



## **Research Exposé:**

**Selling less and disclosing more. How companies are changing their supply chain practices to comply with the new regulation imposed by the EU Commission in the fashion/textile industry.**

An explorative analysis on the organizations point of view

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## **Abstract**

Fashion industry's fast development and expansion are currently responsible for a substantial negative environmental impact and the European Commission is trying to address these concerns with the new “EU strategy for sustainable and circular textiles”. This study aims to explore the practices and strategies being put in place by companies in the textile/fashion sector to comply with the new normative introduced, using the complex adaptive system (CAS) theory as a theoretical lens. The research follows a qualitative, exploratory research design and data is collected through in depth semi-structured interviews with key individuals working on supply chain related roles, in fashion companies. The contribution of this study increases the knowledge in supply chain risk management and supply chain resilience literature, especially for the fashion sector. Moreover, it serves as a guideline for smaller companies in the sector to approach more sustainable supply chain models and circular economy dimensions.

**Keywords:** *fashion industry, regulation change, qualitative, supply chain resilience, supply chain disruption, sustainability*

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## List of Abbreviations

RBV	Resource-based View
SCV	Strategy-creation View
EU SSCT	EU Strategy for sustainable and circular textiles
CAS	Complex Adaptive Systems
SCRES	Supply chain resilience
EC	European Commission
EPR	Extended Producer Responsibility
CSDDD	Corporate Sustainability Due Diligence Directive
HL	Humanitarian logistics

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## 1. Introduction

Fashion industry's fast development and expansion are currently responsible for a substantial consumption of resources, creating a negative environmental impact and contributing massively to waste. The OECD estimates that by 2060 the global material consumption will increase from 79Gt in 2011 to a staggering 167Gt in 2060 and the textile industry represents the fourth highest impacting industry in terms of material consumption in EU. Textile is also ranked as the second highest in term of land use and represent a significant contributor to water scarcity and CO2 emissions. To further enhance the problem, since 1996, there has been a fall in clothing prices which increased consumption, with as a result an exponential need for resources (Dissanayake et al., 2021).

At the same time, another trend is concerning policy makers and the general public: the growth of the global fashion market is expected to go from 1,5 trillion dollars in 2020 to an impressive 2,25 trillion dollars in 2025, reaching a growth of 33%. Coherently the demand in the fashion industry has been continuously growing as so did the trends and styles, which contribute to early obsolescence, disposal, and consumption of scarce natural resources (Centobelli et al., 2022).

In recent years the European Commission has started focusing on changing the regulations to better address the problems related to the textile industry and on the 30th of March 2022 enacted the "EU Strategy for Sustainable and Circular Textiles" which will strongly impact the way products are designed, produced, sold, and discarded as well as have an impact on the use of unsustainable resources, pollution, climate change and human rights in the value chain. (European Commission, 2022).

Even though there are a great number of studies and papers explaining the motives and the reasons why a consumer buy "sustainable" and what are the drivers of that decision there is still a lack of a deep knowledge on how companies are reacting and changing to meet the regulation being imposed by the EU Commission and in particular the more drastic action taken to conform with the new "Strategy for Sustainable and Circular Textile" and the Directives that will follow.

Companies in the fashion industry are now facing a significant disruption both from the demand side, with customer more willing and interested in the sustainability aspect of the

purchase, but also from the procurement and operational side because of the new challenges. The new regulation will force a change in the whole supply chain and action are needed to face this change. The novelty of these new regulations creates a research gap to explore; how are companies reacting to these disruptions? Are they ready to face such significant changes in their business models?

The aim of this research is to provide an organizational perspective on the changes imposed on the textile and fashion industry because of the new regulation proposed by the European Commission, which starting from now will force significative changes in the way fashion companies operate.

The question this research will try to answer is centered on the implication on the supply chain, with a focus on the supply chain management with the intention to uncover what practices are being put in place in fashion companies.

This contribution will help understand, from a management point of view, how to adjust and change to successfully meet the new policy makers' requirements. The goal is to understand how companies are changing their processes to comply and conform to new rules. The implication from an academic point of view is a positive contribution to filling a gap that is not yet fully explained, in the fashion sector, from an organizational point of view. This study provides contributions to supply chain risk management and supply chain resilience literature by increasing the knowledge in such field. Finally, this contribution can have a positive social impact allowing organizations to better understand how to change their processes, in order to lower the environmental and social impact. The final goal is also to increase the shares of sustainable clothing items, which represent only 4,3% of the global apparel market (Statista Research Department, 2022).

The choice of the theoretical perspective has favored the Complex Adaptive Systems framework (CAS). CAS are composed by three key elements: the agents, the interactions between agents in a non-linear way and the propensity of agents in a CAS to either adapt or learn. CAS have three essential focusses, the internal mechanisms, the environment, and the co-evolution (Yaroson et al., 2021; Holland, 2002; Choi et al., 2001).

Between the theories considered as possible theoretical lens The Resource Bundle Framework was analyzed, a construct focused on analyzing value creation from a resource bundle perspective. This theory provides instruments to analyze both the resources involved in value creation, but especially how resources interface and coherency effects impact value

creation. The assumption of this framework is that different resources both have different interfaces and different cogency relationships (Huemer & Wang, 2021).

Another framework considered has been the Strategy creation view, an instrument that offers a “strategic logic” applicable to the context of the analysis. The SCV has been developed to analyze more unpredictable markets where resources may not have a defined value and focus mainly on the learning and related processes and managerial cognition (Furr et al., 2021).

The RBV has also been considered as a possible candidate but the fact that this research is focusing on disrupted markets characterized by a high uncertainty made it less relevant to the context. In fact, it appears virtually impossible to assess which resources will continue to carry their value in a highly dynamic context such as the textile and fashion industry in 2022 (Furr et al., 2021).

## **2. Theoretical Framing**

The theoretical framing will first introduce the concepts and definitions of supply chain disruption to after explaining the structure of supply chain management in the fashion industry. In addition, the decisions and concepts of the European Commission and the EU strategy for Sustainable Circular Textiles will be presented and explained to understand how these will impact fashion companies’ supply chain and strategical decisions. Finally, the discussion will focus on the theory choice explaining the main concepts that will be utilized to analyze the changes in the organizations.

### **2.1 Supply chain management**

Supply chain management (SCM) can be define using its object, target group, objectives and mean in achieving these objectives. SCM have as the object the supply chain which represent (Stadtler, 2008) a network of businesses engaged in the various processes and activities that result in value being delivered to the final consumer in the form of goods and services through upstream and downstream links (Christopher, 1998. ). In a broader sense a supply chain is composed by two or more entities that are legally distinct yet connected by exchanges of materials, information, and money. These companies could be manufacturers of components, finished goods, and parts, logistic service providers, or even the (ultimate) customer himself. This definition therefore includes the above-mentioned target group, the final customer. The term supply chain management can now be defined as the process of “integrating organizational units along a supply chain and coordinating material, information,

and financial flows” to satisfy (ultimate) customer requests with the goal of enhancing the supply chain's competitiveness as a whole (Stadtler, 2008).

## **2.2 Supply chain disruption**

Due to factors including globalization of business, higher consumer demands, environment instability, and the occurrence of internal and external risk events, supply chains are more vulnerable than ever to risks in today's rapidly changing world (Parast & Shekarian, 2020).

A supply chain disruption causes production by one or more nodes in this network to stop or be restricted for a prolonged period. A supplier of raw materials or components, a manufacturer or assembly facility, a distribution center, or a retailer are all examples of nodes in a supply chain network. Such a delay can prevent the delivery of final goods to customers if no action is taken. (Mehrotra & Ray, 2012). This study wants to focus on how disruption deriving from regulation changes are being faced by companies in the apparel sector. Researchers have so far analyzed mainly the disruption risk related to factors internal to the firm as Process Risk and Control Risk, factors external to the firm but internal to the supply chain network (as Demand Risk and Supply Risk) while fewer have discussed the implication coming from external factors like the introduction of new regulations (Shekarian & Parast, 2020).

The ability of companies to create and distribute their goods has been significantly affected in recent years by a variety of high-profile events and enduring challenges including political unrest, fuel crises, epidemics, and terrorism. Such occurrences have increased awareness among academics and practitioners of the need to build more resilient supply chain networks to reduce “the potentially devastating effects of disruptions” (Tukamuhabwa et al., 2015).

## **2.3 Supply chain resilience**

The resilience is a multi-disciplinary and multidimensional concept; it is a subject of research of psychology, ecosystems but also disciplines such as supply chain management and risk management. (Ponomarov & Holcomb, 2009). Supply chain resilience (SCRES) is the response needed to face disruptions. The concept of resilience from an organizational perspective can be defined as “the ability to proactively plan and design the supply chain network for anticipating” unforeseen disruption (negative events), respond to disruptions adaptively “while maintaining control over structure and function, and transcending to a post robust state of operations, if possible, a more favorable one than that prior to the event”. This grants an organization a competitive advantage. Mitroff and Alpaslan state that companies

which are resilient have a proactive approach and are able to recover better to unexpected events and hardship (Ponis & Koronis, 2012). Resilience, however, refers to more than just recovery; it also denotes a certain degree of adaptability and flexibility to both positive and negative environmental pressures (Ponomarov & Holcomb, 2009).

To improve the resilience of supply chains various strategies have been proposed by literature and majority have reached an agreement or similar results concerning some key driver of SCRES. These drivers can be summarized in the impact of “flexibility, agility, collaboration, and redundancy strategies which have been recognized as the most relevant organizational capabilities in achieving resilient supply chains (Shekarian & Parast, 2020).

### **2.3.1 Flexibility**

Flexibility is the capacity of an organization to adapt its supply chain's configuration in response to long-term or structural changes in the market environment. Several studies and research have outlined the relevance of flexibility in increasing SCRES (Shekarian et al., 2020). The inclusion of flexibility instruments has been proven to increase responsiveness of business solving most of the supply chain uncertainty related issues. (Das, 2011).

*Proposition 1: Companies in the textile and fashion industry are changing their supply chain strategies and processes in order to increase the flexibility of the supply chain and respond quicker to disruption.*

### **2.3.2 Agility**

Agility can be defined as the ability to adapt operation in responding to environmental instability and disrupted markets (Lim et al., 2017; Shekarian et al., 2020). Tukamuhabwa in his research indicates the ability to be agile as one of the most significant and essential characteristics to enhance SCRES (Tukamuhabwa et al., 2015). It has been asserted that in order to be able to mitigate disruption and respond in a timely and efficient manner, agility plays a critical role. Agility can be regarded as a risk management initiative and enables firms to respond promptly to market changes and potential supply chain disruptions (Braunscheidel & Suresh, 2009).

*Proposition 2: Agile solutions are being put in place also in the fashion SC by companies to respond to disruption.*

### **2.3.3 Collaboration**

Collaboration in the supply chain have been referred to as the capacity to effectively collaborate with other entities for mutual gain in areas “such as forecasting, postponement and

risk sharing” (Parast & Shekarian, 2019). A collaborative culture encourages open communication and information sharing among supply chain participants to increase supply chain visibility, lower supply chain uncertainty, and boost competitiveness (Chen et al., 2013). Numerous studies have found a linkage between a high level of collaboration and the ability to react, to react and mitigate the effect of disruption (Shekarian at al., 2020). Collaboration in a supply chain greatly benefits from decisions synchronization and incentive alignment, both of which are necessary for effective response to supply chain disruption (Jain et al., 2017).

*Proposition 3: Collaboration strategies are being introduced in the fashion supply chain, especially to increase transparency and synchronization to respond from one side to the increased disclosure obligation and to the other to respond to disruption from the demand side.*

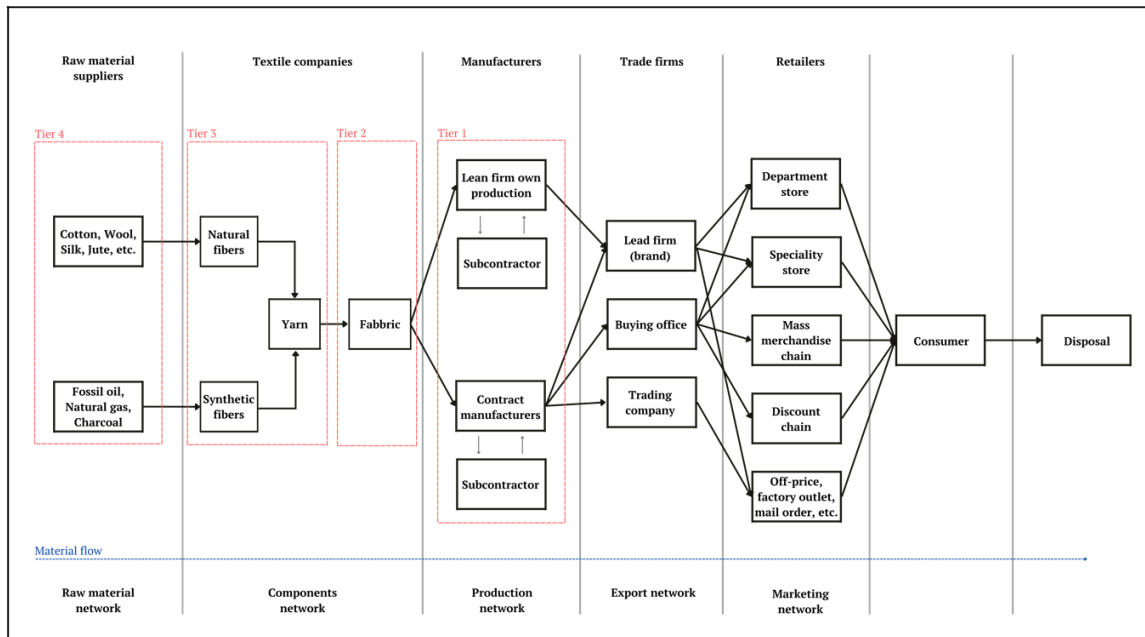
#### **2.3.4 Redundancy strategies**

Redundancy strategies refer to the selective and strategic use of exceeding capacity and inventories to face critical situations such as disruptions in the supply chain (Parast & Shekarian, 2019). In turbulent and complex business environments in which minimizing the effects of supply chain disruption is necessary, Kamalahmadi and Parast demonstrated how the integration of three types of redundancy strategies (inventory, backup suppliers, and protected suppliers) can improve a firm's performance (Kamalahmadi & Parast, 2017).

*Proposition 4: Redundancy strategy especially concerning backup suppliers have been introduced in fashion and textile SC to assure supply of critical scarce materials such as organic, bio or recycled fibers.*

#### **2.4 Fashion supply chain management**

Supply chains nowadays are a crucial element of an effective organization, and their agility and collaboration are strategically important for coordination and communication purposes. (Moon et al., 2017). Fashion supply chain include all the stages of production and distribution, including the transformation of raw materials into finished goods that are ready for sale (Camargo et al., 2020).



**Figure 1 - The Textile and Clothing Supply Chain - re-elaborated illustration (Schumacher & Forster, 2022; Obser, 2015; Appelbaum & Gereffi, 1994).**

Due to a strong trend toward fast fashion as well as short product life cycle the complexity of fashion and textile supply chain has been increasing (Barnes & Greenwood, 2006). In recent times disruption phenomenon have occurred also in the fashion supply chain, and events such as COVID 19 have caused an increase in risk from the supply side (Lundin & Wennberg, 2022).

In general, we can identify three different supply chain strategies: efficiency strategies, risk-hedging strategies, and responsive-agile supply chain strategies (Moon et al., 2017). The efficiency strategy focus on creating the highest cost saving in the supply chain and to achieve this result the non-value-added are eliminated, economies of scale are pursued, and optimization is a key objective both in terms of capacity utilization and distribution. The risk-hedging strategy instead focus on pooling and sharing resources in order to share the risk of possible disruption. Alternative supply sources are important as well as safety stock shared with other companies. Finally, the responsive strategy aims at being responsible and flexible to customer changing demand while agile strategies are more information based and operate within a demand-driven approach (Lee, 2002). Being the fashion industry characterized by high demand uncertainty and stable supply it is possible to place its supply chain in the”

responsive supply chain” quadrant, even if recent events are disrupting the supply side, suggesting for agile solutions (Lee, 2002).

		<b>Demand Uncertainty</b>	
		Low (Functional Products)	High (Innovative Products)
<b>Supply Uncertainty</b>	Low (Stable Process)	Efficient supply chains	Responsive supply chains
	High (Evolving Process)	Risk-hedging supply chains	Agile supply chains

**Figure 2 - Supply chain strategies**

Supporting this view Doyle et al. (2006) analyzed the different SCM strategies connected with each fashion product. They highlighted the fact for which there must be a balance between profit margins maintenance and supply chain agility, which should be especially developed for fashion products with shorter life cycle. Moreover, from a procurement point of view, the establishment of a supplier-buyer relationship/network is considered of key importance in the sector as it allows for a better operational agility and cost efficiency. Likewise, (Ngai et al., 2011) emphasize the agility in SCM strategies as crucial for clothing firms to survive an unpredictable and highly volatile environment.

*Proposition 5: the supply chain strategies in the textile and fashion industry are moving from a “responsive supply chain model” to an “agile supply chain model”.*

## **2.5 EU Strategy for Sustainable and Circular Textiles**

The EU Strategy for Sustainable and Circular Textiles (EUSCT) has been developed to respond to a series of critical situation regarding the textiles value chain, of which 81% is represented by the clothing sector. The growing trend of higher consumes and shorter utilization of garments is contributing massively to the phenomenon of overproduction and overconsumption. Such trends, also identified with the term “fast fashion” push customers to consumer more and more products of lower quality, at a lower price, produced in bulk quantities to adapt to the latest trend. This growing demand for apparel il fueling the use of



non-sustainable and scarce resources as the fossil fuel derived synthetic fibers widely presents in the fashion market (European Commission, 2022).

The complexities of the global value chain of textile have been facing significant social challenges fueled partially by the internal and external pressure to achieve cost efficiency and deliver economical products to the final customer. These challenges come with a heavy social cost which is mostly composed by practices as child labor and gender-based wage inequalities. Improving such aspects is a critical part in achieving a sustainable value chain. Moreover, the global COVID 19 pandemic together with the unjustified Russian invasion of Ukraine exposed the vulnerabilities of the fashion supply chains with negative consequences in terms of revenue but also in terms of availability of raw materials, energy prices and “exporting segments of the textile ecosystem”. “The 2020 Circular Economy Action Plan and the 2022 EU Industrial Strategy” identified the textile industry as one of the most relevant sectors in which the urge to push and promote circular and sustainable consumption as well as business models was critical. To do so the EU with its EUSCT aim at creating a framework to coherently transition to a textile sector whereby:

*“By 2030 textile products placed on the EU market are long-lived and recyclable, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment. Consumers benefit longer from high quality affordable textiles, fast fashion is out of fashion, and economically profitable re-use and repair services are widely available. In a competitive, resilient, and innovative textiles sector, producers take responsibility for their products along the value chain, including when they become waste. The circular textiles ecosystem is thriving, driven by sufficient capacities for innovative fibre-to-fibre recycling, while the incineration and landfilling of textiles is reduced to the minimum“* (European Commission, 2022).

Some key actions have been identified and are being developed together with the normative instruments that will allow their application:

### **2.5.1 Mandatory Eco-design requirements**

One of the most significant ways to reduce the impact of textile products is increasing its durability. Quality concerns such as color fastness, stretch tars or zippers’ quality results as the main elements responsible for products being discarded in landfills. An increase in durability will have as a positive effect on the consume of fashion product allowing for circular business model to develop around the concepts of reuse, rent, repair, take-back services, and

second-hand retailing. Eco-design concerns also improving the material composition of products, minimizing the blending of fibers. Such practices reduce the recyclability leading to increased waste. Schemes proposing quality criteria and durability standards, hazardous chemical restriction and include environmental related requirements already exists. Examples can be the “EU Ecolabel criteria for Textile Products” and the “EU GPP criteria for textiles products and services”. The European Commission (EC) is working on providing a “binding product-specific ecodesign requirements” under the “Ecodesign for Sustainable Products Regulation”, which will increase performances in term of durability, reparability, reuse, and recyclability minimizing environmental impact (European Commission, 2022).

### **2.5.2 Stopping the destruction of unsold or returned textiles**

Destruction of unsold or returned products is a common practice in the fashion sector and contributes to a significant waste of resources. The EC to disincentivize such practices is proposing a compulsory transparency requirement for large textile and fashion companies to publicly disclose the numbers of discarded products. Further action will focus on introducing a ban on such practices (European Commission, 2022).

### **2.5.3 Tackling microplastics pollution**

The Commission want to address the issue of microplastics by introducing, under the Ecodesign for Sustainable Products Regulation, a set of prevention measures which will add compulsory design requirements to textile (European Commission, 2022).

### **2.5.4 Information requirements and Digital Product Passport**

For businesses and customers to make better decisions and for stakeholders in the value chain to communicate more effectively, environmental sustainability data of goods must be stated in a clear, organized, and accessible manner. Such information will help increase the transparency, visibility and credibility of real sustainable businesses and products. The Commission will adopt a Digital Product Passport for textiles based on compulsory information requirements on relevant environmental factors as one of the measures under the new Ecodesign for Sustainable Products Regulation (European Commission, 2022). Such a change will require the Commission’s review of the current Textile Labeling Regulation which already require clear fabric composition and origin. As part of the review information disclosure will be introduced for sustainability related topic and circularity parameters (European Commission, 2022).

### **2.5.5 Green claims for truly sustainable textiles**

The inaccuracy of claims frequently dissuades consumers who would prefer to buy more sustainable items. To tackle the problem the Commission is proposing an initiative to empower Consumers for the Green Transition. This initiative will amend the “Unfair Commercial Practices Directive 34 and the Consumer Rights Directive 2011/83/EU” (European Commission, 2022) and will require information disclosure at the point of sale about commercial durability guarantee and information pertinent to repair, including a reparability score. Moreover, environmental claims such as “eco-friendly” or “green” will only be allowed if proved by recognized environmental excellence, certified by a tertiary party. The same measure will apply for voluntary sustainability and social claims (European Commission, 2022).

### **2.5.6 Extended producer responsibility and boosting reuse and recycling of textile waste**

Extending producers responsibility until the product disposal will help decouple the waste generation from the growth of the sector. Extended Producer Responsibility (EPR) have proven to allow for better product designs more attentive to circularity in the life cycle and the end life of the product. This requirement has already been introduced in some EU countries since by 1 January 2025 it will be compulsory to establish separate waste collection for textiles (European Commission, 2022).

### **2.5.7 Enabling conditions and Corporate Sustainability Due Diligence Directive**

To achieve these goals and progress the EU will facilitate the scaling up of businesses with resources efficient processes, reuse, repair, and circular business models. Furthermore, support will be provided for investments in innovation and research in the sector. Finally, to address the more critical social aspects related to the textile industry, the Corporate Sustainability Due Diligence Directive (CSDDD) is being proposed. This directive will address concerning human and labor rights including practices regarding child labor, forced labor, unfair wages, discrimination, health concerns and safety. The obligations will affect big companies, midcaps (companies with a turnover higher than EUR 40Mln and more than 250 employees) as well as third countries’ companies which generate significant turnover in the EU. The due diligence obligations will require textile companies to “identify, prevent, mitigate, bring to an end and account for actual and potential adverse impact on human rights ... and the environment in companies’ own operations and across their global value chains”. (European Commission, 2022).

## 2.6 Complex Adaptive Systems (CAS) theory

In the context of SCRES research a series of established theoretical lenses have been used to help in understanding phenomenon, identifying drivers and enhancer of resilience and in expanding the generalizability of the findings in different sectors and contexts (Foy et al., 2011). The choice of the CAS theory stands in the fact that previous used theories in the context of SCRES do not fully grasp the dynamicity of the fashion sector and its supply chain. The fact that this research is focusing on disrupted markets characterized by a high uncertainty make theories such as the RBV not perfectly suitable. In fact, since it appears virtually impossible to assess which resources will continue to carry their value in a highly dynamic context a more complexity centered theory is needed (Furr et al., 2021; Yaroson et al., 2021).

According to some supply chain academics there is a growing need to classify networks of dynamic supply chains as complex adaptive systems (Day, 2014). Complex Adaptive Systems (CAS) can be defined by three main characteristics: (i) A CAS is made up of numerous agents that interact with one another. The agents could be businesses operating in a supply chain or consumers on a market. (ii) The interactions between the agents in a CAS are non-additive (non-linear). The interactions can be defined by assigning each agent a set of condition/action rules that specify its interaction strategy with other agents (the equivalent of a strategy for playing a game like chess). These rules can have a simple stimulus-response form, IF stimulus x THEN make reaction y, or message-processing form, IF message x THEN transmit message y for message processing. The rules are commonly laid out to create an internal representation of the agent's external environment, enabling the agent to forecast the future. (iii) Agents in a CAS can either adapt or learn. In other words, they update their rules as they gain experience and look for ways to make them better. Some rules start to incorporate secondary objectives and anticipate outcomes as one learns to engage. Finding the right "building blocks" for explaining different aspects of the CAS agents is necessary for coming up with new, plausible rules. (Holland, 2002). Choi et al. (2001) suggest that by using a framework designed expressly to consider supply networks as a CAS, it is possible to analyze behavior across the supply network more thoroughly and create interventions that are more likely to have a positive impact (Schiffling et al., 2020). Choi et al. (2001) propose three focuses when examining supply networks as a CAS: *internal mechanisms*, *environment*, and *co-evolution*. The dynamics of these three focuses serve as the foundation for this study, allowing to analyze how companies are managing disruption in the supply chain. *Internal processes* are thought to be concerned with the agents (such as people and organizations) that

make up the fashion supply chain. We are interested in how information and resources move between the agents, as well as their connectivity and capacity for self-organization. Also, the values, beliefs, norms, and assumption that are shared by the agents are taken into consideration (Schiffing et al., 2020). The *environment* is something that exists outside of the CAS; for SC, this focus would be on contextual, cultural, geographical, political, financial, and normative issues that could affect change within the CAS. These environmental elements might be dynamic, forcing the CAS to utilize current information and investigate new knowledge in order to affect change (Choi et al., 2001).

**Table 1** - *The three focusses of Complex Adaptive Systems in the Supply Chain context. Adaptation from (Schiffing et al., 2020).*

<b>CAS focus</b>	<b>SC context</b>
Internal mechanism	<p>Concerned with agents within the CAS.</p> <p>In SC agents are individuals and companies taking part in the fashion value chain (see Fig. 1). Examples are managers, suppliers, retailers, consumers, manufacturers.</p> <p>Develops a knowledge of shared norms, values, assumptions, and beliefs amongst individuals and businesses.</p>
Environment	<p>Concerned with external factors not part of the CAS.</p> <p>For SC context environment may include contextual, cultural, geographical, political, financial, and normative issues.</p> <p>The environment factors are often dynamics and require CAS to adapt to changing contexts.</p>
Co-evolution	<p>Concerned with the interaction of CAS and environment, the process of reaction to the environment and creation of it.</p> <p>Concerned with evolution in the equilibrium state between environments and CAS.</p> <p>For SC, normative instability and regulation introductions can lead to unpredictable changes in the CAS operations.</p> <p>Examines non-linearity in relation to how a major change in input does not always lead to a change in output.</p>

In conclusion the SC of fashion industry can be defined as a CAS as it is developing over time into a coherent form, especially after disruptions, adapting itself without any singular organization controlling or deliberately managing it (Holland, 2002).

### 3. Literature Review

The literature basis for this research was derived from online research aided by the software Publish or Perish. The sources used include Google Scholar, ResearchGate, Elsevier, ScienceDirect, emerald insight, BMC, DiVa, and Wiley Online Library. The queries included key words related to the context of the research. “Supply chain disruption”, “Supply chain resilience”, “Fashion”, “Regulations”, “Qualitative”, “CAS framework”, “Strategy-creation View”, “Resource bundle framework”. No exclusion criteria have been used. The number of papers analyzed has been 81 and the number of papers included in the paper are 57. All the paper found have been analyzed quickly for a first screening, followed by a more interested analysis where the relevance was considered higher with regard to the research. The following table contains the more resourceful articles used during this research project and provide a quick analysis on the main points and findings.

**Table 2:** *Literature Review*

No.	Reference	Content/Findings
01	Mansoor Shekarian & Mahour Mellat Parast (2020): An Integrative approach to supply chain disruption risk and resilience management: a literature review, <i>International Journal of Logistics Research and Applications</i> , DOI: 10.1080/13675567.2020.1763935	This research presents a comprehensive literature review to assess the significance of each of the most popular techniques to increase resilience (flexibility, agility, redundancy, and collaboration) on minimizing the impact of the various supply chain disruptions (demand, supply, process, control, and environmental disruptions). Collaboration and flexibility have been found to be the most significant strategies to control and cope with disruption
02	Benjamin R. Tukamuhabwa, Mark Stevenson, Jerry Busby & Marta Zorzini (2015): Supply chain	This paper presents definitions, review, and theoretical foundations for further studies: it reviews the current literature of SCRES,

No.	Reference	Content/Findings
	resilience: definition, review and theoretical foundations for further study, <i>International Journal of Production Research</i> , DOI: 10.1080/00207543.2015.1037934	comprehensive definition of SCRES, strategies and approaches for SCRES, and propose to use the Complex Adaptive Systems (CAS) theory to improve understanding using a theoretical framework.
03	Dilek Yilmaz Borekci, Yasin Rofcanin & Hasan Gürbüz (2014): Organizational resilience and relational dynamics in triadic networks: a multiple case analysis, <i>International Journal of Production Research</i> , DOI: 10.1080/00207543.2014.903346	The research presents a case study of buyers and suppliers' relationships in the textile industry in Turkey. It analyses the relational dynamics and the resilience deriving from these relationships. The findings shows that the best strategy to reach increased resilience of buyer-supplier-supplier triads is co-opetitive relational behavior. Co-opetitive stands for a strategy firms adopt which include both cooperation with rivals on defined project and competition on the bigger market. Joint ventures are an example of such strategy. (Bouncken, 2015; Braunscheidel, 2009)
04	Sheu, J. B. (2014). Green supply chain collaboration for fashionable consumer electronics products under third-party power intervention—A resource dependence perspective. <i>Sustainability</i> , 6(5), 2832-2875.	Sheu investigates green supply chain in an environment which present similar characteristics to the fashion one. It features strong brands awareness, need for rapid responsiveness to demand variation, fit to trend, timeliness and fashionable designs as well as reduced product lifecycle. The influences of third-party power intervention (such as government and public institutions) have found to improve the collaborative relationship between dyadic members. This results in improved green supply chain performance by increasing reciprocal

No.	Reference	Content/Findings
		interdependence of dyadic members and reducing power asymmetry.
05	Niu, B., Chen, L., & Zhang, J. (2017). Punishing or subsidizing? Regulation analysis of sustainable fashion procurement strategies. <i>Transportation Research Part E: Logistics and Transportation Review</i> , 107, 81-96.	The article analyzes fashion procurement approaches to achieve more sustainable supply chains. One of the most crucial functions that affects supply chain sustainability is procurement, as it not only affects the output of the supply chain but also its fundamental structure. The research examines the effects of two types of government intervention and conclude that subsidizing can induce companies to change their procurement approach. This is true only if the subsidy exceeds a certain threshold. Furthermore, a tradeoff is found between improving sustainability and social welfare maximization, which poses government a duty to balance the two elements.
06	Schiffing, S., Hannibal, C., Tickle, M., & Fan, Y. (2020). The implications of complexity for humanitarian logistics: A complex adaptive systems perspective. <i>Annals of Operations Research</i> , 1-32. <a href="https://doi.org/10.1007/s10479-020-03658-w">https://doi.org/10.1007/s10479-020-03658-w</a>	This article proposes the application of the CAS framework and concepts to humanitarian logistics (HL). While the research focuses on HL, the article suggests a wider applicability to different context in which complex logistic operations are present informing the design and management.
07	Yaroson, E. V., Breen, L., Hou, J., & Sowter, J. (2021). Advancing the understanding of pharmaceutical supply chain resilience using complex	The purpose of this article, as the title suggest, is advancing the understanding of supply chain resilience, in the pharmaceutical sector, utilizing the complex adaptive system as a



No.	Reference	Content/Findings
	adaptive system (CAS) theory. <i>Supply Chain Management: An International Journal</i> . <a href="https://doi.org/10.1108/SCM-05-2019-0184">https://doi.org/10.1108/SCM-05-2019-0184</a>	theoretical lens. The finding of this research once again demonstrates the usefulness of the CAS to systematically understand resilience. Additionally, from a CAS perspective, co-evolution was the result of the decision-making process that led to the antecedents for developing resilience strategies. Resilience strategies have been to be developed by enhancing a company's flexibility, visibility, joint decision making and SC strategic alliances.

## 4. Methodology

### 4.1 Methodological approach

This research project will follow a qualitative approach. The choice of a qualitative approach is dictated by the fact that the aim of this study is to identify what are the variables and processes that are happening inside the fashion/textile organizations to face the current regulation changes. The lack of strong hypothesis does not allow for the use of more quantitative methods, suggesting for more exploratory research. Furthermore, the lack of studies concerning the reaction to the new normative prompt the research to address this gap with qualitative studies.

### 4.2 Application domain

The application domain for this study will be fashion brands and their response to the changes to their supply chain management practices and strategies caused by new EU legislation.

### 4.3 Target sample

The target sample is formed by supply chain and procurement managers, but also sustainability managers to understand the company strategy working in fashion companies. The selection of the companies will focus on a limited number of companies positioned on a

medium-high level with a focus on innovation like Stone Island, Scotch and Soda, Moncler, Benetton and OTB, which will be impacted by the new regulations. To approach companies and identify key respondents this research will use *Purposive Sampling* at the beginning of the sampling and subsequently *Snowball Sampling* or chain-referral sampling to access relevant sources for the research.

The possibility to access the analysis results will be used to motivate the participation of high-level managers in affirmed clothing companies, because of the benefits of having a broader idea on how other brands are facing the new challenges posed by the European Commission.

#### **4.4 Data collection procedures**

This study will collect primary data using in depth semi-structured interviews conducted primarily online via Zoom, Microsoft Meet and Skype, with representative from highly established Italian and non-Italian fashion brands as well as some suppliers of the mentioned brands. The choice of online interviews is motivated by a distance and a time factor which is a barrier in conducting the interviews in person. The language of the interviews will be both Italian and English based on the nationality of the interviewee to bypass language barriers.

A content guideline will be developed with the goal of better extracting information related to the topic of interest. Coherently with the approach chosen, the open questions serve the purpose of collecting non-numerical data.

#### **4.5 Data analysis procedures**

Data analysis will be conducted with the aid of the software MAXQDA and will focus on content analysis to extract the key information obtained during the interviews' process.

### **5. Expected Contributions**

#### **5.1 Scholarly Contributions**

This study provides contributions to supply chain risk management and supply chain resilience literature by increasing the knowledge in such field, especially for the fashion sector. Answering the questions posed in the introduction such as how companies are reacting to normative disruptions and how supply chain strategies are changing will allow a better understanding and theory building of new strategies to mitigate the disruption risks. By illustrating the practices put in action by fashion companies a comparison can be made with

the previous proposed solution and strategies to face supply disruption, either confirming or contradicting the current literature. The summarization of the EU SSCT can be used by scholars as a starting point for further research, investigating how such proposed normative are impacting other aspects of the organizations, especially concerning the product design phase and the end life of the product with regard to the concept of EPR.

## **5.2 Implications for Business and Society**

This research will be helpful to better understand the direction the EC is taking to guide the textile and fashion sector in EU towards more sustainable and circular models. The analysis of the practices implemented in companies operating within the fashion industry could serve as a guideline for smaller companies in the sector to approach more sustainable supply chain models and circular economy dimensions. Managers and procurement specialists can use the information emerged from the research to focus their assessment of the supply chain on the critical elements mentioned in the article. The overall contribution this paper aims to achieve is a push for innovation and change in the fashion sector, to address the social and environmental concerns, producing higher quality, more durable and more respectful garments.

## **6. Chapters Overview**

The thesis chapters will be structured as follows: first, the introduction chapter will briefly present the scholarly discussion, context, research gap and aim and finally the theories used. Secondly the theoretical framing will provide an overview of the concepts related to supply chain management focusing first on the concept of disruption in the supply chains, followed by a brief description specifically in the fashion industry. Moreover, the contents of the EU SSCT as well as the theories chosen will be explained. The following chapter will focus on the literature review shortly explaining the paper finding process and highlighting the crucial ones. Subsequently, the discussion of the hypothesis and the research model will be presented, followed finally by the methodology. In this section the research design will be presented together with the application domain, the target sample, and the procedures both for data collection and data analysis. The fifth chapter will present the findings of this research and the discussion, followed by the future research section and the limitations. The conclusion and references will conclude this paper.

# 7. Work Plan

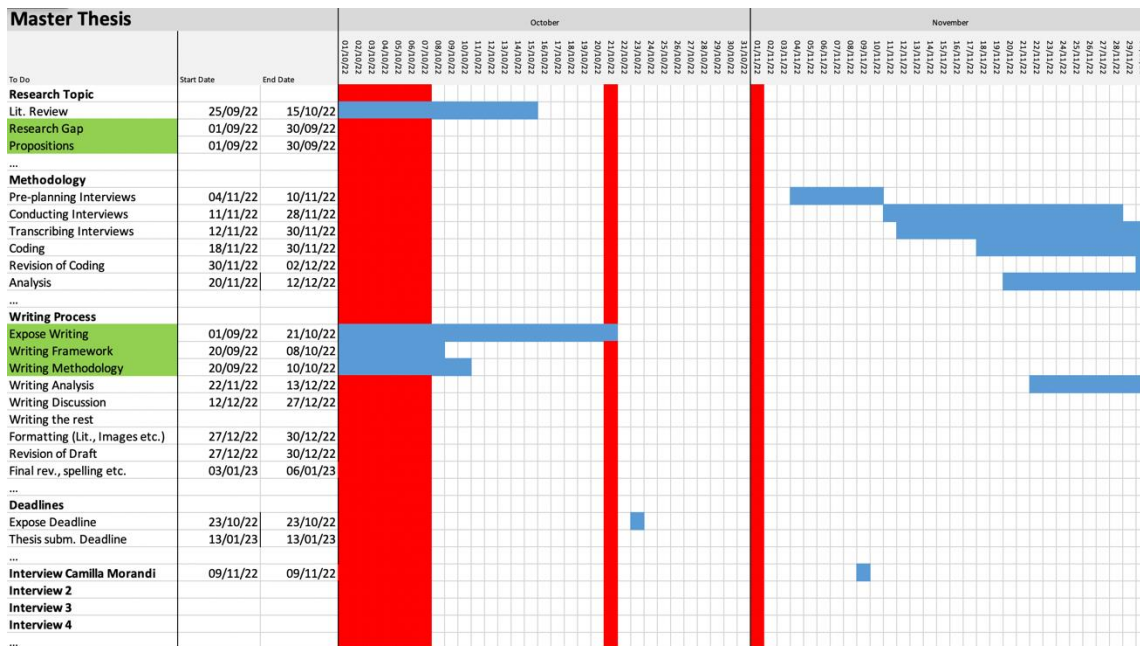


Figure 3 - Work plan

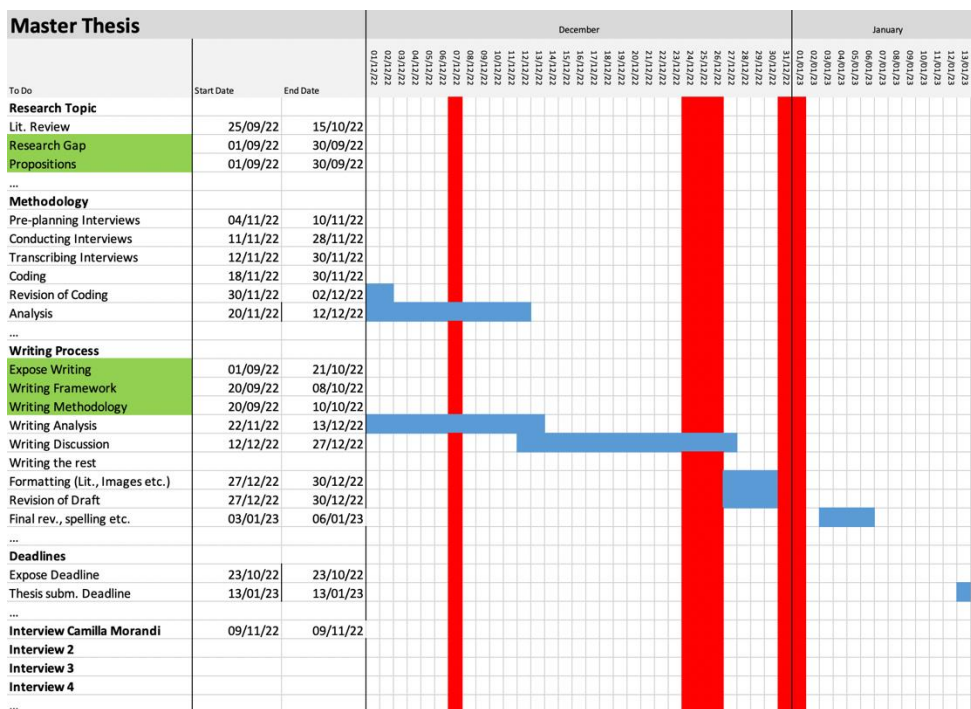


Figure 4 - Work plan 2

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