5.1. Research philosophy

Business studies are not an exact science like mathematics or physics where diverse methods should lead to the same unique result. On the contrary, there are many approaches to look to the same problem that can lead to different findings and conclusions. Regarding the way reality and knowledge are taken into consideration, two main streams can be distinguished. On the one hand, objectivism stands for the appreciation of facts where the world is conceived as a separate entity that co-exists independently from people's perceptions (Saunders, Lewis & Thornhill 2009: 110 – 111). On the other hand, subjectivism refers to the importance of feelings and opinions of social actors that lead to the construction of reality and knowledge (Saunders et al. 2009: 111 – 112). In this case, the understanding of the world is based on human interactions from a personal perspective rather than isolated conceptions.

Taking into account this division, three main paradigms emerge within business sciences, namely positivism, scientific realism, and social construction. Positivism lies under objectivism, as it is characterized by quantitative data where only measurable items are taken into consideration. On the other end it is possible to find social construction, which is based on human perceptions and subjective knowledge. Then, scientific realism stands in the middle of both streams, as it considers the whole world view where reality can exist outside people's minds as objective facts. (Saunders et al. 2009: 113 – 119.)

For the purpose of this study, it seems appropriate to take the subjective approach, as the research questions try to find about individuals' perceptions on aspects of their business as well as difficulties experienced. Thus, answers are linked to their personal experiences and relationships with the environment, as depicted by a social construction. At the same time, objective data is considered under the light of realism in terms of facts regarding the companies' supply chain activities. Consequently, data aims to achieve more depth than breadth, where information does not provide simple facts but complete perspectives and opinions to be analysed.

5.2. Research approach and purpose

The research approach refers to the role that theory takes in the development of the analysis. There are three main approaches, namely deduction, induction and abduction. The first one occurs when theory is the main point of reference, which is then tested through empirical research. Contrary, induction takes the data as the starting point of the research, which is then used to build theory. Finally, abduction can be considered as a mix of the previous two, as it takes place when there is a constant evaluation and comparison between theory and empirical data. (Saunders et al. 2009: 124 - 128.)

As mentioned before, there is a lack of previous studies that focus on the fashion industry when analyzing the impact of CE. Current literature on the topic provides a wide variety of conclusions but there is not a generally accepted rule regarding CE. Consequently, the starting point of the research comes from a combination of theories that are meant to be contrasted with the empirical data, to then arrive to conclusions that can be used to develop the knowledge on the topic. Thus, the approach taken is closer to abduction where, as mentioned by Dubois & Gadde (2002), the research framework is confronted with the empirical world and continuously reoriented accordingly.

Regarding the purpose of the research, it is possible to identify three main movements, namely exploratory, descriptive and explanatory. An exploratory study takes place when there are few or no earlier data on the topic, thus, the objective is to provide new insights. The descriptive research is otherwise meant to provide a detailed description of

phenomena, events or people. Lastly, the explanatory purpose aims to explain the reasons why something happens through the analysis of relationships between factors. Even though they are different nature, it is common to find overlapping purposes within the same research. (Saunders et al. 2009: 138 – 141.)

In this case, the topic object of the study mainly takes an exploratory approach, as the findings aim to provide new knowledge that serves as a starting point for further research. Implications of CE have been previously analyzed, but not within the context of SMEs in the fashion industry. Consequently, the research questions are driven by the discovery and understanding of this event. At the same time, it also shares some aspects of an explanatory analysis, as it follows the interactions between the implementation of a circular economy and the SC performance. In order to understand the way CE impacts SMEs, it is needed to study the relationship between CE characteristics and SC aspects.

5.3. Research strategy

Once the approach and purpose have been delimited, the research needs to follow a certain strategy. The answers to the research questions can be found through diverse strategies, such as ethnographic research, action research, focus groups, discourse analysis, or case study among others. Taking into account the explorative character of the research, it is difficult to classify it within a specific research strategy. The lack of previous empirical data on the topic asks for a strategy that can lead to the development of initial conclusions that can be contrasted and adjusted regarding the theoretical framework.

Thus, the present document aims to attain the research objective through the multiple case study, which involves an empirical analysis of a phenomenon within its context (Saunders et al. 2009: 145). In this case, the objective is linked to the implications of the CE in the fashion context, and more precisely in the case of SMEs. Regarding the choice of Italy as the focus of the study, it is important to mention the fact that the fashion industry is a highly representative sector of the Italian economy, being the European land with highest concentration of this type of companies (European

Commission 2016 f). Then, time constrains force the analysis to focus on an attainable amount of data. Thus, contextualizing the research in one single country, but in multiple cases, allows for deeper analysis without limiting variety. Besides, the fact of being able to communicate in Italian has facilitated the task of reaching and agreeing interviews with the organisations.

Regarding time horizons, the research follows a cross sectional design (Saunders et al. 2009: 155), where data on different SMEs is collected at one point in time. The objective is to know about the current situation that SMEs are facing in Italy, thus, it does not require obtaining the information in two separate time frames. The main issue is to analyze how CE impacts each of them and a cross sectional horizon allows for analysis of events at the present time.

5.4. Data collection

The data collection method selected is the interview, which is developed in a semi-structured way, as the main objective is to acquire information regarding some specific topics but at the same time, where additional follow-up and in-depth questions can be included. The rationale behind this interview structure is based upon the fact of lack of previous experience as interviewer so an unstructured interview would not be recommended, as it requires a high degree of interpersonal and social skills as well as confidence in the ambit of interviews. (Eriksson & Kovalainen 2008: 82 – 83.) Thus, a semi-structured interview provides a guideline of the questions to be asked, but at the same time, it leaves the door open to gather information about other unplanned themes or to discover new interesting subjects for the study.

The case study presented is based on a sample of 7 Italian SMEs, that can be classified either as forward supply chain (FSC) or reverse supply chain (RSC) within a CE approach. Regarding the selection of cases, in order to ensure literal replication logic, or in other words to have similar results (Yin 2009 54-56), the sample has been selected following the same general characteristics. The first requirement is to fit within the description of Italian SME, thus, having less than 50 employees and an annual turnover

under €10 millions (European Commission 2016 g), and being based in Italy. It is important to mention that after collecting the information about the companies, it came to realization that all of them also fit into the category of micro-SME, as of accounting with less than 10 employees. Then, they have to belong to the fashion industry commercializing, either or both, fashion clothes or accessories. In this case, the fact of being the designer, producer, or seller did not matter as long as the company had full control over the entire SC. This is due to the holistic view of the CE, which accounts for each step of the value chain.

On the other hand, in order to ensure theoretical replication logic, or in other words to obtain contrasting results (Yin 2009 54-56), companies must fell into the category of, either or both, FSC or RSC. The CE is not yet extended as full integrated approach within the fashion industry, thus, this categorization has been made after discovering that the SMEs where either working with previously used resources (reverse chain) or with new resources (forward chain). Besides, in both cases, the nature and origin of the resources may vary in order to obtain a better comprehension of the implications of a CE from diverse perspectives. The only requirement was that new resources had to be bio or eco fibres, as to be considered sustainable.

The collection of data has been developed through Skype interviews in 6 cases and through written response in 1 more case. Same base questions were asked to all interviewees in an attempt to obtain reliable data, whereas deeper focus was placed on some aspects depending on the forward or reverse character of the company, to achieve a higher validity of information. For instance, questions regarding take-back schemes were mainly directed towards those organizations whose resources were not recycled or reused in order to know about their perceived potential. Besides, questions were initially developed in English, but after receiving a higher response to have the interview in Italian, questions were translated; with the exception of one case, where it was agreed to have it in Spanish, mother tongue of both parts. After asking for permission, interviews were recorded to then be transcribed in the language they took place. An example of the English guidance questionnaire can be found in **APPENDIX 1.**

The following tables show a classification of the sample as RSC or FSC, including company location, number of years in operation, type of resources and product line.

**Table 5.** Interview sample: RSC SMSs.

| Company | Interviewee* | Location | Nº of years | Type of resources | Product line |
|---|---|---|---|---|---|
| Bolina Sail | Interviewee A | Lignano Sabbiadoro (Udine) | 2.5 | Recycled sails from different types of sea crafts | Bags including handbags, shoulder bags, backpacks, etc. |
| Riot Clothing Space | Interviewee B | Verona | 1.5 | Recycled materials from different sources** | Clothing and accessories including bags, wallets, etc. |
| Volver Upcycling | Interviewee C | Rovereto (Trentino) | 2 | Recycled truck tarps and safety belts. | Bags including backpacks, wallets, shoulder bags, etc. |

*All interviewees develop main responsible positions within the companies.
**The percentage of recycled materials varies from 50% to 95%, depending on the type of product.

**Table 6.** Interview sample: FSC SMSs.

| Company | Interviewee* | Location | Nº of years | Type of resources | Product line |
|---|---|---|---|---|---|
| Francesca Tronca | Interviewee 1 | Casorate Sempione (Varese) | 3 | 100% hemp | Women clothing |
| H-EARTH Ethic & Eco Underwear | Interviewee 2 | Montemurlo (Prato) | 10** | Eco fibres: bamboo, vegetable starch vegetable silk and eucalyptus. | Underwear |
| OF HANDMADE | Interviewee 3 | Cellatica (Brescia) | 9 | Eco and bio fibres: Hemp, flax, organic cotton and wool. | Women and children clothing |
| Rétro eco à porter | Interviewee 4 | Roma | 6 | Eco and bio fibres: Hemp, bio cotton, bamboo and bio silk. | Women clothing and underwear |

*All interviewees develop main responsible positions within the companies.
**The company existed for more than 50 years, but it has entered the sustainable path in 2006.

5.5. Data analysis

A stated by Saunders et al. (2009), qualitative data analysis is characterised by the use of conceptualisation, in other words, interpreting the meaning of non-standardise groups of data. Thus, once the information is collected, the analysis of the data is performed under content analysis, where general themes are first identified to subsequently reduce them into 3 to 5 main topics that are labelled accordingly to the research objective (Saunders et al. 2009: 491 – 494). The process is interactive in nature, as there is a continuous reshape and redirection of conclusions along the data collection and analysis. This way, conclusions and findings are extracted and contrasted in order to provide new insights related to the CE in the fashion industry.

The information analysed comprises primary data obtained from interviews, following a series of steps. First of all, after asking for permission, Skype interviews were voice recorded. This allowed for major concentration on the topics being discussed as it provided the security of being able to re-listen to it in a posterior moment in time. Along the interview process it came to realization that there were clear differences between companies using new and used resources, whereas information was closely similar within both groups. Right after each interview, recording files were checked and then, transcribed in the language the interview was conducted. Listening to the interview provided a deeper understanding of the information and allowed for discovery of interesting aspects that were not noticed during the time of the interview. During the transcription, information directly related with the RQs was highlighted in order to have a base for future deeper analysis.

Once the interviews were over, the analysis proceeded from the reading of each transcript, being 1 Spanish and 6 Italian documents of about 10 pages each. Within the transcript, and starting with the interesting information previously identified, notes were placed under the text divided into four categories, namely "link with motives", "link with CE", "potential of reverse logistics", and "link with difficulties", which at the same time included a division between "upstream", "internal", "downstream" and "outside". After that, relevant quotes were extracted from the interview and placed into two tables

(one for each group of companies) according to the category they belonged. This way, it facilitated the comparison of terms and meanings provided by each group of companies.

After comparing answers, and according to the perceived value of the information in relation to the RQs, main categories were reduced to two, being "main CE power and principle" and "CSCM challenges" subdivided into "upstream", "downstream", and "legal and financial support". The following step comprised the comparison between companies' answers within its own groups in an attempt to draw common conclusions applicable to all of them, as well as to identify which contextual aspects led to diverse answers within categories. This part of the analysis was based on perceived meanings and understandings but always backed with previous literature, which helped to create a holistic vision without renouncing to the variability present within each group due to diverse products, materials, geographic locations, internal values, etc.

The final step comprised the development of clear answers to the RQs, were information previously analyzed was synthesized in order to provide a simple picture of findings. This was contemporaneously made with a final discussion where RQs' conclusions from both groups were compared with current literature to identify how the data agreed, disagreed or added a new perspective regarding the existent knowledge. This process followed a systematic review of RQs answers together with previous empirical research and theoretical assumptions leading to both supportive conclusions and contrasting ones, which allow for future research on the topic.

5.6. Data reliability and validity

The credibility of research findings depends on their reliability and validity. Taking the first concept, reliability relates to the way information is collected and analysed, and as defined by Saunders et al. (2009: 156), it is based on the ability to produce consistent findings under similar conditions. There are four main threats to reliability. The first one is the subject or participant error, which refers to the possibility of participants to provide different answers due to their individual feelings at the time of the interview (Robson 2002 in Saunders et al. 2009: 156). For instance, an employee who had a

stressful week may be influenced by that feeling when answering the questions. In order to avoid this threat, interviews were agreed to take place at the time and day more suitable for the interviewee. Besides, the interview took place in a distended way where each participant was given enough time to answer each question and to discuss more in deep any topic they felt to talk more about. Also, one interviewee was too busy to have the interview on Skype, and it was agreed to answer it in written format, which ensured that replies were produced in a moment when the participant was more willing to provide information.

The second threat refers to the subject or participant bias, which refers to external constraints that may affect the interviewees' answers (Robson 2002 in Saunders et al. 2009: 156). For instance, a worker may feel the pressure to answer in a determinate way due to the possible reaction of the manager. In this case, this threat has not represented an impediment to obtain reliable answers as interviewees work in high responsibility positions within the businesses. Thus, it is possible to affirm that the data provided was consequent with interviewees' actual opinions and experiences. On a third place, the observer error refers to the possible misleading actions during data collection. For instance, in the case of being various interviewers, each of them may have a different way of asking a question which can lead to disparity. (Robson 2002 in Saunders et al. 2009: 157.) This threat has not meant an important problem for reliability, as interviews were conducted by the same person, in a similar manner, and following a guideline of questions. Then, throughout the development of interviews, new relevant topics arose from the conversations which led to the inclusion of follow up questions that were also asked to the rest of participants.

Finally, the last threat identified refers to the observer bias or how the interviewer feelings and opinions may affect the understanding and interpretation of the information (Robson 2002 in Saunders et al. 2009: 157). In this case, the rule has been to analyze the data obtained from a neutral position, without considering previous knowledge neither own conceptions. Due to the lack of research on the topic, this has been an easy task, as the analysis has also comprised a learning process, where new knowledge has been created. At the same time, all interviews were considered equal in terms of utility, relevance and novelty, regardless the type of organization and interviewee.

Thus, it is possible to conclude that in terms of reliability, a similar research conducted in a different moment in time will possible lead to similar conclusions in terms of main CE aspects and CSCM challenges. However, it is important to note that answers were linked with the geographic context, in the sense that many respondents pointed out how situations were diverse outside Italian frontiers. Thus, a replication of the study with SMEs from the fashion industry in Germany would not agree with many of the difficulties signalled as main drawbacks for CE integration.

Moving on to the second aspect required for a quality research, validity is defined as whether the findings are about what they are supposed to be (Saunders et al. 2009: 157). In other words, the study will be valid if respondents have given the right unaltered and independent information in order to answer the research questions. A threat related to this research include the possibility of participants not answering with complete honesty some of the questions as to avoid other SMEs to know the way they manage their SCs. However, in order to obtain further participants for the study, interviewees were asked by the end of the interview if they knew about other organizations that could be interested on participating. Surprisingly all of them suggested other SMEs, being some of them direct competitors, and even provided me with the direct contact details of the person in charge as they knew each other. Thus, it seems appropriate to assume that in the case of SMEs within the sustainable side of fashion in Italy, rivalry is not as high as expected, thus, reducing the risks of missing validity.

Likewise, another threat to validity could be the fact of misunderstandings due to the language barrier in the case of interviews conducted in Italian. Nonetheless, to reduce this risk interviewees were sent the translated questionnaire before the interview date, in order for them to have an overall idea of the topics to be discussed. Besides, before starting the interview, participants were given a short explanation of the objective of the thesis as well as the RQs, which settled the appropriate environment for the easier development of the interview. Then, in the case of follow up questions that arose during the course of the interview, reformulations and further explanations were given in those cases where the interviewee could not correctly understand the point of the question.

To conclude, data collection and analysis has been designed and developed in a way that supports the reliability of findings, reducing the threats through logical and transparent processes. Moreover, validity of findings can be assured thanks to the collaborative approach of all participants, whose willingness and openness during the interviews allowed for easy and interesting interviews, leading to the right information flows. It is also important to note that the explorative character of the research does not ensure that results are *generalisable*, or in words of Saunders et al. (2009: 158) that findings are applicable to other research settings. Thus, internal validity is accomplished but external validity or *generalisability* would require of further knowledge on the topic in order to develop a research design and strategy that can be used, for instance, across sectors yielding similar results.

# 6. FINDINGS AND DISCUSSION

This section contains the empirical part of the document. It comprises the disposition of findings to answer the research questions proposed. In order to provide a simple vision of how the data is linked with each of the topics discussed, direct quotes translated from interviews are shown in tables within each of the sections. The analysis is followed by a discussion that leads to the formulation of clear answers to the research questions describing the way they add knowledge on the topic in relation to current literature.

6.1. Findings from interviews

After carefully evaluating and analysing all the information collected during the interviews, several conclusions can be formulated in order to fulfil the objective of the thesis. The information is displayed as follows. First of all, there is a presentation of findings related to the first research question, being this "How is the circular economy being integrated into (SME) supply chains in the fashion industry?" In this analysis, CE characteristics present in each type of SC have been extracted and compared. Then, findings are separately classified in order to show the relevance of the approach for each RSC and FSC companies.

Moving on to the second research question, namely "What are the main supply chain management challenges faced by SMEs in the implementation of the circular economy approach?" In this case, conclusions are outlined following a specific pattern in order to facilitate achieving an overall view of the difficulties the companies have pointed out during the interviews. Due to the different contextualization and characteristics of both groups of companies, the analysis is divided between RSC and FSC SMEs. Each section contains the main challenges within SC components and also, a mention on the difficulties related to actors having an impact on the chain, to obtain an overall picture of their current situation in the market.

## 6.1.1. The CE and the RSC

The **Table 7.** provides a simple and synthetic representation of the characteristics of the RSC SMEs that reflect the integration of a CE approach. The content shows the main CE principles and powers, together with the interviewee quotation that better represents it. Alongside, a short explanation about main aspects is given.

First of all, it is possible to see how Bolina Sail and Volver Upcycling portray the image of companies that close the circle of different industries, sail and truck tarp producers, respectively; whereas Riot Clothing, even though is still on the pathway to use 100% recycled materials, can be seen as a company closing the circle from the perspective of end consumer waste. Besides, all interviewees agree with the CE principle "*waste is food*", and some of them even mentioned *upcycling*, the representative CE term for reverse logistics signalled by the Ellen McArthur Foundation (2013).

Thus, it is possible to conclude that their work is developed on the bases of the CE principle "*waste is food*", that asks for a change of mindset from waste to input.

**Table 7.** RSC fashion SMEs: main CE principle and power.

| CE characteristic | Interview quote |
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| **PRINCIPLE**<br><br>**Waste is food** | *"We try to bring back to life sails that are no longer used, [...], to give them a new life to not discard them. We give people the possibility to use them in a different way"* – Translated from Bolina Sail interview.<br><br>*"It has as a base the discourse of sustainability so starting from mainly recovered materials, creating then what it is, let's say, my vision of fashion"* – Translated from Riot Clothing Space interview.<br><br>*"[…] I could buy the same material new and I could even print it with what I like and I could make bags that are, I don't know, with flowers or other prints if I made them new. […] but the advantage is that you can use something that would be thrown away. If little by little we made this with everything, waste could be reduced a lot."* – Translated from Volver Upcycling interview. |

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| **PRINCIPLE**<br><br>**Think in systems** | *"[...] that they are actually products that even have a really high value [...] There is a need to explain them that they (the reused materials) are an opportunity and not a waste"* – Translated from Bolina Sail interview.<br><br>*"I follow the entire process, from idea to the finished piece. [...] I collaborate with other artisans in the case I want to develop products that do not belong to my competence or my ability to make them"* – Translated from Riot Clothing Space interview.<br><br>*"Sustainability [...] with the environment but also sustainable within the work itself. [...] It is about everything being sustainable. [...] we recover everything we do; within the company we make little waste. [...] we live in Rovereto, we have the company in Rovereto, now we will have the storehouse in Rovereto as well...trying to operate everything within a local scope."* – Translated from Volver Upcycling interview. |
| **POWER**<br><br>**Circling longer** | *"The main thing is that the material is resistant, that it is original and that it is not something that can be found anywhere."* – Translated from Bolina Sail interview.<br><br>*"It gives you even higher possibilities to play [...] because maybe you came across fabrics that are from the 50s, that are way more beautiful that nowadays fabrics [...]"* – Translated from Riot Clothing Space interview.<br><br>*"We try to, before anything, that they are in good condition [...] it has to be a material that is in good condition in order to ensure that the bag will last and that it will not be rubbish in months [...] With us is not about quantity but about quality."* – Translated from Volver Upcycling interview. |
| **POWER**<br><br>**Cascade use** | *"We have many clients that buy the bag because it is something new, different from the others, and then because of everything that is behind, so the story about the sail and everything that the object tells."* – Translated from Bolina Sail interview.<br><br>*"[...] getting to know and introducing others to things that otherwise you may not be able to be in contact with. [...] you are able to tell a story through that fabric, to create awareness about different countries, different cultures."* – Translated from Riot Clothing Space interview.<br><br>*"What actually counts is that, yes, that it is made with recycled materials, but only if it is a quality product [...] then when we tell the story (of how it is made) customers give it a higher value, yes, it has a higher value"* – Translated from Volver Upcycling interview. |

In relation to this, Interviewee A from Bolina Sail mentioned during the interview the need to explain to the market the real possibilities of redesigning previously used resources to transform people's mentality from waste to opportunity. This view confirms the study developed by George et al. (2015), who addressed the systemic approach of CE by portraying a model that considers economic waste and economic

resources within the same scheme, rather than separate issues. In the same line, Interviewee B from Riot Clothing tries to perform the entire process from product design to commercialization, but when this is not possible, there is collaboration with both, other producers within the chain as well as actors outside the chain.

This fact shows the relevance of an integrative approach as portrayed in the GST. Likewise, Interviewee C from Volver Upcycling, mentioned the importance of not only using recycled materials but of being consequent along the chain in order to create value in a sustainable manner, both socially and environmentally. One example of this is their philosophy of working in a local manner, having all facilities and partners at km zero. Once again, the company's development is based on an integrative and holistic mindset.

Consequently, it is possible to confirm the CE principle of "*think in systems*" as the motor that drives the sustainable growth of the companies.

Moving on to the CE powers, it is important to point out that even though the holistic aspect of a CE, it is possible to strongly identify its power mainly within the activities of the SMEs' upstream component in comparison to other parts of the SC. On the first place, the quality and originality of materials are the essential requirements mentioned by all the interviewees. This factor can be directly linked with the CE power of "*circling longer*" based on the CE model developed by George et al. (2015). For instance, the higher the environmental self-renewal ability of sails, the higher the possibilities of Bolina Sail to produce a bag that will extend the life of the sail circling for a longer period of time. Moreover, the CE power of "*cascade use*" is reflected on the emphasis placed over the story behind the original materials coming from a different industry which, as declared by all participants, helps them educate and transform consumers' mindsets. As pointed out by the Ellen McArthur Foundation (2013), reusing resources from external economic sectors allows for maximum exploitation, becoming a powerful competitive advantage for organizations.

Thus, it is possible to affirm that fashion organizations enlarging the life cycle of materials through reuse and regeneration are powered by longer and cascade circulation as portrayed in the CE theory.

6.2.2. The CE and the FSC

The **Table 8.** provides a simple and synthetic representation of the characteristics of the FSC SMEs that reflect the integration of a CE approach. The content shows the most relevant CE principles and powers, together with the interviewee quotation that better represents it. Further below, a short explanation about main aspects is given.

**Table 8.** FSC fashion SMEs: main CE principle and power.

| CE characteristic | Interview quote |
|---|---|
| **PRINCIPLE** <br><br> **Diversity** | *"But I wanted to come back to a slow fashion. A smaller thing, managed by people with passion, and paying them in a fair manner without exploiting anyone. […] Now I am making the fabrics with European hemp that is certified by Master of Linen."* – Translated from Francesca Tronca interview. <br><br> *"A company must be profitable, but it can also be at the same time socially responsible, in terms of who is employing […] For people's health […] because the skin absorbs […] the chemical substances that you wear. […] my products have a fabric that has the advantages of a technical fabric but being entirely natural."* – Translated from H-EARTH Ethic & Eco Underwear interview. <br><br> *"[…] Eco chic philosophy [...] I have always had a strong sensitivity for the environment. So I had the idea of developing something contemporaneous. [...] Because I believe in the possibility of creating something that is fashionable, taking care of the environment, of everything that surrounds it."* – Translated from OF HANDMADE interview. <br><br> *"[…] reusing fabrics that come from the traditional industry is like continuing to wear the same typology of fabric with toxic substances […] it is not about a change from that point of view but rather to re-start, let's say, to spend more in order to waste less. The fast fashion is not sustainable in the sense of production levels."* – Translated from Rétro eco à porter interview. |

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| **PRINCIPLE**<br><br>Design out waste | *"It is a marvellous plant that truly, nothing is wasted, it is good for the earth […] Regarding waste […] I actually make really little fabric waste […] I try to really consume, to exploit it to the maximum, placing maybe smaller models within bigger ones."* – Translated from Francesca Tronca interview.<br><br>*"Making the underwear I produce a waste [...] since I do not have a big production volume, I have agreements with other companies that all their production waste is recovered by me […] So, I put them together and then, I hand it over to a company that transforms it in mattresses' stuffing […] or, lately I have gave it to a company that produces mop yarns."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"The circular economy is deeply rooted in the achievement of recovery, recycling, and zero waste. We want to emphasize the importance of handcrafted and handmade production […] but above all, we want to tackle the pollution and waste issues."* – Translated from OF HANDMADE interview.<br><br>*"If you study the design pattern well, it is difficult to have a big amount of waste. […] When I realized to have a determinate amount of waste, I have recovered it […] giving it away to associations that are here in Rome that conduct sewing courses. But there is not a volume of production enough to lead to a high waste that justifies a recovery system."* – Translated from Rétro eco à porter interview. |
| **PRINCIPLE**<br>Think in systems | *"I have even decided to buy the yarns and make them transform into fabric, always here in my area, 12 km distance […] creating a km zero fabric […] dying process always 9 km distance […] all the members of the chain are here in my area. Everything is made in the radio of 15 km. […] Everything is safe […] there isn't waste […] I am 100% sure that they made everything according to the environmental regulations."* – Translated from Francesca Tronca interview.<br><br>*"I try to optimize a bit everything. If you have to be ethic, you have to be in all the cycle so you should not prevail one part over another [...] let's say that I produce the fabric, the unfinished product, and then I give the sewing to another company, and the dying to another one. Here in Prato […] They are all in the radio of 10 km, so everything we can say at km zero. […] Regarding the dying, there is a closed system of water recycling."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"The most relevant part relates to the production, that we want to keep within Italy, at km zero. [...]Our company is born with a strong ecological connotation. It is based on supply chain at km zero and slow fashion […] easily accessible, eliminating the problems of transportation, time and pollution."* – Translated from OF HANDMADE interview.<br><br>*"Yes, I only have producers in Italy. The underwear is made in the surroundings of Rovigo, whereas the clothing lines are made between Roma and currently Brescia. […] But all the producers, let's say those who sew, are all in Italy."* – Translated from Rétro eco à porter interview. |

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| **POWER**<br><br>**Pure circles** | *"I have chosen the hemp because in my opinion it is a really beautiful fabric that falls, it has a particular way of falling, and then it is comfortable to wear, it is thermoregulatory […] It is bio by itself, […] it does not require any pesticide, it does not require anything to grow, and it consumes less water than any other fibre."* – Translated from Francesca Tronca interview.<br><br>*"I have reasoned in a different way using always eco fibres […]. Thus, my materials are the bamboo, vegetable starch, currently I am using a really new fibre that is made from castor oil. Another one is the vegetable silk and the eucalyptus fibre."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"Our company develops first a research on raw material, that has to be natural and, when possible, bio. The selection of raw materials is one of the most important moments as it is the base for the creative part of the work. We try to make a deep research on the materials to be used, with preference over natural fibres, natural wool, cotton and linen."* – Translated from OF HANDMADE interview.<br><br>*"I basically take several materials, hemp, bio cotton, and bamboo being principal; and also bio silk […] it is a product that is more wearable, more comfortable on. The majority of the people that buy this type of material, of fabric, then it is difficult that they go back (to buying regular fabrics)."* – Translated from Rétro eco à porter interview. |

Starting by the CE principles that characterise the fashion FSC, it is possible to observe that all interviewees coincide in the way products are developed, which can be linked with the principle of "*building resilience through diversity*". It is not about designing a product that is good for the environment but a product that fits the environment supporting human's health, nature's health and ethical working systems. Thus, all companies perform their activity under a *biomimicry* approach, in other words, their entire working system is designed not to meet the environment needs but to favour them. This fact also relates to the CE principle of "*design out waste*", highly visible in the discourse of the companies in relation to in-house waste. Besides, responses also reflect the views of academics identifying the efficient use of resources as a pillar of the CE (Diavat & Govindan 2011; Ghisellini et al. 2016; Lieder & Rashid 2016). For instance, Interviewee 1 from Francesca Tronca mentions how she places small models together with bigger ones in an attempt to reduce the waste and increase efficiency in the process.

Moving on to the second principle that has been identified in all SMEs, "*think in systems*" is reflected in the so called *Made in Italy* claimed as essential by all interviewees. The companies portray a production system based on the involvement of

other small companies within the same local territory, which resembles the philosophy of km zero. Besides, the EPR can be distinguished when they mention the importance of having full control and awareness of the ways channel members develop their respective responsibilities. It seems that one of the main pillars of their system is the fact of not only producing in an environmentally sustainable and socially respectful manner but, doing so in a way that also favours the local economy, surrounding themselves with passionate partners that share their same vision and values. Besides, doing so, they annul the social risk analysed in the study of Giannakis & Papadopoulos (2016), predominant within the fashion industry.

Thus, it is possible to conclude that the FSC of fashion SMEs under a CE approach is built upon the principles of building resilience through diversity, while eliminating waste at all levels and steps of the process. Besides, the entire system is taken into consideration, ensuring the implication and responsibility of all actors to perform in a sustainable and ethical manner.

On the other hand, the companies' supply chain is powered by the characteristics of the natural resources, which leads to "*pure circles*", where chemical substances disappear from the formula, and water consumption is reduced to a minimum. As stated by the Ellen McArthur Foundation (2013), the uncontaminated nature of basic materials used to develop final products imply a better system maintenance and growing quality, that favours the results of organizations following the CE approach. For instance, Interviewee 1 from Francesca Tronca mentions the ability of hemp fabrics to decompose in nature. In the same line, this type of resource is known to be organic by itself in the way it is harvested and transformed into yarns. But this does not only relate to hemp, other bio materials such as eucalyptus or bamboo, have the ability to allow these SMEs to put in circulation garments that promote a pure and natural way of collection, promotion and distribution. In sum, their systems reflect the ability of bio fibres to completely substitute synthetic or regular ones, with a highly satisfactory result.

Consequently, a CE approach for FSC SMEs is successfully implemented thanks to the power of "*pure circles*" through the introduction of bio and eco fibres that allow the system to eliminate any toxic or pollutant substance from the final garment.

6.2.3. The CE and RSC SMEs: Supply chain management challenges

Starting with RSC SMEs, the **Table 9**. below shows the main areas of conflict identified within each of the components of the SC.

The first challenge identified within the upstream component of the chain supports the conclusions drawn by Hvass (2014) in his study about reverse fashion pioneers. As mentioned by the interviewees, the uncertainty and variability associated to the resource supply and characteristics imply an additional management challenge. But it is important to mention that companies placed higher emphasis on the positive aspects of regenerating materials, as this issue is balanced with their passion for the job and creative skills. In line with the lack of control over the amount and type of supplies, Interviewee C from Volver Upcycling, also referred to the limitation that it implies in terms of production capacity. In their case, they try to maintain the km zero philosophy within each activity, and this constrains their material supply options as suppliers need to be within close distance to their job place. Thus, in order to increase the number of bags produced, they should either diversify their collections using different materials or abandon the *Made in Italy* in terms of materials' origin.

Then, on the supplier side a main drawback is pointed out referring to the process of coming into terms to close supply agreements. For instance, Interviewee A from Bolina Sail, thinks that there is a need for higher visibility of both, companies producing the waste and companies able to transform it, in order to facilitate the exchange. Two viewpoints can be extracted from the SMEs comments that explain why this process is very difficult in Italy. On the one hand, Interviewee A argues that the main problem relies on the profit driven mentality of the organizations producing the unwanted material. In his opinion, in many cases, it is cheaper for those organizations to throw away the materials rather than agreeing its commercialization with the small companies. On the other hand, Interviewee C from Volver Upcycling, does not think that these

organizations should be provided with economic benefits in order to incentivise the regeneration of waste. In her opinion, the problem relies on the complex waste recovery system established in the country, where each company has to declare and pay accordingly to the type and amount of waste produced. This system represents a challenge for these SMEs to access unwanted primary resources from other organizations.

Then, regarding the internal component, the theory discussion showed how in terms of Dissanayake & Sinha (2015) findings, the remanufacturing process is one of the most challenging activities for fashion companies; conclusion supported at the same time by Hvass (2014) work, who pointed out the negative effect regarding lack of best practices in this matter. However, in this case, the production process has not been identified as a problematic area by any of the respondents. Actually, in their words, the techniques used are basically the same as those that can be employed to produce collections with new resources. At the same time, none of them recognised the need of special skills or knowledge to develop this task, corresponding with mainstream fashion abilities.

"*They are normal techniques but even because we do not use anything else apart from scissors and a sewing machine.*" – Translated from Bolina Sail interview.

"*No, no, let's say all within the standards. Working in loom, embroidery…but let's say everything in the usual manner.*" – Translated from Riot Clothing Space interview.

"*No, the techniques we use are the normal ones used to produce bags and wallets. The fabric is sewed like it is possible to sew leather for instance. The production process does not represent an innovation.*" – Translated from Volver Upcycling interview.

**Table 9.** RSC fashion SMEs: main CSCM challenges.

| CE component & challenge | Interview quote |
|---|---|
| **UPSTREAM** **Material uncertainty** | *"The inconvenient is that you are not always sure about the availability, so you need to continuously be searching. There isn't the producer that you can pick up the phone and say - send me this material -, but you are entailed to look for it. [...] Now we have been able to make enough stock. At the beginning it has been really difficult because we had to go and search a lot more."* – Translated from Bolina Sail interview. *"The other side of the coin is that maybe you fall in love with a fabric and then you realize that you don't have enough fabric to make it* (the product idea) *possible. That is a bit the limitation that sometimes happens, that maybe you receive a piece that is too small to do something."* – Translated from Riot Clothing Space interview. *"Sometimes it happens that if the truck tarp is too dirty, we need to wash it two times. The disadvantage is that the material is not regular, you will always find different levels of thickness, more or less used ones, in terms of colours; many times there are pieces that we need to discard because they are broken [...] If you want to keep it local, within 100km, it is limited; we know we are going to have a growth limit or maybe we need to do other, like I don't know, we keep 2000 bags in truck tarp and then we make other 2000 in wallpaper, something like that."* – Translated from Volver Upcycling interview. |
| **UPSTREAM** **Supplier agreements** | *"It would be useful a communication between the sources of waste and those that want to use it, in a way that both of them could economically benefit; for instance, there could be a tax reduction [...] those organizations could have a visibility, an economic benefit, because otherwise they do not make it; this is the problem here in Italy, if there isn't an economic benefit there isn't interest [...] - look if you manage to reuse the waste, we give you a tax discount - people would came up with many more ideas to reuse it. [...] People are becoming more aware of this, but if there was something at national legal level, it would be much faster, it would be better."* – Translated from Bolina Sail interview. *"*(material source) *mainly from private sources. Yes, yes, from the bureaucratic point of view it is very difficult. I know companies that prefer to throw it away rather than recover it. Because at the end it is cheaper for them."* – Translated from Riot Clothing Space interview. *"We talked once about making some sort of communicate with the industrial association, to let them know that we wanted this type of material [...] a company realized that we used this material and they wanted to sell it to us at a really high price [...] some of them try to take advantage of the situation. [...] It is very delicate the waste topic in Italy. [...] more than anything it is a legislative problem [...] there is a pathway for everything that is waste [...] it is not that easy that the company, in our case because this is like their primary resource, but for another company that maybe is considered waste, in order to give it to another organization they need to get a certification, and also the company that wants to recover the material; that is mainly the problem. [...] I don't think that they should receive any tax discount because they give their waste to another company. It should be a matter of corporate ethics [...] it would already mean a benefit for them."* – Translated from Volver Upcycling interview. |

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| **DOWNSTREAM**<br><br>**Market unawareness** | *"Yes, there are still many who don't even know that this can be made [...] our products are not yet that much searched because people do not know that is possible to do this. There is an unexplored market [...] to approach them to the recycling world and explaining them that actually it is not about rubbish."* – Translated from Bolina Sail interview. |
| | *"Sometimes you need to make them understand the message. After that, it becomes a client that buys any type of product but before, you need to make them become a client. It is a challenge to reach them, but I see that this year in comparison to the last one, there has been a good percentage of sales growth."* – Translated from Riot Clothing Space interview. |

Additionally, following the study of Dissanayake & Sinha (2015), section 4 assumed that in the case of reverse supply chains, design belongs to the internal component constraining the process. Notwithstanding, after the interviews with the companies, it is possible to observe how this consideration does not apply to their businesses. The design of the regenerated pieces is already planned, and after receiving the materials, it is slightly modified when needed. Thus, the design process belongs to the upstream component like in the case of FSC companies. Besides, as mentioned by Interviewee B from Riot Clothing Space, the fact of using recycled materials can even mean an opportunity regarding the design process, as it provides diverse materials each time which incentivise creativity and increases the possibilities of developing unique pieces.

*"No, usually it happens before. We already have the main design [...] After we have the material [...] we try to each time make the ideal with regards to the type of material."* – Translated from Bolina Sail interview.

*"Let's say that initially I have an idea and then I check the fabrics that I have available to develop it [...] working for myself, I do not have the need to make 10 equal things. [...] it even gives you bigger possibilities to play [...] I re-make them, I transform them, [...] and there is the story behind."* – Translated from Riot Clothing Space interview.

*"No, no. We have the basic bag, the design is ready. We make the shape, and then we cut them that way. [...] if we cut a piece [...] and it has a hole, well, then we try to invent something to redesign it."* – Translated from Volver Upcyling interview.

Lastly, difficulties within the downstream component support the view of Hvass (2014), who pointed out the need of changing consumer mindsets regarding remanufactured products. It is possible to see from the respondents' answers that the Italian market is still unaware of the possibilities of recycled and regenerated materials within the fashion industry. The challenge appears to be related with the novelty of such businesses, as even though consumers may feel attracted by the design of the product, they do not know its origin and thus, they do not understand its potential added value. This situation requires interviewees to continuously tell the story behind each product.

To complete the analysis and following the holistic character of the CE, the following **Table 10.** shows the challenges they have experienced with regards to financial and legal support in Italy, which from an integrative perspective has an impact over their overall performance.

In relation with the economic support experienced by the organizations, it is possible to observe how companies have benefited from regional support but, there is an absence of public governmental sources of funding linked with their sustainable character. This fact has not been directly pointed out as a difficulty for the development of the activity, but it is recognized as something that could favour the achievement of minor objectives. For instance, in words of Interviewee B from Riot Clothing Space, it would be beneficial to be able to obtain some kind of support to finance the steps needed to accomplish the *Made in Italy* certificate. This situation contrasts with the views of Caniato et al. (2012), who pointed out that SMEs were more likely to be pressured by the internal costs of following a sustainable approach within the fashion industry.

On the other hand, in terms of legal support, findings focus on the influence of certifications or legal recognitions regarding sustainable aspects. According to their experience, there is not an official certification that proves the sustainability of their collections. But at the same time, the potential benefits of such a legal recognition are

placed on the need to differentiate their business from those falsely claiming the use of regenerated materials. Thus, it would help in terms of CA in the market, contrasting the opinion of Rauer & Kauffman (2015) who identified the need of certifications in order to facilitate consumer understanding of eco-friendly products benefits. However, not all participants recognize this need. For instance, in the case of Volver Upcycling, the company is confident on the consumer trust regarding the origin of their bags and a common standard certificate is not observed as something relevant for the business. On the other hand, Interviewee B was interested on achieving the *Made in Italy* recognition, but given the complex and expensive process behind the nomination, it was not manageable for the company.

**Table 10.** RSC fashion SMEs: financial and legal support in Italy.

| Support | Interview quote |
|---|---|
| Financial | *"I have won a regional contest that was aimed at handicraft and sustainability […] it has helped me to start the business. I see that every once in a while there are some things […] if there was more help it would not be bad. Even regarding the "Made in Italy" discourse […] because then the analysis are expensive, it is not possible to make the chemical analysis of each fabric."* – Translated from Riot Clothing Space interview.<br><br>*"During the first year we were within an incubators organization that helped us a lot. They pointed us in the right direction regarding the choice of product. Besides, they had a lot of visibility, they did publications in magazines."* – Translated from Volver Upcycling interview. |
| Legal | *"No, but mainly because regarding this process there is not any certification […] I think that none has been interested at a legal level. It could help, even because there are companies claiming that produce with recycled materials but it is not true."* – Translated from Bolina Sail interview.<br><br>*"It is told more than anything […] the normative is very complex […] I wanted to obtain the "Made in Italy" […] but even for that is very complicated to be able to get the authorization to make it. […] It implies the fabric composition, they ask you to develop analysis of each fabric each time in order to know the composition; it is an endless bureaucratic mess. […] It could be useful in the sense that, because we know well that many companies try to make it look like that when it is not […] the confrontation between us, being our work, and those who make it as a hobby."* – Translated from Riot Clothing Space interview.<br><br>*"There is not a certificate for our products but it could be helpful. Anyway, we always say the truth about how it is made and with what. We always respect the corporate ethics. If there are others who do not, maybe a certificate could help to differentiate us, but it is not something that directly affects us."* – Translated from Volver Upcycling interview. |

6.2.4. The CE and FSC SMEs: Supply chain management challenges

Moving on to the FSC SMEs, the **Table 11.** shows the main areas of conflict within each of the components of the supply chain.

Regarding the upstream component, main difficulties to the integration of a CE approach refer to supply management activities. An important issue highlighted by all companies is the lack of variety and availability of suppliers of natural bio and eco yarns. This situation forces them to sometimes choose a specific supplier not because of their own predilection, but because there is no other option. Besides, it provides suppliers with a higher bargaining power that allows them to raise their prices as the market is mainly dominated by a few firms. Moreover, this fact also affects their km zero or *Made in Italy* philosophy, part of the CE "*think in systems*" principle. For instance, Interviewee 4 from Rétro eco à porter, explains how the company has established relationships with providers within Italy, but in the case of some specific materials, such as the bio silk, the company is forced to obtain them from abroad in the absence of Italian producers.

**Table 11.** FSC fashion SMEs: main CSCM challenges.

| CE component & challenge | Interview quote |
|---|---|
| **UPSTREAM** <br><br> **Lack of suppliers** | *"It's been three years that I am doing this research [...] it is not an easy task, because it is a particular product. If I wanted to look for cotton or any other, it is enough to go to the big fabric fairs. Otherwise in the big fairs the hemp is a bit, it is a struggle... [...] the European one, it is more difficult to find, it is more expensive, but at least we are sure, about everything that is behind."* – Translated from Francesca Tronca interview. <br><br> *"Regarding resources, I am a bit constrained because there are not that many producers. So you are a bit constrained, or you take that, or you take that [...] for instance, the eucalyptus fibre is made in Austria [...] But there is only one producer of this fibre."* – Translated from H-EARTH Ethic & Eco Underwear interview. <br><br> *"The research of natural resources is not one of the easiest. Looking for natural fibres, especially bio fibres, leads to few results. There are few options, few colours, and really high prices."* – Translated from OF HANDMADE interview. <br><br> *"I basically purchase always from the same fabric producer, an Italian one. For some things I look abroad because from us it is still a bit difficult to find this type of materials. [...] there is less choice whereas I can find synthetic material everywhere and with diverse price categories."* – Translated from Rétro eco à porter interview. |

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| **UPSTREAM**<br><br>Supplier transparency | *"Then enters the discourse of the Chinese hemp and the European hemp. Here it is different [...] In fact, I have made this research and it came out that in China all try to deviate the attention, to not give you the precise answers […] so my fabrics are made with European hemp certified by Master of Linen, so we are sure that it is European and it has a certain traceability."* – Translated from Francesca Tronca interview.<br><br>*"They (suppliers) have the environmental certifications; therefore, they are really attentive to these things. […] I purchase the vegetable silk in Japan, from a big company but there the environmental regulations are much more restrictive than here in Europe […] a small company is much more flexible to control all its supply chain."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"(Regarding bio fibres) There are just a few companies that provide certified products. It is easier for me to work with natural fibres, such as linen, cotton, alpaca or merino. Possibly requesting its traceability and origin."* – Translated from OF HANDMADE interview. |
| **UPSTREAM**<br><br>Design limitation | *"It is the same as any other fabric. The only thing is that for instance, a 100% hemp T-shirt is not elastic as a cotton one thus, you are a bit more limited."* – Translated from Francesca Tronca interview.<br><br>*"The limitation of using natural products is that you do not use the synthetic. There is much more choice of synthetic, so you can make sexy underwear, attractive; there are much more choices regarding colours, brightness. Using natural fibres you make a more basic product […] the advancements of technology allow you to get closer to the traditional products. The path is a bit slow but step by step you can get closer."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"Sometimes it is a bit limited due to the material, in terms of colours for instance. Using only natural materials can affect the performance of the final product. Thus, it is important to always pay attention to the material but also to the impact it has on the final product and its commercialization."* – Translated from OF HANDMADE interview.<br><br>*"With this type of fabric the performance is a bit more complicated, in the sense that if I purchase a synthetic fabric, I know exactly how it behaves. Whereas each time that I purchase a piece, it can be different regarding the way it falls, when it is dry or wet […] There is a need to test it each time to control that it behaves in the same way. But I must say that fabric producers have evolved a lot and they make fabrics that are closer to the conventional ones. […] There is a bit of limitation at creative level but I think this will be solved within short time."* – Translated from Rétro eco à porter interview. |
| **DOWNSTREAM**<br><br>Market unawareness | *"The main disadvantage is the market [...] unfortunately most of the people still do not understand, they are not educated [...] many of them do not even know what is hemp […] It is a discourse of education to make them discover this marvellous fibre."* – Translated from Francesca Tronca interview.<br><br>*"People are starting to be more conscious in comparison to the past. The interest is slowly growing […] there is a need to make them understand […] but it still requires time, we are still at the first steps. In general, who complains makes it about the price, because maybe an underwear piece for them is the same whatever the material it is made of, they do not know what is behind. […] who buys from me tends to repurchase because they feel good, they feel the difference in comparison to traditional cotton."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"Usually you convince these people when they touch the product and they feel its softness, its lightness, then you convince them, but you convince them because the product is valid. It is not that the client buys it due to ideological choice, but they buy it because they appreciate its quality even if they do not understand the advantages of buying this type of garment. […] There is a sort of re-education."* – Translated from Rétro eco à porter interview. |

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| **DOWNSTREAM**<br><br>**Brand unawareness** | *"I hope to attract even the common people in brackets that do not understand and then I explain it to them. [...] They stop by because they see a design that they like. [...] But then, us small companies, you can find that they talk about us maybe in the speciliazed magazines. [...] They could push a bit the "Made in Italy", a lot of talking about this "Made in Italy" here and there, and then at the end...no one seems to bother. [...] In sum, particular sustainable things but they remain always as the idea of small companies that do their own things."* – Translated from Francesca Tronca interview.<br><br>*"[...] here in Italy way less but at the end it is all about the wallet [...] maybe there is a purchase of one ethical piece for every 10 of those conventional ones. Maybe abroad this thing is more extended."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"It is certainly difficult to compete with whom, moving big quantities of money can manage a stronger image and a richer offer. We small brands, especially if characterized by a strong identity, need to be always more captivating, precede and hit with a constant and contemporaneous communication."* – Translated from OF HANDMADE interview.<br><br>*"[...] it is always more of an Italian discourse because abroad they speak about it a lot more [...] In Germany, sustainable fashion is much stronger than fast fashion. [...] in America, even famous people speak about it, but not in Italy."* – Translated from Rétro eco à porter interview. |
| **DOWNSTREAM**<br><br>**Retailers** | *"[...] it is a bit more expensive so it is not perceived in a normal shop but in those that deal with bio stuff [...] Promotion is directed towards this type of retailers, not for the traditional haberdashery [...] if I enter in a shop that deals with natural stuff, I have a different perception."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"Currently we sell within Italy. [...] We directly commercialize the products through fairs and the showroom in Italy. [...] My hope and wish has been always to create an eco sustainable but at the same time fashionable product, that could be proposed and sold in high end stores."* – Translated from OF HANDMADE interview.<br><br>*"[...] it is a bit hard because then you confront the world of the brands where you are not an established brand [...] it is a thing that I have found more in Italy. Abroad there are many stores that sell the big brands together with less known bio fashion brands. From us instead, it is still a bit divided. [...] it is not only a thing linked to a specific world, to a specific way of thinking. In my opinion, fashion should be this. These materials should be the norm [...] it should be the way of producing. [...] I do not want to be remembered just because Rétro chooses eco and bio fabrics but because the clothing line is beautiful, the eco fabric is an added value."* – Translated from Rétro eco à porter interview. |

In this line, another issue arises from the different levels of transparency of these organizations which directly affects the CE power of "*pure circles*". This problem exemplifies the previously analysed views of Rauer & Kauffman (2015) on how the effective introduction of a GSCM is threatened by the presence of lack of transparency along SCs. It is possible to observe how the differences between the environmental standards required in each country make it difficult for these SMEs to know how the process of harvesting and producing the yarns or fibres is actually developed. For example, Interviewee 2 from H-EARTH Ethic & Eco Underwear, declares that the

company purchases the vegetable silk from a big organization in Japan where the regulations regarding environmental issues are much stricter than in Italy and every step is controlled. The provider has even been certified proving the nature of the material purchased.

On the other hand, Interviewee 1 from Francesca Tronca refers to the differences between the European and the Chinese hemp. She mentions she has contacted organizations in China to know about the processes the fibres go through along the chain. However, she found it difficult to obtain clear answers due to the company's lack of transparency regarding this topic. Thus, the company has established relationships only with European providers that are certified under the Master of Linen organization, even though the costs are higher but at least, it is possible to trust the origin of the fibre.

Lastly, in a lesser degree but still present, design limitations have also been pointed out in terms of performance difference between eco and mainstream fabrics. But in this case, all participants showed positive expectations regarding the current and future evolution of this type of fabrics. As mentioned by Interviewee 2 from H-EARTH Ethic & Eco Underwear, collections are a bit constrained in terms of simplicity of design, but with the advancements in technology, the elimination of this challenge is expected. New eco fibres are arising and this will allow them to upgrade the designs into diverse underwear collections.

Then, as seen in the case of RSC SMEs, the internal component of the supply chain does not represent major difficulties than those experimented by the mainstream fashion producers. Besides, all interviewees, except Interviewee 3 from OF HANDMADE, used to work within the fashion industry before starting the sustainable path. This provided them with the knowledge and skills needed to better cope with fashion production, whereas Interviewee 3 joined forces with skilled people in the industry to found the company.

Conversely, the downstream component is seen as a quite challenging part of the business. First of all, the main concern refers to the lack of understanding and awareness of the majority of the market regarding the sustainable side of fashion. As

seen in the interview quotes, their potential market is still reduced to customers whose purchasing mindset is already linked to a conscious consumption. But, in the case of regular fashion buyers, interviewees are required to transform their vision in a way that they re-educate them on how it is possible to produce fashion in a sustainable manner. Also, this unawareness leads them to underestimate the work that is behind each piece of garment, and in consequence, to considerate sustainable fashion overpriced. This situation agrees with the study developed by Harris et al. (2015) but, in this case, interviewees have found how transforming people outside their principal market into potential clients happens when they try on and experiment the quality of the product. Thus, knowing the source of the materials that compose the product may change their mindset regarding the price of the clothes in comparison to fast fashion items. But, as mentioned by Interviewee 4, what turns them into a long term buyer is the feeling when they wear the clothes.

Another difficulty identified relates to the promotion of the brand, and in particular, outside the eco and bio segments, which in Italy seems to be more challenging than in other countries. And this is not only due to the lack of understanding by the public, but also by the lack of support within the whole industry. An important drawback is set by the Italian fashion market, which provides huge opportunities to already established and well-known brands. But in the case of this type of SMEs, opportunities within the mainstream scene are reduced. For instance, Interviewee 1 relates an episode with two journalists from a fashion magazine in Italy, where after asking for pictures of Francesca Tronca's clothing line made in 100% hemp, they finally wrote the article about an established American brand whose line was not even 100% bio.

In the same line, a battle that all SMEs are fighting to win is the commercialization of their sustainable lines together with regular lines. In other words, they aim to change the conception of their collections as product niche towards the mainstream, to become the normal path to follow. However, also in this case, the Italian market presents a lot of barriers. For example, Interviewee 4 tells how placing Rétro eco è porter clothing lines in Italian based retail shops that do not belong to a bio segment represents a hard battle as stores prefer to have only big brands. She also mentions that abroad it is normal to see eco collections together with famous clothing lines; and that in Germany some eco

brands are even given priority. Thus, even though the Italian market is slowly reacting to the need for a change within the fashion industry, the pathway is still long, and credit is mainly given to the powerful brands.

To complete the analysis and as seen in the case of RSC SMEs, the following paragraphs discuss the challenges companies have experienced with regards to legal and financial support in Italy.

**Table 12.** FSC fashion SMEs: financial and legal support in Italy.

| Support | Interview quote |
|---|---|
| Financial | *"From the government there is no help because I have never received a cent of subsidies, of grants […] I have looked for grants for the green economy, that they speak a lot about…but they speak maybe about solar panels, but with regards to textile fabrics there is no one interested. […] With respect to European or Lombardy region subsidies […] They give you 50% non repayable; the minimum investment, I tell you about two, one last year was of €30.000, and one of this year that is €50.000. […] It is viable for companies that are already grown […] But in my case, small as I am, I cannot even think of making such a big investment."* – Translated from Francesca Tronca interview.<br><br>*"Here in Prato they are very strict about the recycling topic but to favour certain own monopolies. It is not a justified level of strictness […] but it is more to favour their shares within the recycling…for those public companies that deal with waste."* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"Unfortunately, I do not think that there is a serious support towards the circular economy from an economic and governmental point of view, in particular related to the fashion sector. It is still very difficult to obtain funding and support […] it seems that the fashion topic is still too trivial to require a serious legislative intervention."* – Translated from OF HANDMADE interview.<br><br>*"No, there has not been any. The only thing I won is when I participated in a funding call of the Lazio region, but it was aimed at feminine entrepreneurship, there wasn't any advantage in the fact of proposing a bio or eco product […] regarding clothing there isn't any state financial help to let's say, build up the company; apart from low impact production, I don't know, the acquisition of photovoltaic panels for the cities […] there is not much interest in sponsoring this type of activity."* – Translated from Rétro eco à porter interview. |

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| Legal | *"It is true that there are not hemp certifications because hemp is already like that […] many say it is "bio hemp" but there is not a bio certificate for hemp. It is a lie to say that hemp is bio because it is not, because it is already bio itself and it does not need any type of certificate […] there are companies that propose mixed hemp and cotton products, and they sell them at a cheapest price. But where do they produce them? No one knows."* – Translated from Francesca Tronca interview.<br><br>*"If I buy bio cotton, there is a bio certificate. But if I buy fibres different from cotton, for instance, eucalyptus, hemp, bamboo, they are not certified. So mine is a bio fibre but it cannot be certified. Only cotton is certified. […] in my case, at least for the moment, this has not influenced me. […] they are also expensive…sincerely, I could not afford them, they even cost €10.000"* – Translated from H-EARTH Ethic & Eco Underwear interview.<br><br>*"We do not have any formal certification, and actually, it has never been demanded. We are evaluating a possible certification for the "Made in Italy", where even resources have to be evaluated and tracked."* – Translated from OF HANDMADE interview.<br><br>*"I am bio certified for the underwear that is made in bio cotton. For the final product there isn't anything. I have even talked about this with ICEA, but that remains as our own declaration […] it is based on the trust that people put choosing our products. Even at low impact level, there is nothing. […] Yes, yes, in fact this is the big problem because then there is who take advantage of it telling what is not […] obviously it would be really helpful for us, for the consumer that then makes the purchase, it would be much simpler. […] It would be nice if there was a sort of fair trade even for those who produce within Italy, that it could guarantee that all the steps are controlled…yes, that could help a lot."* – Translated from Rétro eco à porter interview. |

As seen in the companies' discourse, it is possible to observe how there is a lack of financial help from part of the government and public institutions. As pointed out by Rauer & Kauffman (2015), political decisions can have a high impact on the way companies may implement sustainable approach. In the case of Italy, the economic support towards sustainable growth is mainly focused on some specific sectors, such as solar panels mentioned by Interviewee 1, or the purchase of photovoltaic panels for the cities mentioned by Interviewee 4. At the same time, one of the main constrains relies on the small size and capacity of this type of companies in relation to the amount of investment required to obtain the regional and European economic funds. Consequently, this situation hinders the ability of many micro SMEs within the fashion industry to effectively pursue a fully integrated circular economy as they require a back up source of funds in order to finance the activity.

Moving on to the legal side in terms of resource and product certifications, interviewees place the importance of having a certification on the producer side. In other words, they

agree in the fact that a standard certificate that validates the sustainable origin and production of their clothing lines would help them to differentiate their companies in the market from competitors whose sustainable discourse lacks of real background. This finding contrasts the views of Rauer & Kauffman (2015), who claimed that not having a formal environmental nomination negatively affected the companies' message to the public. As mentioned by Interviewee 2 from H-EARTH Ethic & Eco Underwear, the lack of certifications has not influenced his performance neither his relationship with the public. Besides, he does not think it would represent a big difference in terms of how the public considers the underwear.

6.3. Discussion

After displaying the findings obtained from the perspective of each RSC and FSC SMEs, this last section aims to provide a comparison and contrast of results. The aim is to achieve, first of all, a deeper comprehension of the differences between RSC and FSC organizations and how they relate to each other; to then summarize the main points related to both RQs answers, highlighting the way the research has provided additional knowledge on the topic.

Looking on to the main CE feature that characterise each group, it is possible to see how RSC SMEs work on the basis of quality. The main change in relation to mainstream sustainable practices is the fact of not only reusing any type of resource, but focusing on the quality and origin of that resource in order to have a reliable story that can be told to customers. In other words, it is not about being efficient recycling the highest quantity of disposed material as possible, but about being effective regenerating the right amount of material that allows for the production of high quality and long life products. On the other hand, quality is also an important feature for the FSC group of companies; however, in this case the essential characteristic is redesign. This is due to the fact that their businesses represent an integrative change in the whole system; where mainstream fabrics are substituted by bio and eco fabrics; where each activity is developed within close distance; where social and ethical claims dominate managerial performance; where each part of the chain shares the same values; and where the main advantage is

linked to the environment rather than to economic aspects. In words of Interviewee 4 from Rétro eco à porter:

"*the fashion industry has come to a point where there is an excessive devaluation of the garments, there is a perception loss regarding the product [...] what you do not instantly pay when you purchase the clothes, you re-pay it in labour exploitation and environmental impact that afterwards comes back to us.*" – Translated from Rétro eco à porter interview.

Consequently, the only possible solution is to redesign the whole system. In relation to this, RSCs are led by the principle of not considering waste, but only sources of input powered by enlarging the life cycle of materials that otherwise would be thrown away. These resources are regenerated and given the possibility of circling longer taking advantage of their quality condition. Nevertheless, FSCs following the *biomimicry* philosophy are powered by the existence of pure circles, due to the natural and organic origin of materials leading to uncontaminated products. An important implication derived from this finding is the fact that FSC organizations are placed in an advantageous position to close the circle through the implementation of take-back schemes. The uncontaminated nature of their products will facilitate the conservation of quality materials during a longer period of time, thus, favouring its continuous circling within the system.

Following this topic, when FSC interviewees were asked about the implementation of this type of programs, all showed positive responses but the actual viability of such a project would depend on two aspects. The first condition refers to the type of product, being unfavourable in the case of underwear and specific unique pieces, but highly potential in the case of regular clothing collections:

"*Maybe jeans, shirts, they can have another use, the vintage game, it has a different structure, a parallel economy. But on the other hand, regarding underwear no.*" – Translated from H-EARTH Ethic & Eco Underwear interview.

*"No for the moment I have not thought about this, but it is actually really interesting. […] because the used clothing market works, and even recycled fabrics, regenerated, and then redesigning the model. It could be done. […] You can change the model, and then you do not have the cost of a new fabric again, it is a good option."* – Translated from Francesca Tronca interview.

*"I think that for some things it could work, for others instead it would depend. In the sense that there are customers who can get really attached to the piece, maybe for products that are more linked to fashion trends […] for those who after 2 to 3 years do not want the garment anymore, because perhaps wide leg jeans are back on trend instead of stretchy jeans. Then it could be interesting to pay attention to this* (the take-back program).*"* – Translated from Rétro eco à porter interview.

The second condition emerges from the type of commercialization channel utilized, implying a bigger challenge when garments are distributed to be commercialized by secondary organizations. For instance, Interviewee 2 from H-EARTH Ethic & Eco Underwear mentioned the fact that products are mainly sold through other companies' stores and thus, there is not control neither infrastructure to establish a take back program:

*"It is a very challenging thing from a logistic point of view […] I cannot go to the shop, which is my client, and tell them – collect the used underwear and send it back to me – It is not the case, it does not make sense."* – Translated from H-EARTH Ethic & Eco Underwear interview.

On the other hand, same question but totally opposed response was given by RSC SMEs. In this case, it seems logic that as materials are already reused, developing new products with such resources would not guarantee the quality required to sustain the product continuity along another economic circle. Besides, their product collection is characterised by uniqueness and differentiation which, as mentioned before, would attach the client and difficult the change from buyer to user as portrayed in the performance economy theory:

*"Not in this sense, because we are at the last ring of the recycling chain, thus, taking it back (the product) would only be an extra cost; it will not make sense taking it back."* – Translated from Bolina Sail interview.

*"Maybe it is not suitable for my company because as I develop only unique pieces, then it becomes a bit…I don't know…in my opinion there is the pleasure of choosing one piece and then it is only mine."* – Translated from Riot Clothing Space interview.

*"People get attached to the bag they bought anyway, because each bag is unique so they already know there is no other equal; maybe it is impossible to find the same colour again…"* – Translated from Volver Upcycling interview.

Thus, the main points of the answer to the first research question, "How is the circular economy being integrated into (SME) supply chains in the fashion industry?" can be formulated as follows. First of all, taking the fashion RSC SMEs it is possible to identify quality as main CE feature, whereas in the case of FSC SMEs, the main CE feature appears to be redesign. Both characteristics have already been signalled as relevant by other scholars in the field of CE (Preston 2012; George et al. 2015; Zaman 2015). However, in the case of fashion SMEs, this finding helps to contextualize the importance of each characteristic within the appropriate part of the chain. Moving on to the way the CE powers the functioning of the RSCs and FSCs, "*circling longer*" and "*pure circles*" prevail as main aspects enlarging the life cycle of materials, respectively. This conclusion supports the theoretical model developed by George et al. (2015), helping the understanding of the relevance of a self-renewal rate to close the loop within the fashion context.

Thirdly, regarding CE principles, opposed to the features and powers where CE aspects within each type of chain were interrelated, there is a clear differentiation regarding the underlying principle that drives the integration of a CE within RSC and FSC fashion SMEs. On the one hand, RSC fashion SMEs base the implementation of a CE on the principle of "*waste is food*", as the main focus is given to the regenerative character of materials along the chain. On the other hand, FSC fashion SMEs portray "*diversity*" as the CE principle driving the management of their supply chain. So it is possible to

observe how in the case of fashion SMEs, CE principles as portrayed by the Ellen McArthur Foundation (2013) are given a diverse priority according to the side of the chain at consideration.

Finally, it seems appropriate to add that, even though in the sample provided FSC SMEs did not close the loop, questions about the potential of take back schemes were raised in order to provide a complete vision regarding the integration of a CE. Answers provided allow for the identification of two moderator factors affecting such possibility; being negatively related with the presence of unique products and positively related with the presence of direct commercialization to the final user. The novelty of these considerations adds another dimension to the existing knowledge regarding the potential of introducing remanufacturing processes for fashion organizations. Whereas the study of Dissanayake & Sinha (2015) signalled collaboration among supply chain actors and the standardisation of operations as factors favouring the implementation of such programs; the empirical evidence discussed points out to the product itself, identifying its natural source, direct commercialization and standard consumer consideration as main enablers.

Looking on to the main challenges, it is possible to differentiate how SMEs working with used materials face more difficulties within the upstream component of the chain; whereas in the case of FSC SMEs, the downstream component arises as the source of problems. Thus, even though both groups of companies signalled the importance of resources for their businesses, conflicts encountered by FSC SMEs did not represent a crucial impediment to effectively design and produce the garments. It is possible to conclude that the use of bio and eco fibres together with an ethical working system based on a *Made in Italy* philosophy is fully compatible with the production of quality fashionable pieces.

On the other hand, the challenges mentioned by RSC SMEs regarding the high uncertainty surrounding suppliers and materials can actually limit the possibilities of the business, for instance, in relation to growth capacity as seen in the discourse of Volver Upcycling. This conclusion provides an additional consideration to the findings of Rauer & Kauffman (2015), who discussed external and internal supply conflicts as a

crucial barrier for GSCM. Their findings are supported from the perspective of the RSC SMEs interviewed but partially neglected from the side of FSC SMEs. Thus, it could be possible to add that the impact of supply conflicts has to be analyzed in relation with the type of materials used in order to achieve a complete vision of the problem.

Then, it is possible to see how the CE as an approach does not imply complex manufacturing processes for the SMEs, as opposed to the mainstream sustainable thoughts portrayed by Caniato et al. (2012) and Dissanayake & Sinha (2015). It is possible to clearly differentiate the movement from sustainable efficiency to effectiveness, where these SMEs are able to implement their environmentally and socially respectful vision at all supply management levels. Besides, product related challenges were mainly linked to design limitations, that, in the opinion of many interviewees, will be soon reduced if not disappear, with the advancements of technology. From a theoretical point of view, this fact exemplifies the difference made between SSCs and GSCs; where authors studying sustainable growth in the fashion industry from the SSCs perspective recognized manufacturing as more relevant than design processes (Caniato et al. 2012), whereas authors taking the GSC perspective, agreed on the importance of design as the way to support zero waste policies (de Brito et al. 2008; Diavat & Govindan 2011; Wu et al. 2012). Thus, as mentioned at the beginning of the study, it is possible to confirm how the CE in the fashion industry has the potential of a blue oceans strategy, where in words of Kim & Mauborgne (2015) the key point is to create market needs.

Accordingly, it is possible to see how market unawareness plays an important role for the promotion and commercialization of both forward and reverse products. However, in the case of FSCs, the most important struggle refers to being able to place their collections next to mainstream fashion brands within regular stores. Given the type of product commercialised, it is possible to conclude that introducing a CE approach in the production and commercialization of fashion accessories, such as bags, does not directly affect the companies' ability to sell the product to any type of consumers and retailers. But, in the case of fashion garments, such as T-shirts, the reality in Italy is much more complex, constraining and limiting the abilities of companies to reach a broader market, keeping their brand perception within a certain eco-friendly niche. This finding provides

a new consideration with regards to the marketing and sales challenges of sustainable fashion products previously identified by authors such as Harris et al. (2015) and Rauer & Kauffman (2015). In the case of Italy, main concerns do not regard the consumer mindset itself but rather the market situation where power and attention, from retailers and public media, is mainly provided to already established and well-known brands. From a theoretical point of view, it signals the relevance of considering the market context in terms of not only consumer side, but also regarding its internal functioning including the unwritten norms that drive actors' behaviour.

As a final mention, the experience of SMEs regarding the legal and financial support received in Italy sets two main points to be considered as having an impact on their overall SCM. Taking the legal considerations in terms of the existence and possession of eco or bio certificates, both types of companies recognised that an official mention regarding the eco-friendly character of their businesses would help to differentiate their business from those competitors falsely defending the production of eco-items. In the case of financial help, even though it would help, the lack of funding has not been recognised as a crucial barrier for the integration of a CE approach. But, this is due to the fact that the lack of monetary funds has been balanced with the passion and willingness of all interviewees to follow their sustainable vision. Thus, an aspect that resembles the work along the supply chain of all companies is the personal motivation of the interviewees to make a positive impact in the environment they are embedded in. This reality confronts the studies of Preston (2012) and Ghisellini et al. (2016), who support the fact that replication of a CE model will only occur when it is backed by commercial success or return on investment. The SMEs declarations have proved how the model has to be backed with the right attitude and values of the founders in the first place, in order to sustain itself in the long term.

Thus, the main points of the answer to the second research question, "What are the main supply chain management challenges faced by SMEs in the implementation of the circular economy approach?" can be formulated as follows. Main findings highlight the relevance of the upstream and downstream components of the chain, leaving the internal component in the background. Once again, there is a clear differentiation between the difficulties encountered by each group of firms. On the one hand, the upstream

component is revealed as the section where RSC SMEs need to pay most of the attention attention in order to overcome the challenge of working with high levels of uncertainty. On the other hand, FSC SMEs are mainly constrained by the functioning of the fashion market in Italy. In this case, evidence shows how apart from the consumer side previously studied by Harris et al. (2015), in the case of fashion SMEs, it is important to take into account the market itself. The Italian context has arisen as having a lot of impact on the way SMEs are able to implement a CE approach.

Likewise, in the case of environmental certifications and financial help, Italy has been portrayed as a lower level country in terms of support towards the sustainable side of fashion. But even though this situation has not meant an important constraint for the SMEs interviewed, it represents an important novelty in theoretical terms. Previous research on challenges has focused on each of the internal components of the chain, obviating the integrative character of the CE, thus lacking the confrontation of results with the context where the organizations are embedded.

# 7. CONCLUSION

This final section aims to conclude the study with a summary of the findings presented, including their theoretical implications as well as managerial importance. Then, the chapter finishes with the identification of the thesis' limitations together with the path to future research on the topic.

The present document has led to the discovery of the implications of a CE for fashion SMEs in Italy. Main conclusions are sustained over the bases of a differentiation between those companies using regenerated resources (RSC) and those using natural bio and eco materials (FSC). Findings yield light over how SMEs integrate the CE aspects within their supply chains, leading to the discovery of quality and redesign as the factors driving the change. Contemporaneously, the system is powered by "*pure*" and "*longer*" circles, where products are design in a way that support the environment where they are embedded. And the RSC and FSC SMEs' performance falls under the CE umbrella principle of "*waste is food*" and "*diversity*", respectively. On the other hand, conclusions regarding main challenges to the CE integration signal the upstream component, in terms of supply uncertainty, in the case of RSC SMEs and the downstream one, in terms of market unawareness, in the case of FSC SMEs as the main sources of problems.

## 7.1. Theoretical contribution

As pointed out at the beginning of the document, there was a lack of previous information regarding the implications of a CE for the fashion industry. After the data collection and analysis, it is possible to observe how the findings settle the bases to reduce the literature gap on the need of knowledge regarding the implications of a CE approach in current fashion supply chains as identified by de Brito et al. (2008). In this case, the information provided relates to the perspective of the usually forgotten, but market relevant, lenses of SMEs.

Current knowledge on CE shows the main features, principles and powers that drive this philosophy from a general point of view (Ellen McArthur Foundation 2013; EPEA Switzerland 2016). But, answers to the first research question show how each of the aspects relate to SMEs working within the fashion industry on each side of the chain. This new consideration allows to see how each aspect has a different relevancy depending on the classification of the company as RSC or FSC. Consequently, it is possible to affirm that SMEs within the fashion industry integrate CE aspects in a different degree depending on the nature of the closing loop.

Likewise, the challenges confronted by these companies exemplify the relevance of the nature of the resources, as well as the context where the organizations operate, including the external market and actors. Thus, this opens the door to a different consideration of previously identified CSCM challenges, where the analysis abandons the single component focus to include a wider view of the context and the SC type of organization. This way, it has been possible to obtain a complete understanding of the difficulties that SMEs are facing in Italy.

## 7.2. Managerial implications

Even though the explorative character of the study, conclusions drawn from the empirical analysis can serve as bases for managers looking to acquire new knowledge on the CE within the fashion industry.

Data collected and analysed can be of interest, first of all, for all fashion SMEs managers in order to achieve a better understanding of how their work can fit within the definition of a CE. Given the recent appearance of such terminology, many organizations are not aware of its potential yet. Thus, being able to have a direct insight on how both RSCs and FSCs integrate the concept, will allow them to place their activities on the CSC continuum. At the same time, it may be useful for managers to know which specific areas of the supply chain may need deeper attention in order to effectively manage the integration of a CE within each of the processes.

Secondly, the analysis of challenges manifested how RSC SMEs mainly confronted the problem of supply and resource uncertainty. But, this difficulty was linked to the nature of the closing loop, with materials coming from a different industry. However, in the case of FSC fashion SMEs the potential of closing the loop will not imply such a problem, as it will be based on an internal loop, where own products become inputs again. This fact may be of interest to those organizations planning on developing a closed system within the same industry, as it provides an incentive to implement the reverse logistics.

Another interesting fact for managerial purposes arises from the difficulty of this type of fashion SMEs to overcome their segmentation as niche brands. In this case, and due to the commonality of responses received, it could represent an opportunity for them to join their forces in order to raise their awareness and voice in the Italian market. As mentioned by Möller & Rajala (2007), the proliferation of strategic nets represents an opportunity for companies to achieve higher benefits than acting alone in the market. Thus, if managers adopt a collaborative approach between SMEs, it could help to reduce the impact of the identified challenge. Same philosophy could apply to producers of eco and bio fibres, in relation to the identified challenge of finding the appropriate material supplier. Increasing their market visibility by a joint action could lead to benefits for both, sellers and buyers of natural fibres.

7.3. Limitations of the study and future research

The research has been designed and developed in a logic, systematic and coherent form in order to comply with the reliability, validity and applicability requirements. However, this has not avoided the presence of some limitations, mainly due to time and experience constraints.

To start with, one of the limitations comprises the small sample of companies, as well as the limited geographic location of those SMEs. Even though the sample has been selected in order to count with enough variety of companies that could represent both RSC and FSC, the number of participants is reduced due to the time constraints that did

not allow for a bigger sample collection. Also, all participants are embedded in a similar context, country and market wise. These facts may limit the applicability of the study to other SMEs in the fashion industry.

Then, regarding the data collection, limitations may have occurred due to the lack of previous experience interviewing. Constraints derived from this situation include the possibility of omitting questions related to topics that could be of relevance for the study; developing the interview in a way that did not exploit the full advantage of the interviewees' responses; or forgetting to ask the right follow up questions on the right moments. Perhaps there has been an evolution on the interview performance from the first interview towards the last one, leading to an increase of accurate collection of information along the process.

Likewise, the novelty of the CE topic, not being widespread within the fashion industry, could have led to answers to some questions being backed with a mainstream sustainable thinking. For instance, the questions related to the take-back schemes asked to FSC SMEs did not provide information related to actual practices but rather to the potentiality of such schemes. Consequently, the analysis of the information has required of intensive interpretation to fully understand and observe the links between empirical data with CE theories.

In relation to these limitations, future studies can be done in order to transform them into research opportunities. The explorative character of the thesis, with findings being more of a first step rather than a final conclusion on the topic, calls for further investigation.

On the one hand, in order to increase the quality of findings, the study could be replicated in other countries, which will help to understand the implications of contextual factors over the challenges identified by the organizations. For instance, a similar research regarding German fashion SMEs could serve to compare both countries and, to identify how the Italian market could achieve a similar level in terms of support towards the sustainable side of fashion. Similarly, including SMEs that actually closed the loop within the fashion industry, regenerating their own products, could be of

relevancy in order to show how the process is developed and to incentivise other organizations to follow the example. It will also be beneficial in theoretical terms, as it will allow for the achievement of the whole picture rather than the expected potential of a take back scheme as presented in this study.

On the other hand, given the holistic approach of the CE, and on the basis of the influence of outside actors, such as other fashion producers, it could be interesting to assess the possibilities of a network approach. For instance, a research that tries to find out about the potential of a market association between several fashion producers following the CE to achieve a determinate common goal. Advantages of such study include the discovery of relevant managerial insights as well as obtaining a different perspective on how to solve one of the main challenges indentified by the SMEs.

Finally, designing a research to study the other side of the coin, meaning the factors enabling the CE integration, could be an interesting completion to current findings. Knowing which factors facilitate the implementation of the CE will help setting the bases to establish a theory that helps managers to fight the negative effects of the challenges.

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# APPENDIX 1. Literature Classification

## Environmental impact

| Studies | Industry | Purpose | Theory | Relevant Data |
|---|---|---|---|---|
| 2006<br>Hsiou-Lien Chen & Leslie Davis Burns | Textile industry | Environmental effect of different textile inputs: cotton, nylon, polyester | - Pollution sources: production of the fibres (whether through agriculture, rising of animals, or chemical synthesis); finishing and dyeing/printing processes; using and maintaining the product; product disposal | - Table with differences on footprint of each input and measures: institutional and consumers |
| 2008<br>Irina-Isabella Savin & Romen Butnaru | Textile finishing mills | Showing how wet finishing procedures harm the environment | - Mechanical and wet processes: list of processes | - Explains finishing procedures and how they harm environment |
| 2010<br>Linda Greer, Susan Egan Keane & Zixin Lin | Textile industry | Explaining ten best practices for textile mills to save energy, water and money | - Dyeing and finishing one ton of fabric can result in the pollution of up to 200 tons of water | - It can be useful for steps on the SC as it provides measures for different processes |
| 2011<br>Joan Farrer & Kim Faser | Textile industry | Differentiating between sustainable and unsustainable textile practices | - Consumer disinformation<br><br>- Retailer disinformation: the further they are from the origin the less they know | - Shows typical process for development and manufacture of a fashion textile product<br><br>- From environment to sustainability: includes people pillar |

| 2012 WRAP | Textile industry | Extensive report on textile and its sustainable future | - Opportunities for businesses and consumers<br><br>- Waste and pollution of textile industry in the UK: classified by activity type<br><br>- Sustainable potential | - Shows which activities harm more the environment<br><br>- Important data on consumption, waste, and pollution |
|---|---|---|---|---|
| 2014 F. Akarslan & H. Demiralay | Textile industry | Showing the harm of textile production to human health | - Textile ecology, human ecology & waste ecology | - Explains each component and the effects on human health: cancer + dermatitis |
| 2015 Subrata Das | Textile industry | Solutions to textile waste | - Contains several procedures explaining how waste can be treated | - Shows the 4 categories of waste coming from textile |

**Circular Economy**

| Research | Industry | Purpose | Theory | Relevant Data |
|---|---|---|---|---|
| 2007<br>Mikael Skou Andersen | Global Economy | Explaining the functioning of a circular economy<br><br>Setting a price tag to externalities | - Environmental economics (Pearce and Turner 1990) vs. industrial ecology (Preston 2012)<br><br>- Ecological utilisation space concept<br><br>- Thermodynamics laws: minimising inputs<br><br>- Sustainable development (weak/strong)<br><br>- Hartwick's saving rule: economic sustainability<br><br>- Externalities<br><br>- Life cycle assessment based approach (LCA) | - Whereas external effects relate mainly to the present generations, the sustainability issue implies a need to address the future generations |
| 2012<br>Felix Preston | Global economy | Defining CE: characteristics, barriers and future prospects | - From efficiency to transformative change<br><br>- Origins: mass production, just in time, flexibility but intensive use of resources→ high price volatility of resources, need for a change: prosperity in terms of new value creation models<br><br>- Industrial ecology coming from environmental economics<br><br>- C2C approach: only replicated if it leads to commercial success → requires systemic changes beyond unitary firms, involvement of the whole SC (collaboration) | - Waste as an input<br><br>- Need for coordination & collaboration, national policy alignment for competitiveness and lower implementation costs<br><br>- From recycling and efficient use to reuse closing the loop<br><br>- The future: redesign of industrial systems, redesign products (C2C) and changing consumption patterns<br><br>- Explanation of barriers to a CE implementation |

| 2013 Maximilian Martin | Apparel industry | Explaining how the industry needs and could be transformed | - Origins: sustainability challenges due to accelerating product cycles and off shoring → the advent of fast fashion, social problems: working conditions and salaries (Rana Plaza)<br><br>- SC rationalization and lean manufacturing: need for transparency<br><br>- Quick response vs. fast fashion<br><br>- Waste to energy | - Apparel value chain model<br><br>- Mainstream value creation: moving up luxury customer segments, expanding to emerging markets, or selling unisex clothes<br><br>- Benefits on resource productivity: reduction of water consumption up to 50%, energy up to 40%, and chemical use by 20%<br><br>- Need to shift sustainability as core value<br><br>- Mindset shift: sustainable as economic source, seeing it as a competitive advantage |
|---|---|---|---|---|
| 2013 Ellen McArthur Foundation | Global Economy but mentions textile industry | Explanation of CE: opportunities for the economy and companies | - Origins:  World's growing population & scarcity of resources, resources' price volatility & high competition→looking for decoupling sales revenues from material input<br><br>- Until now: new forms of energy and recycling but not reusing (design and disposal)<br><br>- How economies and companies win<br><br>- Consumers: access over ownership, IT engagement-need to create awareness<br><br>- Textile: page 34<br><br>- Circularity calculator: new inputs vs. closed circle | - Inner, longer, purer and cascade circles<br><br>- Mentions waste by textiles<br><br>- Challenges: fashion obsolescence and weakest link |
| 2013 WRAP | Textile industry | WRAP report on CE for the textile industry | Sustainable Clothing Action Plan (SCAP) | It shows each phase of the loop and how it can be performed |

| 2015 Donald A.R. George, Brian Chi-ang Lin & Yunmin Chen | Global Economy | Circular economy model with recycling ratio as driver | - Origins: Depletion of resources and waste.<br><br>- Roots: ecological economy (Boulding 1966) and systemic approach.<br><br>- Contrast: Green Solow Model (Brock and Taylor 2010) with Environmental Kuznets Curve (EKC): it argues that environmental degradation happens on early stages of economic growth, but once achieved a certain level, economic growth favours environmental improvement | - Environmental quality achieved through an increase in environmental self-renewal rate or recycling ratio (considering recycling costs equal to zero).<br><br>- Future research→ CE country A is a resource-abundant country and country B is a high-tech country which develops the recycling technology |
|---|---|---|---|---|
| 2014 Kerli Kant Hvass | Textile industry | Analyzing through interviews (industry's early movers) the post retail sustainable practices of textile companies: two strategies→ second-hand and product take back | - Origins: By 2025 over eight billion people will need textiles and clothing, throw away pattern increasing textile waste; resources are ending →need for closed loop<br><br>- CE vs. Sustainability: primary upstream SC, now more focus on downstream→waste management in CE: disposal must be addressed from design phase<br><br>- Principles: the 5 R's (Ho and Choi 2012)<br><br>- Extended Producer Responsibility (Kostecki, 1998), link to integration and systemic approach, upstream and downstream<br><br>- Take back strategy: discount if you bring them back, more foot traffic in the store, more purchases<br><br>- Reverse logistics | - Business Model change: complete life cycle strategies<br><br>- Challenges: Raise awareness of product use, imitation of best practices, stock availability of second hand. |
| 2015 Lynn Wilson | Scottish textile sector case study | Shaping the future of the industry under a zero waste closed loop framework | - CE definition by Ellen Mc Arthur<br><br>- Driver: commercial goal rather than CSR | - Government aims in % reduction and potential economic gains<br><br>- Reference to waste, environmental, carbon |

| | | | | and water impacts |
|---|---|---|---|---|
| | | | | - Provides four company examples of closed loop activities |
| | | | | - Provides recommendations on how to implement CE in textile industry |
| 2015 Atiq Uz Zaman | Global Economy | Reviewing research and establishing pathways on zero waste (ZW) | - Origin: shortage of landfill areas in cities → new waste management strategies<br><br>- Roots: industrial ecology, C2C, green engineering, eco-effectiveness → waste prevention, waste avoidance, waste reduction<br><br>- ZW as part of lean production, C2C principles that eliminate waste ensuring upcycling<br><br>- ZW: combination of design and waste management philosophies<br><br>- Waste to energy | - Zero waste concept continuously evolving, no holistic strategy<br><br>- Definition of zero waste: closed loop, PLC from extraction to disposal<br><br>- Model: the life cycle of zero waste management systems.<br><br>- Sustainable consumption replaced by use when resources placed in a closed loop<br><br>- Waste as a transformation of resources in the intermediate phase of their consumption |
| 2016 Patrizia Ghisellini, Catia Cialani & Sergio Ulgiati | Global Economy | Literature review & comparison between China and other countries' implementation at micro, macro and meso levels | - Origins: current economic model continuous growth and resource intensive<br><br>- Efficiency of resource use<br><br>- Equilibrium between economy, environment and society<br><br>- Roots:<br><br>•ecological and environmental economics,<br><br>•law of thermodynamics: matter and energy degradation<br><br>•general systems theory: the whole determines the | - Need for a return on investment<br><br>- CE: awareness of all actors, renewable technologies and materials, clear policies<br><br>- Life cycle: all processes and interactions, embedded<br><br>- Appropriate waste management and reintegration to the circle is crucial<br><br>- CE: restorative and regenerative→ not keeping activities within nature constraints but designing new models according to nature |

| | | | behaviour of the parts not vice versa | - Ownership vs. use: leasing not selling |
|---|---|---|---|---|
| | | | • industrial ecology: joint ecosystem, industry analysed regarding the environment where is embedded, source and receptor together | - CE waste management: scavengers and decomposers |
| | | | - Sustainable development defined: economic, technological, environmental and social aspects | |
| | | | - Entropy law: in terms of physical flows, not monetary (at some point will not be rentable) not possible a 100% zero waste, at some point re-circling will not be possible | |
| | | | - 3 R principles: | |
| | | | •Reduce: eco-efficiency minimize the use of resources (quantity) | |
| | | | •Reuse: same purpose as original, design of products for multiple circles, incentivise take back schemes, marketing of remanufactured products (shared responsibility including consumers) | |
| | | | •Recycle: recovery and reprocessing (industrial production principles economies of scale) | |
| | | | - 3 additional Rs: redesign, reclassification (technical & nutrients), renewability | |
| 2016<br><br>Michael Lieder & Amir Rashid | Manufacturing industry | Literature review | - Origins: resource scarcity, waste generation and economic advantages →reuse, remanufacturing and recycling as implementation<br><br>- Transformation of business models, regenerative design, industrial ecology, remanufacturing, resource conservative manufacturing (design for | - CE definition<br><br>- Industrial ecology definition<br><br>- Remanufacturing definition<br><br>- ResCoM definition<br><br>- Industrial revolution →planned |

| | | | cascades) | obsolescence$\rightarrow$linear consumption$\rightarrow$environmental and landfill problems$\rightarrow$recycling solutions$\rightarrow$mechanization WW2$\rightarrow$remanufacturing |
|---|---|---|---|---|
| | | | - Multiple product lifecycles | |
| | | | - C2C: division of products into technical and biological parts to re-enter in the environment or keep on the loop. | |
| | | | - Product design: critical materials $\rightarrow$improved material efficiency | - Systemic view and relationships between economic advantages, resource scarcity and environmental impacts$\rightarrow$Better in a CE than in linear systems |
| | | | - Re-thinking business models: redesign, forward and reverse SCs | |
| Cradle to cradle Report- EPEA Switzerland | Global Economy | Explaining cradle to cradle (C2C) It includes some case studies | - Biologic (back to nature) and technical (back to the circle) cycles<br>- C2C vs. Sustainability:<br>•quality over quantity<br>•maximize positive effects vs. minimize negative impact<br>•cyclical vs. linear<br>•favouring the environment vs. measuring environmental impact<br>•eco effectiveness (quality, positive effects) vs. eco efficiency (minimal resource consumption, quantity)<br>•upcycling vs. recycling | - C2C: quality and safety in an infinite loop, production use and recovery based on maintaining original attributes as long as possible<br>- CE defined: generating new resources at recycling prices from original resources<br>- Quality: designed to be cycling as many times as possible $\rightarrow$cascade |

**Supply Chain Management (SCM)**

| Studies | Industry | Purpose | Theory | Relevant Data |
|---|---|---|---|---|
| 2008<br><br>Marisa P. de Brito, Valentina Carbone & Corinne Meunier Blanquart | Fashion industry | Discovering challenges for a sustainable SCM | - Stakeholders understanding of triple bottom line and sustainability<br><br>- Division: blamers and the ones who assume some responsibility<br><br>- Drivers are legal and economic<br><br>- Porter hypothesis: legal environmental rules drive innovation<br><br>- Sustainable Development (SD)<br><br>- Triple bottom line (TBL)<br><br>- Stakeholder view of a Supply Chain (SC) | -Stakeholder model of SCM<br><br>-3 drivers to be sustainable<br><br>- Intra and inter organizational issues<br><br>- Not unified vision on proper SCM and business<br><br>- Mentions the fact that product innovation and achievement of the green customer can be done through organic cotton<br><br>- Internal issues: innovation, cross-functional and multidisciplinary teams: from sequential to full integration<br><br>- External issues: partnering and collaboration to minimize demand uncertainty risks, information and resource sharing solutions, integrated logistics<br><br>- Consumers not caring enough: fashion as leisure<br><br>- <u>Supports the fact success comes from a whole integrated system</u> |
| 2010<br><br>Lizhen Du, Lianqing Yu & | Fashion industry in China | Building a model to overcome green barriers on eco SC through CE | - CE as ecological economy<br><br>- Traditional vs. CE: reuse, reduce, recycle | - Rapid response circular supply chain model<br><br>- Core enterprise coordinates the entire chain |

| Rao Cheng | | | - 3 consecutive stages of CE | - How to do it: selection of strategic partners, coordination and optimization, decision support system |
|---|---|---|---|---|
| 2011<br><br>Ali Diabat & Kannan Govindan | Aluminium industry in India | Explanation of drivers affecting implementation of GSCM | - Model developed through ISM framework and proven<br><br>- Green supply chain management (GSCM): forward and reverse logistics | - 3 approaches and 3 focus: GSCM is closing the loop<br><br>- 4 steps to GSCM<br><br>- Model of GSCM<br><br>- Set of studies indentifying drivers of GSCM in several industries: combined in final 11 drivers<br><br>- Result: classification of drivers regarding its interdependence and driving power in 5 groups |
| 2011<br><br>Stefan Seuring | No industry specific | Theory for SSCM application | - SCM<br><br>- SSCM<br><br>- Life Cycle management | - Difference between SCM and SSCM, also reference to closed loop SCM but within SSCM<br><br>- Model of SSCM practices<br><br>- Roles of actors in SSCM<br><br>- Importance of communication and coordination |
| 2012<br><br>Federico Caniato, Maria Caridi, Luca Crippa & Antonella Moretto | Fashion industry<br><br>Big eco-brands & small companies | Explaining drivers to go green, practices to do it and KPIs to measure it | - Sustainability concept: triple bottom line approach<br><br>- SCM: integration of environment and strategy, inter-organisational<br><br>- GSCM | - Company's reputation<br><br>- Sustainability in the fashion industry: collaboration and resource use<br><br>- Green as competitive advantage<br><br>- Practices that have been developed: importance of traceability<br><br>- Research framework model |

| | | | | - Drivers: internal, market and regulations |
|---|---|---|---|---|
| | | | | - Division of processes and KPIs model |
| | | | | - The role of culture |
| 2012<br><br>Debabrata Ghosh & Janat Shah | Fashion Industry<br><br>Features big corporations: Adidas and Patagonia | Comparison on results regarding collaboration or decentralisation policy on the GSC | - Game theoretic models | - Coordination issues<br><br>- Consumer preferences<br><br>- 2 scenarios: decentralized and cooperative SC<br><br>- Problems on reverse logistics: 3 options for a manufacturer<br><br>- Shows how collaborative scenarios are more beneficial |
| 2012<br><br>Holly Pui-Yan Ho Tsan-Ming Choi | Hong Kong based fashion company | Five R analysis on how the company implements a GSCM | - 5 R analysis: recycle, reuse, reduce, redesign, re-imagine<br><br>- Eco-efficiency framework of sustainability<br><br>- Design for environment<br><br>- SSCM<br><br>- Social wellbeing: triple bottom line and CSR<br><br>- Environmental stewardship: GSCM<br><br>- Economic prosperity: extended producer responsibility<br><br>- Governmental regulations | - Why going green? 4 reasons and triple bottom line<br><br>- The rise of transparency: risk for companies, need for collaboration<br><br>- Eco-design: customer interest and brand equity |
| 2012 | Taiwan textile and apparel | Relationship between sustainable drivers and | - GSCM | - GSCM enablers: organizational support, social |

| Guo-Ciang Wu, Jyh-Hong Ding & Ping-Shun Chen | industry | practices. Moderating effect of institutional pressures | - Eco-design<br>- Collaboration among partners | capital and government involvement<br><br>- GSCM practices: green purchasing, cooperation with customers, eco- design and investment recovery<br><br>- Moderators: institutional market, regulatory and competitive pressures |
|---|---|---|---|---|
| 2014<br>Ali Diabat, Devika Kannan, K. Mathiyazhagan | Textile industry in India | Explaining enablers for the implementation of a SSCM | - SSCM<br>- ISM interpretive structural modelling<br>- SD<br>- Sustainability<br>- TBL<br>- Ecological sustainability | - 5 main enablers: Adoption of safety standards, adoption of green practices, community economic welfare, health and safety issues, and employment stability<br><br>-Considers reverse supply chain |
| 2014<br>Yongjian Li, Xiukun Zhao, Dan Shi & Xiang Li | Fast fashion: H&M case study | | - SSCG and SSCM<br>- Competitive fashion sustainable attributes: time, cost, quality, service, environment, resource, and people<br>- TBL<br>- Virtual organization<br>- CSR<br>- SCG<br>- Resource based view vs. Transaction economics | - Reputation risk for brands when making SCM decisions<br>- Table: influencing factors in SSCG<br>- Governance |

| 2015 Geetha Dissanayakea & Pammi Sinha | UK companies | Explaining main activities and implementation of a reverse logistics based in remanufacturing industry and consumer textile waste | - Reverse logistics <br><br> - Remanufacturing vs. upcycling vs. reuse vs. recycle | - Main activities in the process and phases <br><br> - Product returns, disassembly, new design, quality, marketing of products |
|---|---|---|---|---|
| 2015 Fiona Harris, Helen Roby & Sally Dibb | Fashion industry | Identifying challenges and possible solutions to sustainable fashion | - Fashion trends <br><br> - Consumption habits: factors affecting fashion purchases | - Table with challenges for sustainable fashion |
| 2015 Suresh Kumar Jakhar | Apparel industry in India | Development of a model for SSC proven by a case study of an Indian manufacturer | - SSCM <br><br> - 3 major themes identified: drivers, performance, and practices <br><br> - Empirical: based on stakeholders and environmental practices, and environmental practices and their outcome | - Sustainable production performance main driver: 10-16 weeks to produce, labour intensive so need of skilled workforce to be flexible, intensive use of natural resources → high vulnerability <br><br> -Fashion SC is one of the longest and more complex <br><br> - Table with supply, production and delivery and the correspondent sustainable activities <br><br> - Model shows SSC performance evaluation, partner selection and flow allocation decision making framework |
| 2015 Pan et al. | No industry specific | Strategies on how waste-to-energy SC overcomes barriers to a CE implementation | - CES <br><br> - WTE SC: techniques to transform waste into energy, closing the loop <br><br> - Strategies: economic incentives, | - Barriers: technology, finance, regulation and institution <br><br> - Barriers model <br><br> - Sustainable risks: environmental problems and |

| | | | governmental policies, performance evaluation processes, internalization of externalities | resource scarcity |
|---|---|---|---|---|
| 2015<br><br>Anne M. Quarshie, Asta Salmi & Rudolf Leuschner | Sustainability in general- no sector specific | Review of literature on the topic | - SCM<br><br>- BE<br><br>- CSR<br><br>- TBL | - Figure with sustainability topics divided |
| 2015<br><br>Johan Rauer & Lutz Kaufmann | Green tech manufacturers | Showing capabilities to cope with GSCM challenges and barriers | - GSCM<br><br>- Dynamic Capabilities (DCs) | - Examples of buying firms GSM practices<br><br>- Structure related barriers: lack of transparency, lack of influence on sub-suppliers.<br><br>- Environmental standard related barriers: conceptual voids regarding environmental standards, lack of regulation and enforcement of environmental standards<br><br>- Table summary of barriers and capabilities |
| 2016<br><br>Marco Formentini & Paolo Taticchi | Several industries including fashion | The role of governance in SSCM and how it relates with CSAs | - TBL<br><br>- SSCM<br><br>-SCM<br><br>- SSCG<br><br>- Contingency Theory (CT)<br><br>- Corporate Sustainability Approaches<br><br>- RBV | - Contraposition: SSCM as an extension of GSCM?<br><br>- Profiles according to governance: leaders, practitioners and traditionalists |

| 2016 Mihalis Giannakis & Thanos Papadopoulos | Two manufacturing textile companies case studies  Survey across different industries | Identifying sustainability risks and elaborating a model to manage them  SC sustainability as a nexus of risks that need to be managed | - SCRM stages - SC - Risk management theory | - Differences between SC and SSC endogenous and exogenous risks: table of risks - Differences between how SC and SSC deal with risks - Risk management framework for sustainability-related risks - Direct link between environment and financial performance but not between environment and social - Once again supports integration on the SC |
|---|---|---|---|---|
| 2016 Hendrik Reefke, David Sundaram | Delphi study, several sectors | Discussing SSCM regarding main SCM elements | - SCM - SC - SSCM | -SCM 4 key categories table: planning, execution, coordination, collaboration - Sustainability: TBL - Management: governance, risk & compliance |

## APPENDIX 2. Interview Questions

Patricia Garcia – Master Thesis Interview Questions

## THE CIRCULAR ECONOMY IN THE FASHION INDUSTRY:
## IMPLICATIONS AND CHALLENGES FOR ITALIAN SMEs

1. Background information of interviewee:

• Name:

•Company:                                    •Number of employees:

• Job Position:                                •Years in the business:

## Initial Questions

2. Could you describe in a few words the essence of your business?

3. How was the business idea originated?

4. Why did you decide to follow the sustainable path in the fashion industry?

5. Did you have previous experience in the sustainable/fashion environments?

6. Which activities do you consider the main pillars regarding a circular economy approach?

## Forward Supply Chain Questions

UPSTREAM COMPONENT

7. Which are the criteria you follow when selecting raw materials?

- How does it affect the supply process? (i.e. supplier relationships, supply transparency)
- How does it affect the product design process? (i.e. uncertainty, resource variability)

8. Which are the main advantages and disadvantages of using only eco-friendly resources for your business?

INTERNAL COMPONENT

9. Which techniques do you use in the production process? Do you follow pre-established patterns regarding a circular economy approach in the fashion industry?

- How does it affect the production process? (i.e. human capital intensive)
- How does it affect the final product? (i.e. lack of environmental standards)

10. What is your opinion regarding legal and governmental support within the fashion industry towards a circular economy? How does it affect your business?

DOWNSTREAM COMPONENT

11. Which is your main target market? Which are your commercialisation channels?

12. How do you attract customers?

- Do you use the "circular economy" or "slow fashion" terms in your marketing strategy?
- Which are the main challenges/opportunities in finding new clients?

13. What do you think about the image of sustainable fashion vs. fast fashion on public media? How does it affect your business?

**Reverse Supply Chain Questions**

14. Do you pursue any product take-back or tracking program?

- If yes, how is it developed?
- If not, which are the reasons? (i.e. lack of resources, interest)

15. What would improve/incentivise the development of such a practice for your business?