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Circular Economy
in the Fashion Industry in Italy

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ABSTRACT ITALIAN VERSION

Negli ultimi decenni il tema della sostenibilità ha acquisito una rilevanza sempre maggiore, considerando la necessità di ristabilire un equilibrio tra la sfera economica ed ambientale. Tale equilibrio sembra essere infatti compromesso dall'attuale modello lineare su cui si fonda l'economia industriale, in contrasto con la disponibilità delle risorse in natura. L'economia circolare, con lo sviluppo del nuovo paradigma delle 3R (reduce, reuse, recycle), viene considerata un valido strumento per sviluppare un approccio alternativo che sia sostenibile.

La transizione verso il modello circolare richiede una forte sinergia e collaborazione lungo tutta la filiera, accompagnata da una sensibilizzazione del consumatore riguardo al tema. La ricerca verte sullo sviluppo dell'economia circolare nel settore della moda italiano, in cui recentemente sono emerse le conseguenze, in termini di impatto ambientale, dell'attuale modello lineare.

Dal punto di vista delle aziende l'obiettivo, tramite l'indagine statistica, è di capire quanto le aziende che si presentano inclini alla circolarità, siano effettivamente consapevoli della filiera e se la propensione alla sostenibilità si riflette sia internamente che esternamente. Per quanto riguarda il consumatore, l'analisi è volta a definire le caratteristiche di acquisto del campione ed il loro impatto sull'attuale propensione e consapevolezza riguardo il tema. Inoltre, per ogni attore, è stato analizzato il possibile impatto che la pandemia potrebbe aver avuto, in termini di strategia per le aziende e di abitudini per il consumatore.

Dall'analisi è emerso che molte delle aziende analizzate sono effettivamente vicine al modello circolare, tuttavia sono state identificate delle aree di miglioramento. I consumatori sono potenzialmente interessati all'argomento, tuttavia, mancano degli strumenti necessari per cambiare le proprie abitudini di acquisto. È necessario quindi concentrarsi sulla comunicazione per facilitare l'acquisto dei capi sostenibili e per educare la popolazione riguardo l'impellente bisogno di cambiare.

ABSTRACT ENGLISH VERSION

In the last decades, sustainability has gained relevance because of the necessity of restoring a balance between economic and environmental spheres. This equilibrium, indeed, seems to be compromised by the linear model which characterizes many industries and is in contrast with the natural resource availability. Circular economy, with the development of the 3Rs (reduce, reuse, recycle), is considered an effective tool to implement a more sustainable approach.

The transition requires a strong synergy and collaboration along all the supply chain, together with the sensibilization of the final consumers about the topic. The research deals with the development of the circular economy in the Italian fashion industry, that has recently shown the consequences, in terms of environmental impact, of the current linear model.

On the companies' side, the aim is to understand, through a statistical analysis, how much the ones who declare to be close to sustainability, know about their supply chain and if sustainable actions are reflected both internally and externally. On the other hand, for the consumers, the analysis wants to define shopping features of the sample and their impact on the propension toward sustainability. Furthermore, the potential impact of the pandemic is analysed for each actor, in terms of strategy for the companies and of habits for the consumers.

Findings showed that most of the companies analysed are actually close to the circular model, but with possible improvements in some areas. The consumers are potentially interested in the topic, some are already on the right path, but a majority is not provided yet with all the tools needed to alter the purchasing habits. Companies need to focus on the communication downstream, in order to facilitate the shopping of sustainable clothing and to educate the population about the urgent need of change.

1 EXECUTIVE SUMMARY

The thesis deals with the development of the circular economy in the Italian fashion industry. Indeed, in the last decades, the need for change in the current way of doing business in this sector has emerged in order to preserve the environment and its resources.

The analysis is carried out following the research framework represented below.
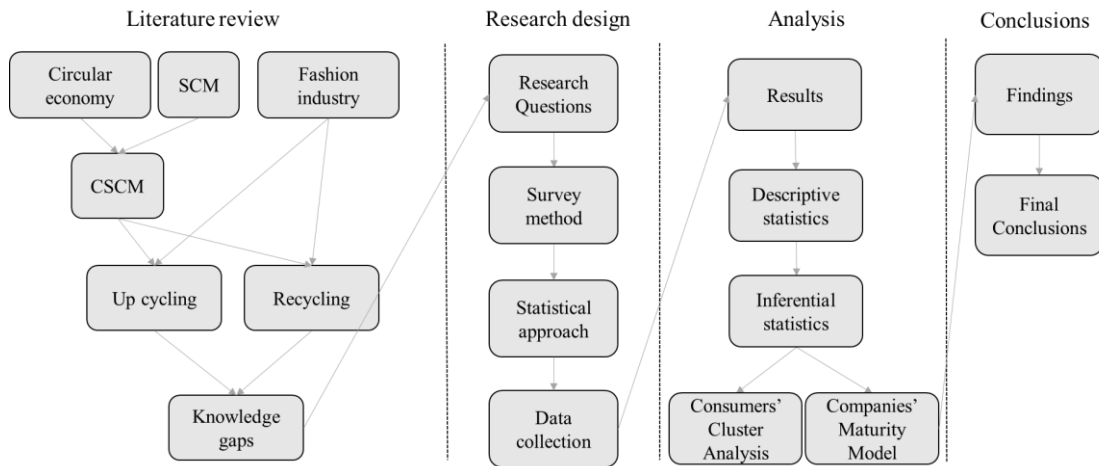
FIGURE 1 - RESEARCH FRAMEWORK

1.1 LITERATURE REVIEW

The current industrial economy is based on the linear logic of "make-waste-disposal" which is not sustainable anymore. Indeed, the balance between the economic sphere and the environmental one is compromised by the limited availability of resources that the world is facing. The transition toward a new way to conceive the business is needed and the circular economy is a possible concrete solution. Europe is investing in developing action plans to accelerate the transition toward the 3R paradigm: reuse- recycle- reduce.

Italy, in particular, is the first country for the circulation of the materials recovered within the production processes and for the use of raw material extracted by waste. Different enabling factors facilitate the implementation of new business models, for example the development of Industry 4.0 which allows to trace the whole production process.

However, there are still many barriers, starting from the cultural one, it is difficult to change the consumer's behaviour and to transmit the need of change. Furthermore, it is necessary to make the whole supply chain transparent and collaborative, indeed the

circular model requires a synergic participation of all the actors. It is necessary to integrate the circular thinking into supply chain management.

For the garments industry the transition is specifically challenging since the current fashion system is based on quick responses, short lead times and huge volumes of garments consumed globally, the so called "fast fashion", where discarded garments still have a significant portion of their useful life when they are disposed of. Indeed, the industry is the second most polluting sector, and the current crisis due to the lockdown because of COVID-19 has emphasized the need for change.

The companies need to re-think their business models and to integrate in their governance new policies, in order to do so the two key drivers that are deepened are: the use of wasting materials to generate new goods of equal or higher perceived value, described as **upcycling**, and converting materials from existing products to create different products, defined as **recycling**. The implementation of both the practices requires a new way to conceive the product design, considering the materials that compose the garments, integrating it with the collaboration and transparency between the different actors.

The transparency is possible with the disclosure and sharing of information by the companies, but currently there are no standards system of metrics that can guide companies in adopting circular models and in monitoring their performance.

However, many companies have started to rethink their business models in order to guarantee more sustainable practices, some start-ups are born as fully circular business examples. It is important that their commitment is properly communicated to the final customers by understanding their behaviours and attitudes toward the new paradigm.

Furthermore, the lockdown caused by the COVID-19, has brought to the attention some critical issues of the sector, including overproduction, how to dispose of excess inventory and the difficulties in managing the relationships between brands and suppliers. Nevertheless, the crisis could be an opportunity to raise awareness among the companies and the consumers about the need of slowing production and consumption.

1.2   RESEARCH PURPOSE

The circular economy is gaining importance in the last years, Italy is well performing in the transition from the linear model toward the circular one; however, there is not much evidence about how the fashion industry is addressing this change.

The theoretical background has shown the main barriers that the industry has to face, and therefore the objective of our analysis is to understand how the companies, which declare to be inclined to circularity, are performing along all the supply chain. The research questions addressed are:

RQ1 How much do the companies in the fashion industry, who declare to be close to sustainability, know about their supply chain and involve the different actors?

RQ2 What sustainability means for the companies inclined to circularity? Is the vision reflected both internally and externally?

RQ3 What is the current level of consciousness and interest about the subject among the final consumers and what leverages can be used in order to increase their inclination to sustainability?

RQ4 Has COVID-19 impacted on the strategies or attitudes of the different actors?

1.3   METHODOLOGY

The research method was chosen on the basis of three drivers: the research questions developed; the control degree that the researcher has over the behavioural events and variables; and the type of focus, that can be on past or contemporary events. As a result, the method that most fit our research analysis was the survey.

The approach was inductive, indeed the analysis started from the observations arose by the literature review and aimed to generate conclusions on the basis of the gaps identified.

The data for the research were collected with different methods depending on the actors analysed: regarding the textile sectors, the brands and the consumers, web-surveys were used, while for the retailers interviews conducted face-to-face were performed.

The sample selection too varies on the basis of the actors, non-probability sampling for the analysis of textile, brand companies and retailers and probability sampling for the final customers analysis.

1.4   FINDINGS AND RESULTS

After one month the data were gathered, and the analysis started. The response rate of the companies varied depending on the channel used to deliver the survey, the use of LinkedIn has proven to be successful in contacting brand and textile companies. For the consumers' survey, a great number of responses were obtained thanks to the use of social media.

For all the actors of the industry, a complete analysis was performed, in the case of brand, textile companies and consumers both the descriptive statistics and the inferential one were computed; for the retailers the analysis concerns the investigation of the answers obtained with the interviews.

1.4.1   TEXTILE AND BRAND COMPANIES

The textile sample is mainly composed by middle size firms and is transversal regarding materials produced. On the other hand, the brand companies are mainly small size firms, focusing on garments production.

The analysis of answers received was performed by classifying the questions in five main categories, keeping in mind the research questions described above:

- the level of awareness of the supply side, considering also the knowledge about the materials purchased;

- the implementation of actions aiming at reducing the environmental impact and their monitoring;

- the waste management and the knowledge about the actors involved in it;

- the end of life product management, considering if the products are made by materials that allow the recycling and the reuse;

- the communication with the customer side. In the case of the textile companies it includes the amount of information shared with the brands in order to make the products more durable. For the brands, on the other hand, this area includes the communication with the final consumers, concerning also the actions taken by the retailers.

On the basis of these factors the companies were categorized in different groups in order to assess their level of maturity in circularity.

With this aim, a Cluster Analysis was performed and showed that, for the textile companies the different groups of firms are well distributed along the scale regarding the awareness of the supply side, the waste management, the implementation and monitoring of sustainable actions and end of life product management. However, the factor concerning the customer side revealed different approaches, indeed three out of five groups are performing really well in collaborating with their brands, while the other two have, instead, low scores.

Finally, by classifying the companies on two dimensions, customer value proposition and interface, and value network, resulted that three out of five textile companies can be considered in the direction toward full circularity, since they are performing well on both axes, and the other two instead, are considered upstream circular.

The same analysis for brands showed different results. As for the textile sector, five clusters were identified, but in this case the area which is less developed is the monitoring and the implementation of the sustainable actions in order to reduce the environmental impact of the production phase. Indeed, as the literature review stated, for smaller companies, the traceability and the monitoring of the indicators are harder and costly. However, three out of five brands can be considered in the right direction toward full circularity, since they have high scores on both axes, and this is in line with the choice of the sample selected. On the other hand, the other two have lower scores on both axes.

1.4.2 RETAILERS

The analysis of the retailers led to a strong differentiation between the mono brands and the multi brands stores.

The first ones seem to be more aware about the commitment of the companies and therefore more inclined to communicate it to the final customer. The multi brands retailers, on the other hand, are less aware, they are more focused on the choice of brands based on the collection or personal taste, and, as a consequence, the mission of sustainability of the companies does not reach the final customer.

1.4.3 CONSUMERS

The sample of the final customers is the widest and most transversal. This allows to have a quite complete overview about the current purchase behaviours of Italian consumers.

The objective is to understand their level of awareness about the environmental impact of the fashion industry and the consequential attitude toward a more sustainable consciousness during the purchase phase.

The questions of the survey were split in two classes: one including features about the inclination toward sustainability, the other one regarding the shopping habits. The first group allowed the definition of a "sustainability profile" per each consumer of the sample. On the other hand, a Factor Analysis was computed on the second class in order to reduce the number of features.

The factors identified are:

- Inclination towards second-hand clothing

- Lack of interest in Fashion trends

- Shopping frequency

- Inclination towards physical shops despite of online

- Lack of awareness about sustainable fashion

- Age

- Lack of price priority

- Comfort priority

- Willingness to express the personality

- Lack of material priority

- Brand priority

Then, five different clusters of customers were identified based on their scores per each factor. It is important to understand the different target consumers, characterized by different attitudes and profiles.

The third research question aims to understand which levers per each profile of customers can be exploited in order to raise the sustainability inclination.

For this reason, a Regression Analysis per each cluster was performed, considering the factors as predictors and the sustainability profile as response, in order to understand which correlations were statistically significant.

The results showed that, the attention to the materials and the awareness about the environmental impact of the fashion industry, positively impact the inclination toward the purchase of sustainable clothes for all the clusters.

Other factors are instead good leverages for specific clusters: for example, a good leverage for the first cluster of young people, could be to make sustainability become a style which people interested in fashion trends want to follow, something "important and cool", watching out though, to the second cluster, which does not care about fashion trends but just wants to express his personality. For other two profiles, on the other hand, their interest in brand names is not fulfilled, and this negatively impacts the sustainability profile.

1.4.4   CORONAVIRUS IMPACT

Our last research question was about the impact that COVID-19 had on the strategies of the companies and on the purchasing behaviours of the consumers.

The answers collected by the surveys showed that 63.6% of the textile companies claim that the lockdown influenced their strategies, indeed most of them talked about the introduction of digital tools and online services.

In a similar manner, 66% of the brand companies were influenced by the pandemic, by starting to implement and improve online sales. Furthermore, some of them exploit this situation to raise the awareness of the customers about sustainable and ethical issues and to improve the communication about their commitment. Others started to recover unused garments or to resell unsold clothing, two of them had to stop production and another one began to produce masks.

The customer on the other hand, resulted less impacted by COVID-19, indeed 60% declared not to have changed his habits, and the majority who did, is more than 50 years old.

1.5 CONCLUSIONS

Interesting findings were reached through the analysis. The majority of the companies which define themselves close to sustainable principles, are actually working on the relationships within the supply chain, and monitoring and implementing internal activities to improve their environmental impact. The companies, on the other hand, that are performing less well on our scale, are lacking on the communication with the downstream part of the chain. This was evident also from the retailers' analysis, indeed the multi brand shops are not aware at all about the circularity of the products they sell, and the sustainable principles are not transmitted all the way to the consumers.

Different profiles and different leverages were outlined for the final consumers, delivering also a common conclusion that a greater awareness and better communication about the sustainable fashion would exploit the hidden potential interest about the topic, resulting in greater sales.

In conclusion, we can say that sustainability is gaining more relevance every day and many people are potentially interested in the topic. Some are already on the right path, giving the example, but a majority is not provided yet with all the tools needed to alter the purchasing habits. Companies need to focus on the communication downstream, in order to facilitate the shopping of sustainable clothing and to educate the population about the urgent need of change.

2 INTRODUCTION

July 29th was 2019's Earth Overshoot Day, defined as *"the day in which our economic and social systems consumed an amount of natural resources that the Earth takes an entire year to generate".* In other words, it implies that we are consuming more than the Earth is capable of producing, indeed, in 2018 the equivalent of 1.7 Earths has been consumed, slightly more than the year before, and 25% more than the '80s. This means that, if the trend does not change, in 2050 we will need three Earths to survive (*Global Footprint Network*, 2018).

The problem is strongly brought to the attention of the society and of the economic sector since the environmental sphere and the economical one influence one another, indeed the natural resources are the input of a great part of industrial processes (Giorgi et al., 2017).

The industrial economy, based on the linear logic of "take, make and dispose", is in contrast with the limited availability of resources, and it risks compromising the equilibrium between the two spheres. Hence the term "sustainability", which means the capability to satisfy the needs without affecting the possibility of the future generations to do the same (*World Commission on Environment and Development*, 1987).

According to Elkington (1998), the term sustainability includes three dimensions: economic sustainability, environmental sustainability and social sustainability. The development can be defined sustainable if the three dimensions are in balance. The circular economy is considered a possible solution adopting a new model of development where the economic and social growth do not depend on the natural resource usage (resource decoupling) and on environmental degradation (impact decoupling), but on "reduce, reuse, recycle" (3R), an economy able to self-regenerate (Mura et. al., 2019).

An approach aimed to decrease and eliminate this waste, would also bring an economic advantage, indeed the pollution is a form of economical waste, which implies a not optimal use of the resources and consequential not-value added activities. (Porter, 1995).

A great impact is given by the fashion industry, being the second most polluting sector, with more than 92 million tons of waste produced per year, 79 trillion litres of water consumed and representing 8% of the global greenhouse gases emissions (Niinimaki et

al., 2020). For this reason, we decided to focus our research on the circular economy in this sector.

Our thesis is structured in six chapters. The first one is the theoretical background, in which we will study in detail the circular supply chain management and its application to the fashion industry. The second chapter will introduce the gaps of the literature review and the consequent research questions. The third chapter will outline the methodology used for the collection of data for the statistical analysis. The fourth chapter includes the results obtained and the analysis performed. In the fifth chapter we will analyse our results and capture the findings. Finally, in the last chapter, we will draw our conclusions.

3 LITERATURE REVIEW

The literature review starts with an investigation on circular economy, in order to understand in detail what this model means, and then, it will outline the definitions and implications of supply chain management. Integrating these two concepts, it will deal with the concept of circular supply chain, connecting it finally with the fashion industry, the main character of our research.

3.1 CIRCULAR ECONOMY

Recently in the developed countries, Circular Economy (CE) has been gaining ground as an alternative to the classical view of "take-make-waste-disposal" model (Veleva et al., 2018). The linear logic starts from the raw material and ends with the waste, the circular model starts from the raw material and it comes back to the raw material through the phase of reuse, recover, recycle and remanufacture (Korhonen et al., 2018). Indeed, its aim is to reduce the high amount of waste generated by the linear model that incessantly develops economies of scale, leading to a continuous growth of the demand (Sanchez et al., 2020).

The most popular definition of circular economy has been given by the *Ellen MacArthur Foundation* (2013) which defines it as "an industrial system that is regenerative by intention and design". Others say that the core of CE is "the circular, closed flow of materials and the use of raw materials and energy through multiple phases" (Yuan et al., 2006).

The butterfly framework, introduced by *Ellen MacArthur Foundation*, describes the continuous flow of technical and biological materials through the "value circle". This diagram has become influential aligning compelling business rationale with the necessity to decouple the wealth growth and the usage of finite resources.

It shows the important role of manufacturers and recycling companies (Lewandowski, 2016).
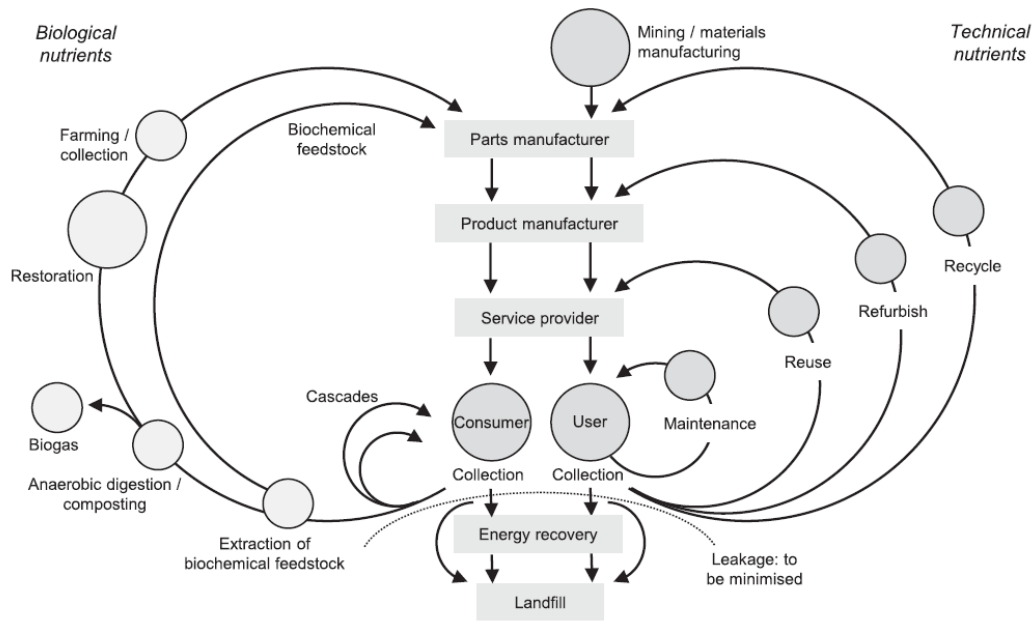
In the CE there are two main cycles: technical and biological, as shown in the picture. In the technical side, the products are durable, indeed it is important to preserve their value and not discard them at the end of their life cycle. There is embedded labour, energy, material, and capital cost that must not be wasted. Different levels are available in order to obtain this result. The inner loop is maintenance: products are resold or shared with little or no rework. Then, refurbishment and remanufacturing of components allow to create new products or extend their usage time. Finally, the outer loop, recycle, implies reworking of the materials, for example milling and re-melting metals into new metal feedstock.

On the other hand, the biological sphere deals with biological materials that once consumed, lose their original integrity and material qualities, but can be turned to other activities or used to create further value.

This diagram is a key part of the new British Standard 8001 "Framework for implementing the principles of CE in organisations" and, although this original version has been revisited and keeps evolving, remains a coherent framework for the developing production and business operational practises (Howard et al., 2018).

3.1.1   HISTORY

The term "circular economy" was first defined, with reference to many papers, by Pearce and Turner in the early 1990s. They saw the need to reconcile economy and environment, specifically, broadening the horizons of economy, switching from a linear and open to a circular and closed model (Sanchez et al., 2020). In 2010 the Ellen MacArthur Foundation was established with the aim to accelerate the transition to the circular economy by applying appropriate strategies to the biological and technological cycles. The first one based on reintroducing the non-toxic materials in the environment and the second one on reusing the components of the products as long as possible.

Another important step was the Paris Climate Summit in 2015 whose scope was a global plan of action to limit global warming (Dobrota et al., 2017). The central aim of the Paris Agreement is to improve and increase the global actions responding to the threat of climate change. For example, by keeping this century a global temperature rise well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Furthermore, in order to help countries to deal with the situation, appropriate financial flows, a new technology framework and an enhanced capacity building framework will be made available. The Agreement also encourages for more transparency and support between different actors (*UNFCCC*, 2015).

Focusing on Europe, in 2015, the European Commission adopted an action plan for the circular economy to accelerate the transition from a linear economy toward a circular one. In order to promote this, shift many actions in different areas must be taken: from the planning and purchasing of the products, through the production and consumption phases, ending with the waste management.

In line with the regulatory interventions established in 2015, the European Commission set in 2018 targets to ensure the transition to the circular economy by the year of 2030. The guidelines approved are known as the "Circular economy package" and they set the goals for the recycle and reuse of raw materials:

- At least 55% of the urban waste must be recycled within 2025 (the 60% within 2030, the 65% within 2035), with a landfill of a maximum value of 10% within 2035;

- the 65% of the packaging must be recycled within 2025 and the 70% within 2030;

- From 2025, the textile and the hazardous waste produced by the families must be collected separately.

In March 2020, a new Circular Economy Action Plan was adopted as part of the European Green Deal for sustainable growth. The actions intended by this plan are the following:

- Make sustainable products the norm in the EU;

- Empower consumers and public buyers;

- Focus on the sectors that use most resources and where the potential for circularity is high such as: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients;

- Ensure less waste;

- Make circularity works for people, regions and cities;

- Lead global efforts on circular economy.

(*ec.europa.eu*)

Concerning Italy, the awareness about sustainability and circular economy has grown a lot in recent years, indeed our country has reached the first position for circularity index in Europe and it is the first European country for the use of raw material extracted by waste, the so called "second raw materials" (*Circular Economy Network*, 2019). The recycling of second raw material results in a potential saving of 58 million tons of CO_2. In Italy, the circular economy has a profit of 88 billion euros, and it employs 575 000 people, it represents the 1,5% of the national value added. The country registers the lowest domestic consumption of raw materials and it is one of the most efficient in extracting value from the resources used. Furthermore, Italy is the first country for the circulation of the materials recovered within the production processes: the 18,5% of re-use, against

the 10,7% of Germany. Only 21% of the total waste is disposed of (against the 49% of the European average) and 76,9% of the waste treated are sent to recycling (Bianchi, 2018).

3.1.2   ENABLING FACTORS

The objective of 3R (i.e. reduce, reuse, and recycle) practices is to quit the use of the create-use-discard models and change towards create-use-reuse. It has a direct impact on the society, ecology, economy, and the environment.

In this chapter different classes of enabling factors for circularity will be described: the first one includes the factors promoting the 3R, the second class are drivers to reach an ecological balance, then industry 4.0 technologies that facilitate the processes will be described, finally government policies and consumer behavior aspects are introduced.

The enabling factors that help in **promoting 3R** are Product-as-a-Service, consumption patterns, collection of used goods, repair, and then finally an efficient distribution and material handling system (Patwa et al., 2020).

Product as a service – "a mix of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling final customer needs" (Tukker et al., 2006). PSSs aim at decreasing the physical content of a product in order to let the customer be more a user, and not an owner, and let the companies become service providers. By doing so, the producers keep the property, and the circular economy becomes functional where the customer pays for the use and not the possession (Mont, 2002).

Sustainable consumption – it is about encouraging efficient resource and energy use improving at the same time the level of quality life and guarantee access to basic services for all (*United Nations*, 2020).

Collection – the collection of waste material helps reduce the use of raw new material, therefore reducing the impact on the environment (Singh et al., 2016).

Repair – an important aspect, always taken into account since it extends the life of a product (Doron, 2012).

Distribution and material movement – There is a need for a sustainable and integrated supply chain to achieve efficient 3R for CE. Important is the integration between upstream and downstream partners (Zhu, 2010).

The core aspect in this economy is cyclical: resources are used, and then are reused again once their use is complete. In order to achieve this **ecological balance**, there are some drivers: energy and resource efficiency, clean and renewable energy, waste management and waste to energy.

Energy and resource efficiency – in order to decrease the creation of wastage and to exploit the waste energy and letting it flow back into the system (Despeisse et al., 2017).

Clean and renewable energy – the traditional fossil fuel has increased global warming and the pollution of earth. Therefore, renewable energy would make a change although it still encounters several challenges such as its shortage (Dincer, 2000).

Waste management – there are many kinds of waste: toxic, plastic, and electronic for example, so it is very important to implement waste management and recovery.

Waste to energy – Waste to energy (WTE) completes the cycle of the flow of energy within the system with minimization of loss of energy in the system and environment (Pan et al., 2015). Use waste from one process for the creation of energy of another one.

The proliferation of intelligent systems and tracking, data and information flow plays an important role in developing a sustainable economy, indeed the technology of the **industry 4.0** could facilitate the process of production with a consequential reduction of the costs. (Jabbour et al., 2017). The main factors are cloud computing, Internet of Things (IoT) and artificial intelligence (AI).

Cloud computing – technology that allows computing as a service, having the capability of executing powerful and complex calculations and analytics but removes the costs associated with the hardware resources (Hashem et al., 2015).

Internet of Things – system of interrelated components providing the ability to transfer data over a network with no need of a human interaction, which has an important role in

the data capturing through meaningful data gathering, processing, and analysis (Yaqoob et al., 2019).

Data driven analytics and AI – new insights for data analysis and decision making (Duan et al., 2019). AI has started to gain significance in the prediction and estimation of waste produced in society and this is useful for increasing the 3R applicability (Oliveira et al., 2019).

Another important influencer on the adoption of sustainable methodologies is the **government** by its policies in terms of capacity building, proper urban planning, asset management, and legislation and regulation (Patwa et al., 2020).

Promoting capacity building – activities where institutions and communities join in activities toward a sustainable society through handling of waste, energy requirements of society, and eco-efficient industrial parks (Chen et al., 2019 and Gupta et al., 2019).

Urban planning – necessary to deal with the challenges of a fast-growing society in economy and population, helping with waste management and sustainable development (Patwa et al., 2020).

Legislation and regulation – regulations can guide the development toward the desired output and dictate how business is done (Yang et al., 2019).

Finally, **consumer behaviour** is a relevant aspect toward circular behaviours, both individual and collective, since they can influence society and the regulating authority (Muranko et al., 2019). Education, communication, and economic factors have major influence on the attitude of the population toward circularity (Aras et al., 2009).

Education – with education, consumers become more concerned towards the welfare of the ecology (McGregor, 1999). Psychographic profiling also known as the study of personality, values, attitudes and lifestyles has shown that conscious consumer behaviour towards ecology is dynamically related to the level of education they receive (Straughan & Roberts, 1999; Sun, et al., 2015). The relationships between the companies and the consumers is particularly relevant in order to inform and educate the customers to the new models (Puca et al., 2020).

Persuasive communication – effective advertisement, promotion, etc. can induce consumers behaviour toward a special cause. Lately also social media have played a major role in influencing the perspectives of people (Hudders et al., 2019).

Cultural factors – Consumer behaviour is driven through cultural ideologies. A consumer is often influenced by their culture, social class and peer groups. (Ramya & Ali, 2016). Cultural factors affect the way consumers' dress, eat and buy products, which in turn has an impact on the business economy and their approach to 3R (Nair & Gulati, 2019).

3.1.3   BARRIERS

Many barriers to CE still exist nowadays and they can be classified looking at different areas: economic, social, political and institutional, technological and informational, supply chain and organization (Tura et al., 2018).

Economic barriers: the lack of financial capability and support, high cost of new technologies and the uncertainty of the long-term benefits of CE (Tura et al., 2018). Furthermore, the circular model could include additional activities due to the pre-processing of the input and this causes extra costs (Puca et al., 2020).

Institutional barriers: evident in the industry policies that still favor linear models and in their complexity, for example regulations about transporting waste and the regulatory limitations in the reuse of second raw materials (Gumley, 2014). There are many documents and bureaucratic procedures relative to the correct waste disposal (Tura et al., 2018).

Technical barriers: the lack of knowledge, technical skills and information that does not encourage circular economy. Indeed, it makes it harder to develop more advanced technical options (Rizos et al., 2016).

Cultural barriers: lack of knowledge among the consumers and producers about the environmental impacts of products and services, generated according to the linear economic model. Furthermore, the cultural barriers include the diffidence which is still spread among the consumers about the purchase and the use of recycled materials. This reluctance could be due to the belief that the product originated by a waste has a lower quality.

Organizational barriers: weak management support and failures in creating a common understanding, and furthermore is the lack of skills and the incompatibility with the existing operations (Rizos et al., 2016).

Supply chain barriers: strong focus on the linear model and lack of collaboration between stakeholders. The circular model requires a synergic process of participation which involves all the stakeholder interested (Gumley, 2014).

3.1.4   CIRCULAR BUSINESS MODELS

The aim of the circular economy is to deeply transform the way we use resources, replacing existing open production systems in new systems where resources are reused and kept in a loop of production and usage, in order to increase the generated value and its life time (Urbinati et al., 2017).

Business models define the way a firm does business and they are viewed as an important driver for innovation (Magretta, 2002; Teece, 2010). Bocken et al. (2020) introduced, three fundamental business model strategies toward the cycling of resources.

- *Slowing resource loops*: aiming at extending the utilization period of products, through the design of long-life goods resulting in a slowdown of the flow of resources as it reduces the total need for products. Slowing down the loop aims at reducing the consumption and the waste as a consequence (Pal & Gander, 2018). This can be achieved both with prolonged use and reuse over time.

- *Closing resource loops*: about recycling or closing the loop post (re-)use and production, resulting in a circular flow of resources. It can be achieved in different ways: from the chemical or mechanical processes that recover part or the entire material used in the clothing and reintroduce it into the manufacturing loop (Stahel, 1994; McDonough & Braungart, 2002), through simply reclaiming the garments and reselling them as they are, to remanufacturing by upcycling or reworking the products (Dissanayake & Sinha, 2015).

- *Resource efficiency or narrowing resource flows*: about efficiencies in manufacturing and using less material per product in order to reduce the resources used in design, manufacture, distribution, use and disposal of products (Bocken et

al., 2019). Narrowing is achieved through modular production systems, demand driven approaches to production or low impact energy use (Pal & Gander, 2018).

The following table shows some business models innovations in order to slow and close resource loops. Relevant to be said is that business model innovations involve changing "the way you do business" instead of "what you do/offer" (Amit et al., 2012). The aim is to reduce/improve the environmental impacts through the way the company creates value. At the beginning it may not always include economic advantages but may become so in the future (Bocken et al., 2013).

Business Model Strategies	Definition	Example of cases
for slowing loops		
Access and performance model	Providing the capability or services to satisfy user needs without needing to own physical products	• Car sharing • Launderettes • Document Management Systems (e.g. Xerox, Kyocera) • Tuxido hire • Leasing jeans • Leasing phones
Extending product value	Exploiting residual value of products – from manufacture, to consumers, and then back to manufacturing – or collection of products between distinct business entities	• Automotive industry – remanufacturing parts • Gazelle offering consumers cash for electronics and selling refurbished electronics (gazelle.com) • Clothing return initiatives (e.g. H&M, M&S' Shwopping)
Classic longlife model	Business models focused on delivering long-product life, supported by design for durability and repair for instance	• White goods (e.g. Miele's 20 year functional life span of appliances) • Luxury products claiming to last beyond a lifetime (e.g. luxury watches such as Rolex or Patek Philippe)
Encourage sufficiency	Solutions that actively seek to reduce end-user consumption through principles such as durability, upgradability, service, warranties and reparability and a non-consumerist approach to marketing and sales (e.g. no sales commissions)	• Premium, high service and quality brands such as Vitsoe and Patagonia • Energy Service Companies (ESCOs)
for closing loops		
Extending resource value	Exploiting the residual value of resources: collection and sourcing of otherwise "wasted" materials or resources to turn these into new forms of value	• Interface – collecting and supplying fishing nets as a raw material for carpets • RecycleBank – providing customers with reward points for recycling and other environmentally benign activities
Industrial Symbiosis	A process-orientated solution, concerned with using residual outputs from one process as feedstock for another process, which benefits from geographical proximity of businesses	• Kalundborg Eco-Industrial Park • AB sugar and other sugar refiners – internal "waste = value" practices

TABLE 1 - BUSINESS MODELS INNOVATIONS FOR SLOWING AND CLOSING THE LOOPS (BOCKEN ET AL., 2013)

There are opportunities and practises for new business models in CE that can be designed at three different levels (Batista et al., 2018).

- Product level: referring to the physical characteristics of the products that allow lifecycle expansion such as modularity, reparability options, upgradability, and recyclability actions (*EU Commission*, 2015).

- Organization level: indicating the processes that enable restoration such as reusing, repairing, reconditioning, refurbishing, remanufacturing and recycling (*APSRG*, 2014).

- Industry level: thanks to relationships and engagements between organizations over sharing resources and waste disposal (*EU Commission,* 2015). Benefits from this cooperation is the reduction of negative environmental externalities and the increase of positive effects (Urbinati et al., 2017).

Urbinati et al. (2017), introduced a new taxonomy aiming at transforming the business models replacing the traditional linear flow with the new pattern: resources – products – waste – renewable resources. This means, under a business model perspective, the adoption of new practises and approaches. First of all, activities of the reverse supply chain need to be introduced in the companies' way of doing, since it is fundamental to know about the reuse, remanufacturing and recycling processes. This could imply the adoption of new technologies and skills.

Then, the value proposition should involve the offer of product-service-systems (PSSs), as described among the enabling factors for circularity. Indeed, the relationships with the clients change, involving more interactions enabled by leasing and rental contracts, and also the revenues flow are different, being reduced at the "pay per use" approach.

The following Business Model Canvas, a tool introduced by Osterwalder (2010) to represent the business of a company, shows the circularity in two main dimensions: the customer value proposition and interface, and the value network. The first one defines how the company implements the circularity towards customers and the market and how they are positioned with respect to their competitors (Osterwalder et al., 2013). It is important for the company to make clear and visible its relationship with the circular economy principles. Two variables for this dimension are price, how the company offers

its value (i.e. pay per use), and promotion, how the awareness of the value of circularity is passed on to the customers. The second dimension, the value network, identifies how the company interacts with its supplier and how it deals with its internal activities (Osterwalder et. al., 2013). Variables in this case are the levels of performance of Design for Recycling (DfR), Design for Remanufacturing and Reuse (DfRe), Design for Disassembly (DfD) and Design for Environment (DfE). The design phase is particularly important and the larger is here the adoption of circularity, the larger is the number of suppliers involved.

By crossing the two dimensions described above, the new taxonomy is obtained which describes four modes of adoption of circular economy by companies (Urbinati et al., 2017).
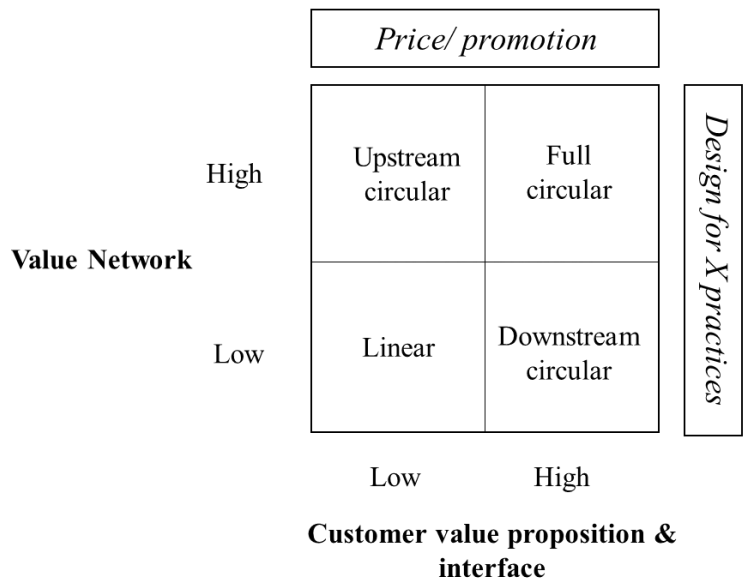
FIGURE 3 – CIRCULAR ECONOMY ADOPTION TAXONOMY (URBINATI ET AL., 2017)

- *Downstream circular adoption mode*, when the circularity concerns the reuse of products, but the internal activities do not reflect it much. Therefore, the focus is on the revenue stream, the pay per use approach, and the advantage is the market penetration with no internal changes on the design phase.

- *Upstream circular adoption mode*, on the other hand, concerns the relationship with suppliers and the design phase, but this effort of circularity is not transmitted to the market, neither with price or promotion. Here the focus is on the cost structure and the advantage is the cost efficiency.

- *Full circular adoption mode*, when companies are circular both internally and externally.

3.1.4.1 CHALLENGES

Some studies identified four main problems that may be encountered in the transition to a circular business model. They may change depending on product and market segment.

- Understand the customer behaviour towards the recirculated products, how big is demand for circular products, which customer segment would you target, what requirements do these customers have, what is their expected behaviour, and what are their alternatives (e.g. second-hand market).

- Keep the cost of adopting a circular business model low, compared with the savings the company has with remanufacturing instead of new production.

- Access to good quality returns, implying of course that better quality products would need less work to make them reusable, but they are more expensive to acquire.

- Speed of technological progress, innovation leads to obsolescence and limits the recirculation of products that do not satisfy customer preferences anymore (Van Loon et al., 2020).

3.2   SUPPLY CHAIN MANAGEMENT

As the previous model has described, the application of circular models requires a wide participation process that involves all the stakeholders of the supply chain. Starting with the definition of supply chain: "a supply chain (SC) is a set of facilities, supplies, customers, products and methods of controlling inventory, purchasing and distribution" (Altiparmak et al., 2006), the concept of supply chain management can be introduced.

Supply chain management (SCM), are the different approaches to SC, indeed "a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed in the right quantities, to the right locations, and at the right time, in order to minimize system wide costs, while satisfying service level requirements" (Simchi-Levi et al., 2000).

Different frameworks of supply chains exist. One of the most recognized is the SCOR Model (Supply Chain Operations Reference), developed by the Supply Chain Council, procuring practical guidelines for the SCM. It integrates five main components, Plan, Source, Make, Deliver and Return, that represent the primary inter-related business processes and must be aligned with the company's organizational strategy (du Toit et al., 2014).
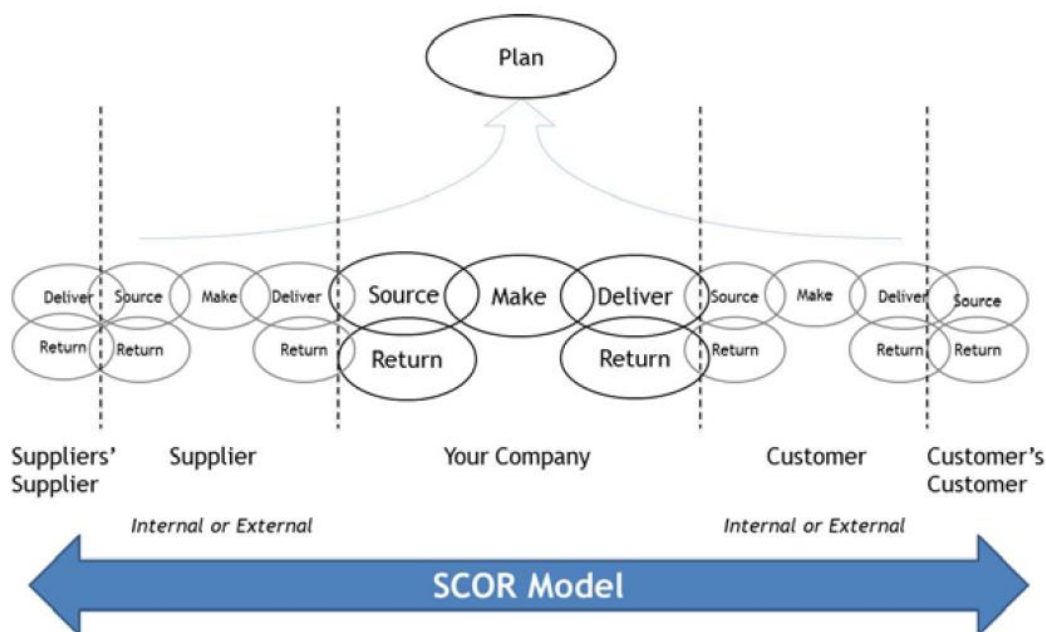
FIGURE 4 - SCOR MODEL (DU TOIT ET AL., 2014)

Mentzer et al. (2001) described another framework with the aim of defining SCM. In this model the role of the individual business functions and how they are aligned across functions and across companies is highlighted. These relationships imply trust, risk, commitment, and dependence on the feasibility of inter-functional sharing and coordination. On the other hand, in inter-corporate coordination, functional shifting within the supply chain, the role of various types of third-party providers, how relationships between companies should be managed, and the viability of different supply chain structures are taken into consideration.
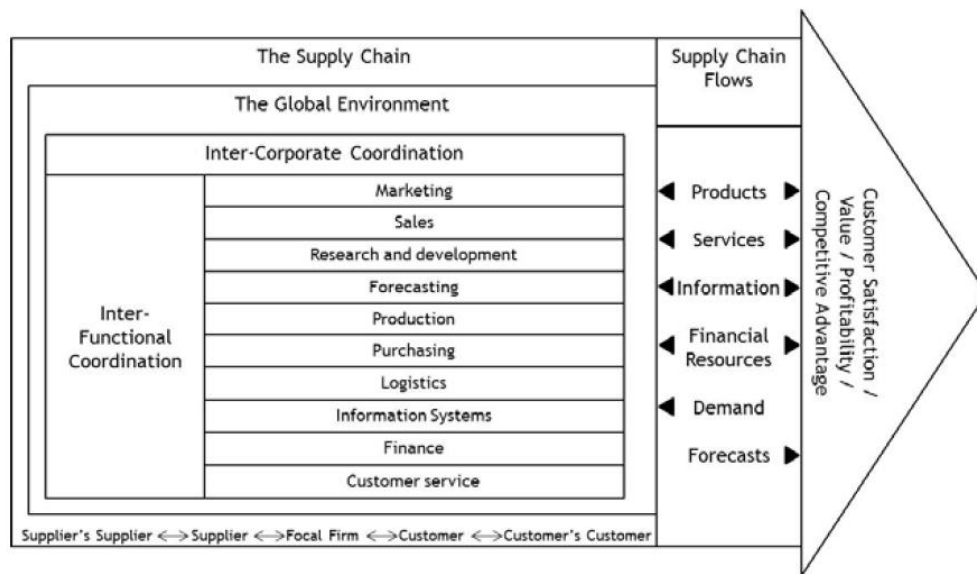
FIGURE 5 - SCM FRAMEWORK (DU TOIT ET AL, 2014)

A final framework, integrating the multiple ones present in the literature, has been introduced by du Toit et al. (2014). The principal components are organisational strategy, SC policies, SC participants, SC life-cycle activities, SC support functions, performance measurement, continuous improvement, and SCM enablers.

So, first of all, it is important to align the organizational strategy to the SC strategy, then the participants must be considered, both from the company and outside. The activities are all those that impact on the life cycle, from the raw material to the final product, while there are many supporting functions such as, distribution and logistics, inventory, and customer service. Continuous improvement became an important topic in SC, since all the actors keep looking forward to new competitive advantages. Finally, they refer to "SCM enablers" for instance with information systems, HR management and infrastructure.

To extend these definitions, a supply chain can be direct, extended, or ultimate. The identification depends on how many actors are taken into consideration: direct if only a company, a supplier and a customer, with the related product, service, financial and informational relationships are considered; extended, including also the supplier's supplier and the customer's customer; or ultimate if all the organizations involved in the upstream and downstream flows are considered.

"The recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain" is called Supply

Chain Orientation. Indeed, it is important for the company to have a system perspective in managing the relationships with the suppliers and the customers.

The reason at the base of a supply chain configuration is to increase the competitive advantage, through the enhancement of customer value and satisfaction, which implies increased profitability for all the members involved (Metzner et al., 2001).

3.3 CIRCULAR SUPPLY CHAIN MANAGEMENT

Now that circular economy and supply chain management have been investigated, the concept of Circular Supply Chain Management (CSCM) can be introduced.

Indeed, a recent definition of CSCM, outlined by Farooque et al., states: "Circular supply chain management is the integration of circular thinking into the management of the supply chain and its surrounding industrial and natural ecosystems". Technical and biological materials are restored and regenerated toward a zero-waste vision, achieved through innovations in business models and supply chain functions, from the design to the end of life and waste management, involving all stakeholders. (Farooque et al., 2019).

Another definition found in literature is CSCM as the configuration and coordination of all the functions in an organization in order to "close, slow, intensify, narrow, and dematerialise material and energy loops to minimise resource input into and waste and emission leakage out of the system, improve its operative effectiveness and efficiency and generate competitive advantages.", as the three fundamental business model strategies outlined in the previous chapters (Geissdoerfer et al., 2018).

De Angelis et al. (2017) refer to the "power of circling longer" as an important aspect to move from a traditional supply chain to a circular one. This implies to increase the interval of time that a certain product is used and, in order to do so, they suggest two main pillars: prolonging products durability or increasing the number of consecutive cycles of remanufacturing, repair, refurbishing and recycling.

They proposed an interesting diagram in order to explain differences from traditional and sustainable supply chain management (SSCM) respect to the circular supply chain. A traditional supply chain is related to purchasing, logistics and operations, focusing on the upstream and downstream relationships with suppliers and customers, ending with the waste landfill. SSCM, on the other hand, includes several topics such as environmental and social goals, the need to understand value creation as opposed to damage limitation and the importance of strategic supplier partnerships in creating this value (De Angelis et al., 2017).
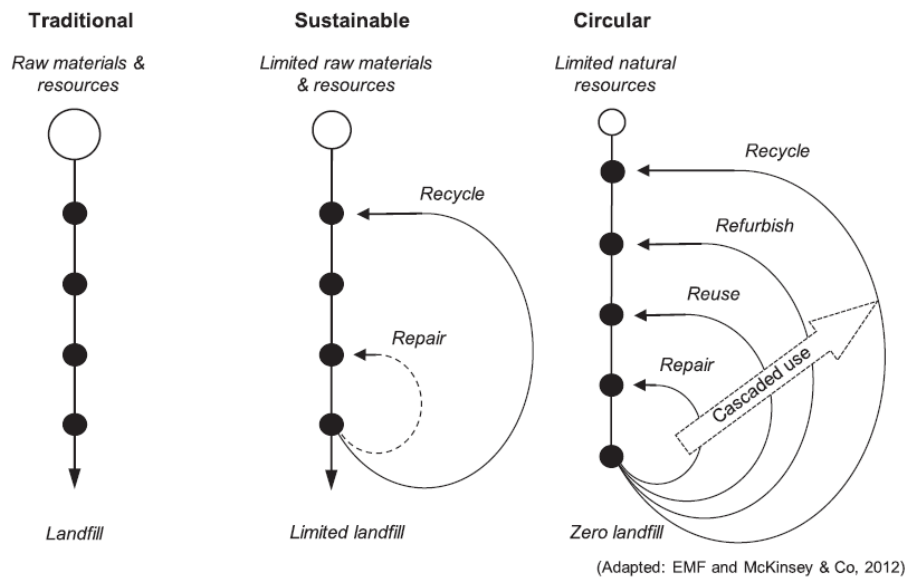
	Traditional supply chains	Sustainable supply chains	Circular supply chains
Strategy	Component price	Cost of ownership	Leasing and service outcome
Structure	Linear and open	Partially closed	Closed, short and cascaded loops
Flow	Input-output	Mixed throughput	Biological and technical cycles
Focus	Efficiency	Customer effective	Collaborative value capture
Scale	High volume	High-medium volume	Medium-low volume
Scope	Global	Global and regional	Regional and local

FIGURE 7 - TRADITIONAL, SUSTAINABLE AND CIRCULAR SUPPLY CHAIN (DE ANGELIS ET AL, 2017)

Circular supply chain must not be confused also with the reverse supply chain and green supply chain. The reverse supply chain deals with product design, operations and end of life management in order to maximise the creation of value by reusing the product after use. It can be both open loop, the recovery materials are collected by third parties, or close loop, where the products are taken back by the original manufacturers. Such ways of recovery though, implies energy cost and pollution both from the transport or the following treatments (Genovese, 2015). On the other hand, "green supply chain management is characterized by greenness in product design, selection and purchase of raw materials, production, distribution of final products, and after sale services" (Kazancoglu, 2018).

Circular supply chain is a step over these kinds of supply chain: it increases the number of actors in the chain, changing the relationships between them, and also considers different sectors from the one of origin. Customers can return the product or its waste to any actor in the value chain of the production system within the industry sector, or

different industrial sectors. It does not only create sustainable value, but also includes dynamic and continuous management. Allowing the loops of resources to be changed (Sanchez et al., 2020).

In the literature, four main dimensions that support the design and the implementation of circular supply chains are defined (Sanchez et al., 2020):

- Relational structure

- Adaptation of logistics and operational management

- The use of disruptive and smart technologies

- Development of a functioning environment

3.3.1   RELATIONAL STRUCTURE

Circularity must be applied at all stages of a supply chain and must include different sectors. This implies many stakeholders from a wider perspective than in the traditional supply chain. It is important to share a common vision, inspiration and motivation on the future of CE, indeed cooperation between internal and external stakeholders facilitates the exchange of information. Three different kinds of stakeholders are suppliers, customers and institutions (Sanchez et al., 2020).

It is critical to select the right suppliers in order to ensure the lower cost of treatment of materials and lower environmental impact (Govindan et al., 2020). In the choice of suppliers must be considered also the location and routes, aiming at optimizing the number of trips, and the waste handling activity they affect to evaluate the environmental impact. Differently from the traditional model, here customers are required to play an active role in the recovery of products and recycling. Loyalty and satisfaction are more significant than ever to longer term relationships allowing a collaboration with companies to encourage green purchasing behaviours (Sanchez et al., 2020).

3.3.2 ADAPTATION OF LOGISTICS AND OPERATIONAL MANAGEMENT

When the circular economy is introduced in a company, it requires both a change in the organization and in the production. Reverse logistics are critical for the introduction of CE in the supply chain logistics, aiming both at greater extraction of product value and in the reuse of materials (Farooque et al., 2019). In order for remanufacturing to be successful it is necessary that this thinking starts from the design of the product (Singhal et al., 2020).

Furthermore, waste management systems must also be adapted. This involves both infrastructure and management aspects, and the behaviour of citizens, product designers, producers and policy makers. The involvement of all the main actors is fundamental to decrease the generation of waste (Sanchez et al., 2020).

Another aspect is industrial symbiosis, implying the transformation of waste into input between companies that work together, whether or not they belong to the same industry. This would need new governance structures and coordination.

Finally, a new business model is needed that is able to move from just products to the reuse and service practices. The circular business model encourages the transformation in circular and reverse supply chains, allowing the products to re-enter the production instead of becoming waste (Sanchez et al., 2020).

3.3.3 THE USE OF DISRUPTIVE AND SMART TECHNOLOGIES

In order to apply the CE to SCM, a monitoring system is needed which must adjust to technological changes. Industry 4.0, including technologies such as Internet of Things (IoT), augmented reality, additive manufacturing (AM), big data, cloud computing, simulation, industrial automation, and cybersecurity, can help facilitate a circular framework, as already described in the "enabling factors for CE" chapter. For example, enabling efficient monitoring, collection, separation, and transport of waste for value recovery.

Those technologies used in product design and manufacturing aim at a reduction of production cost and more sustainable operations. Through IoT information is monitored,

controlled and transferred, building cooperation between stakeholders (Sanchez et al., 2020).

3.3.4 DEVELOPMENT OF A FUNCTIONING ENVIRONMENT

Government support in the implementation of circular economy is necessary, it would be required to reach a systematic regulation and policy system, with better interactions between the actors, as already discussed in the "enabling factors for CE" chapter (Homrich et al., 2018). Strict regulations are important in order to attribute responsibilities on the people involved in the supply chain, these must give clear guidelines regarding how to operate and penalties for non-compliances. Institutional pressure plays an important role through social norms, rules and culture. Governments can promote circular economy and a sustainable society developing appropriate policies, measures and guidelines (Sanchez et al., 2020).

A side to be considered is the lack of benefits in the short term, coming with short term cost, moreover the difficulty in finding financial resources to improve waste management. Here is evident the role of the institutions that can help the introduction of CE with a correct fiscal management, for example by exempting recycling products from taxes.

Finally, another aspect to be examined is the cultural environment. The lack of environmental education is evident in the habits and mentalities of people that often do not take into consideration green behaviours in their everyday life or professional lives. This is why the forming of a new organizational culture is essential for the adoption of CE (Sanchez et al., 2020).

3.4   FASHION INDUSTRY

3.4.1   FASHION INDUSTRY TODAY

The fashion industry is a global business of 1.3 trillion dollars, which employs more than 300 million people worldwide (*BOF & McKinsey*, 2019) and represents a significant economic force and a substantial driver of global GDP (*BCG*, 2019).

Fashion companies today are operating in a very dynamic competitive environment, dominated by sudden changes and increasing uncertainty (Kankanamge & Dinesha, 2014). This requires companies to adapt rapidly to emerging trends by focusing on product innovation and by developing new designs for creating new fashion trends. In particular, the attention to sustainability and circular economy are affecting the fashion demand and the customer's expectations (Gazzola et al., 2020).

The apparel has a long and complicated life cycle with many phases including resource production and extraction, fibre and yarn manufacturing, textile manufacturing, apparel assembly, packaging, transportation and distribution, consumer use, recycling and ultimate disposal; and many social and environmental issues may be involved. The textile sector, indeed, has experienced significant environmental problems linked to the production process, which is characterized by the intense use of chemical products and natural resources, resulting in a high environmental impact (Kozlowski et al., 2015). Furthermore, the global scale of the industry often requires the movement of products from the developing countries characterized by low-labour cost, where the production occurs, to consumers in Europe and US, with the consequent impact of the transportation (Caniato et al., 2011).

Tyler et al., (2006) illustrated that the fashion apparel industry developed an infrastructure around the late 1980s with an emphasis on quick response, through reduced lead times, along with maintaining low costs. The decrease in the price of apparel, and faster trend cycles coupled with low quality and planned obsolescence has led to an increase in the volume of clothes consumed globally and the development of the so-called "fast fashion" (Fletcher, 2008).

Indeed, in just two decades, clothing production has almost doubled, driven by an increase in the number of garments purchased each year by an average consumer; this means that

a piece of clothing, after being used for one season, is simply thrown away (Jacometti, 2019). The speed of fast fashion amplifies problems related to the environmental and social impact of the industry (Gazzola et al., 2020). Indeed, the fast-moving trends imply a short product life cycle in order to quickly respond to changing demand (Pal & Gander, 2018).

Concerning Italy, the "fashion system", comprising textile, clothing, footwear, and leather goods production, can be considered particularly representative at world level, since it is one of the main exporters in the world. The Italian entrepreneurial fabric is fragmented into a number of companies, many of which are small-medium sized, often with a mainly family-type structure.

The Italian fashion companies are characterized by great ability to produce garments that are more difficult to imitate, highly creative and technologically advanced, thanks to high investment in quality and innovation, brands worldwide recognition and strong coordination throughout the production chain.

Furthermore, ability to combine both creative and managerial elements in the company activity and the communication ability distinguish the market.

The features described above make the Italian fashion market competitive and successful, characterized by a strong coordination throughout the production chain (Culasso et al., 2012).

3.4.2   THE NEED FOR CHANGE

The current economy of this sector can be described as a linear system, in which products are made and then discarded generating vast and growing amounts of waste every year (Bocken et al., 2019). In a fashion system where only around 20% of clothing is recycled or reused, huge amounts of fashion product ends as waste in landfills or is incinerated (*Global Footprint Network*, 2017). Research has shown that discarded garments still have a significant portion of their potential useful life embodied at the time of their disposal (Han et al., 2017). The industry cannot continue to function in such a manner, so sustainability and sustainable business models are transforming from niche to necessity (Kozlowski et al., 2015).

Indeed, the fashion industry is the second most polluting sector, with more than 92 million tons of waste produced per year, 79 trillion litres of water consumed and representing 8% of the global greenhouse gases emissions (Niinimaki et al., 2020).

In this scenario, slowing consumption could have a significant effect, as fibre production dominates clothing's product life cycle impacts, but it is a thorny topic to tackle since the fashion industry has experienced a consistent increase in the textile consume (Bocken et al., 2019). Indeed, nowadays the fashion industry is affected by a strong push to make each phase of the production process more sustainable with a view to transition to circular fashion models (Jacometti, 2019). According to Todeschini et. al. (2017), there are five socio economic and cultural macro trends behind the push for sustainable and innovative business model alternatives to the fast fashion paradigms:

1. The increased consumer awareness about sustainability and the changes in the preferences and habits about consumption. Evidence of this change are the increased interest in green products and the spread of exchange and sharing platforms. The use of social media supports the social interactions and contributes to assist the sale and purchase of online products and services. Indeed, the development of e-commerce is one of the main trends in the fashion sector (Bendoni, 2017).

2. The trend of the circular economy. It has been highlighted how the circular economy is one of the strategic areas of innovation for the future development of the textile and clothing sector in order to promote the extension of the end of life of textile and clothing products, their recycling and their reuse (*ETP Fibres Textiles Clothing*, 2016).

3. The clear trend toward increasing adoption of corporate social responsibility. The European Commission defines corporate social responsibility (CSR) as, "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" (*European Commission*, 2010).

4. Sharing economy development. It represents the shift from ownership to access, manifested in approaches such as collaborative and access-based consumption.

The collaborative consumption is an efficient alternative for adapting individual needs to the available resources.

5. Technological innovation, enabling improvements in sustainability in fashion. The fashion industry is more and more interconnected with the digital world. New applications of artificial intelligence are arising in order to increase the transparency and the traceability along the supply chain (Pantano et al., 2019).

The shift toward a circular system is not just a more economical production method, but it is also an opportunity for brands to increase the involvement with the design of the fabrics, resulting in improved innovations. If every brand starts developing eco-friendly practices, the textile and fashion industry will become significantly more sustainable and up to 95% of textiles land filled could be recycled (Moorhouse & Moorhouse, 2017)

3.5   CIRCULAR ECONOMY IN THE FASHION INDUSTRY

The fashion industry is changing fast, between 2010 and 2014 the number of brands publishing their annual sustainability report has increased substantially: by 50% the ones available on CorporateRegister.com platform, and by 83% the European Brands (Ricchetti, 2017).

The circular economy, as mentioned in the previous chapter, is described as "economic system that replaces the 'end-of-life' concept with reducing, [or] alternatively reusing, recycling and recovering materials in production/distribution and consumption processes to accomplish sustainable development".

The three logics of narrowing, closing, and slowing, previously described, are not mutually exclusive and they can be combined in order to reinforce the effort. However, their implementation could be hampered by some obstacles that characterize the fashion industry. Fashion remanufacturing is largely restricted by issues of scale and scope, due to challenges related to material and process repeatability and standardization on one hand and consumer acceptance on the other (Dissanayake & Sinha, 2015).

The narrowing logic requires investments in new technology solutions such as Product Life-cycle Management, 3D visualization or 3D prototyping, which are not easily accessible in most of the countries where the production occurs. Furthermore, the introduction of new manufacturing processes must be accepted and institutionalized by the people involved in the design and the creation of the product who can be resistant to changes. The slowing approach can encounter cultural barriers related to the actual dynamic and meaning of fashion; namely, that fashion involves styles that change according to social and political trends and broader cultural movements. Closing the loops is strictly constrained by the type of fibres and materials used, the difficulty of recycling fibres blends has driven newer design approaches focusing on future recyclability (e.g. mono-material garments) but this places significant restriction on the designer and their ability to respond to changing consumer tastes (Pal & Gander, 2018).

The circular economy provides opportunities for innovation in product design, services, and business models, but it challenges the fast fashion and the actual design system (Todeschini et al., 2017). The shift toward a circular business requires business model

and supply chain innovations facilitating the reuse and the recovery of clothing.

According to Hoffman & Coste-Maniere (2012), the best performing companies in terms of sustainability are those one that are able to re-think their business model and to integrate in their governance the new policies. Experimentation with new business models and the shift toward sustainable and circular businesses are needed to achieve long-term competitiveness. Some fashion companies are developing CSR policies, but the critical step is the implementation of these policies in the design and development phases of the process (Kozlowski et al., 2015).

According to Todeschini, et al. (2017), the key drivers for the circular economy trend for fashion businesses are:

- Upcycling: refers to the use of wasting materials to generate new goods of equal or higher perceived value, utility, and/or quality than the original products (Dissanayake & Sinha, 2015).

- Recycling: consists in converting materials from existing products to create different products.

- Vegan: it aims to reduce overall energy consumption within the whole system by refraining from using raw materials of animal origin.

The waste management hierarchy by the US Environmental Protection Agency (EPA) shows the different options at the end of life of a product.
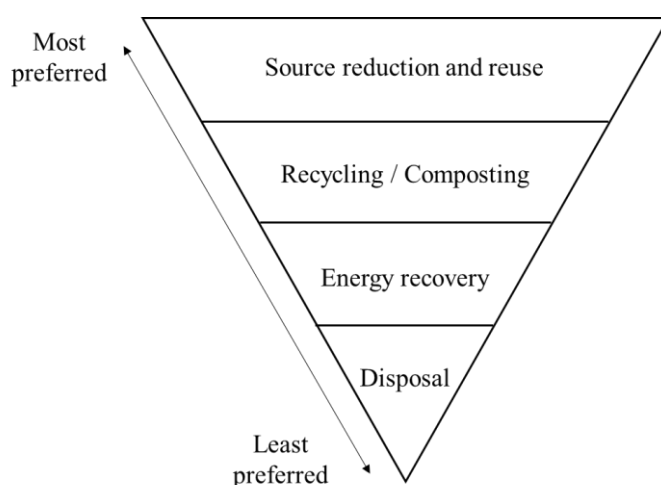
FIGURE 8 - WASTE MANAGEMENT HIERARCHY (RICCHETTI, 2017)

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The most preferred option is to reduce the waste generated, indeed try not to produce it, possibly starting from the design phase of the products. Then there is the reuse or the recycle of the product, which implies an opportune supply chain. Another option is to, at least, recover energy from waste, and finally, the least preferred option is landfilling.

An important phase for reuse and recycling is the collection of the clothing items. There are different options, for example they can be collected by a charity organization, by the shop through "take-back initiatives", by clothing banks, during special events, etc. For the post industrial recycling of scraps from the production phase, there are special companies in charge of their collection and the recycling.

Reuse. With no need of substantial processing to reconvert it to raw material, it implies reusing a product in a new way. Recontextualization and creative upcycling can lead to the creation of a new product with higher value than the source one. After being collected, the clothes go through sanitizing and reconditioning processes, and are later resold in second-hand markets or though charitable organizations.

Recycling. "processing of end of life materials to recover them and reintroduce them in the production cycle". Recycling can involve many sources of materials: from post consumer items, to materials coming from other sectors, for example PET bottles, and scraps of supply chains. Materials are sorted, separated and classified manually, if necessary they go through carbonization and hydrochloric processes, and then finally are shattered with special machines in order to bring them back to their original state.

Waste to energy. It allows to save a little part of the embodied energy still present in the product at the end of its life.

Landfilling. The least preferred option, especially for the non biodegradable man made fibres, that, unfortunately, represents the majority of the materials used in the fashion industry.

Upcycling and recycling will be deepened in the next two chapters.

3.5.1 UPCYCLING

A study concerning the production of upcycled womenswear garments of UK high street fashion, shows that there are consistent differences between the standard and the upcycled production, and it is important to understand and analyse them in order to allow a successful integration of sustainable practices into large-scale fashion manufacturing. The fashion upcycling process (also termed refashioning or remanufacturing) has been defined by academics and practitioners as an upward reprocessing of waste, recovering intrinsic value through recycling, recutting, refashioning and closing the loop of the manufacturing system.

Upcycling enables a sustainable design option for reuse techniques to be employed for greatest economic and environmental benefits, so it presents an opportunity for designers to lead the way in utilizing the many tons of textile waste produced to satisfy the constant demand for new fashion. In order to reach this purpose important changes are needed at each stage of the cycle (Han et al., 2017).
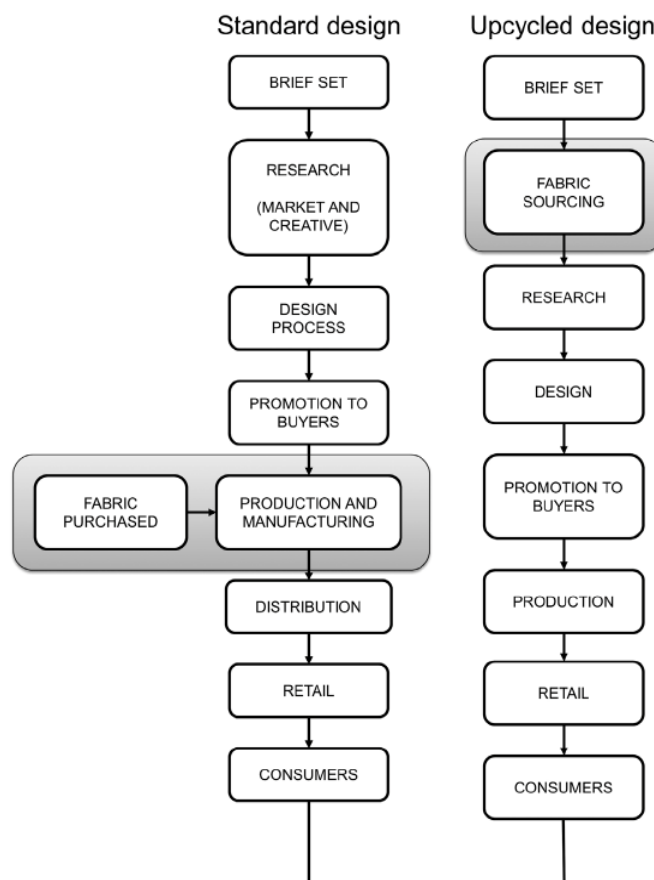
FIGURE 9 - STANDARD AND UPCYCLING DESIGN (HAN ET AL., 2017)

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Starting from the **brief set**, in the upcycling design, the focus is on "design for waste minimization", this is in contrast with standard fashion design which is linked to trends and consumer and market data. "Zero waste fashion design addresses inefficiency in fabric use by reframing fabric waste as an opportunity to explore the magic of fashion; just like all fashion, zero waste fashion celebrates experimentation and the discovery of new forms" (Rissanen, 2016). As a consequence, in the upcycling process the **sourcing** occurs at the design brief step because is based on the availability of unused, pre-existing materials, so it is an antecedent phase to the research and design, as the picture above shows. Furthermore, the quality of the materials becomes crucial since it will determine the duration of the product life cycle. The choice of materials significantly influences the environmental impact, for this reason the circular design guide identifies some steps to drive the research (*Global Fashion Agenda*, 2020):
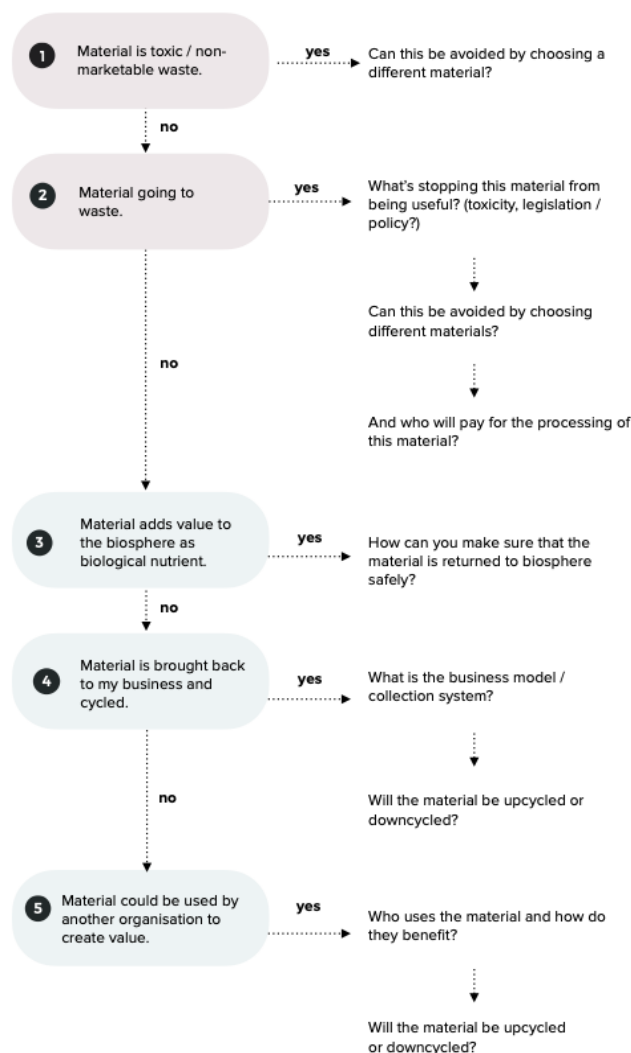
FIGURE 10 - MATERIALS CHOICE (GLOBAL FASHION AGENDA, 2020)

On the other hand, in the standard design process the source stage is a pre-production step, after the wholesale order.

The following step, the **research**, in the standard design process, consists of a mass market, trend analysis; for upcyclers the research requires a direct customer involvement through social media in order to get feedback.

The **design** phase strategy is critical since design decisions impact the whole business model but have particularly critical influence on the translation of sustainability principles to the value proposition (Todeschini et al., 2017). The circular design can take many forms: designing for longevity, durability and reparability, whose aim is to extend the use phase of a garment by one or more owners; on the other hand designing for circularity, disassembly, recyclability or biodegradability, whose aim is to ensure that products and materials are looped back into the system and used in a regenerative process. The following table summarizes the description of each approach (*Global Fashion Agenda,* 2020):

Design for longevity		Design for circularity		
Design for durability	*Design for repairability*	*Design for disassembly*	*Design for fibre recycling*	*Design for biodegradability*
Involves extending the life of a product by prolonging its usage. In other words, durability of a product is measured by how long the product provides a useful and meaningful service to the consumer.	Entails considering which elements will most likely need to be repaired or changed. These are usually buttons, holes or linings. Make sure that you consider repair kits or services when designing for reparability.	Requires components that can be easily separated, making it easier for a product to be reused or recycled, prolonging the life of its materials.	Involves taking current material streams into account. Can be complex and requires that all product materials, including chemicals, are carefully considered.	Means that products only include materials that decompose naturally and that can be returned to nature through biological cycles after use.

TABLE 2 - DESIGN FOR LONGEVITY AND CIRCULARITY (GLOBAL FASHION AGENDA, 2020)

But one of the main differences between the two processes is the role of the designer, indeed in the upcycling system has a central role, is involved from the sourcing phase to the production. He/she should be in charge of thinking about how the product will be disposed of. (Han et al., 2017). For this reason, education becomes an important factor in creating a truly sustainable fashion industry since the new young designers have to think in a different logic with low waste and considering the entire product life cycle. Circular design focuses on prolonging the life of a product, and looping materials back into the fashion system (*Global Fashion Agenda,* 2020).

The design phase in the upcycled system must take into account the limited availability of materials to develop the products, so it requires an "high level of design thinking and creativity" (Dissanayake & Sinha, 2015). In order to pursue this goal, it is necessary to

align the values along the supply network, to foster the interaction and the collaboration between the actors involved in the supply chain. Sharing knowledge and competencies requires significant collaborative efforts, but it contributes to the reduction of associated costs and the improvement of market performance (Todeschini et al., 2017).

Some companies have started implementing upcycled business models, for example the following image shows the circular process of MUD, a company producing jeans. The material of discarded jeans is reused to make new denim fabric, returned jeans are up cycled or sold as a unique vintage pair (Moorhouse & Moorhouse, 2017).
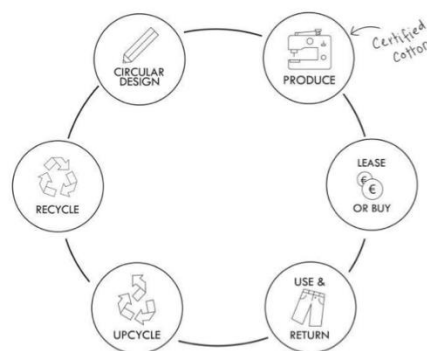
FIGURE 11 - MUD'S JEANS CIRCULAR PROCESS
(MOORHOUSE & MOORHOUSE, 2017)

In May 2016 Levi Strauss and Evrnu designed the first pair of jeans made using post-consumer cotton waste. The process converts consumer waste into renewable fibres and uses 98% less water than virgin cotton products.

3.5.2 RECYCLING

In order to implement business models based on the use of recycled materials it is important to conceive the products in order to re-use them, starting from the materials they are made of. However, recovering clothes is costly, it is important to know the composition of materials, but it is often difficult to transmit to the whole supply chain all the information.

According to Ricchetti (2017), recycling in the fashion industry is not that easy since the importance given to aesthetics and symbolism. Changes are needed in order to get close to the target:

- reshape the planning phase, educating new designers;

- institute parameters for the assessment of the environmental impact in an easy, transparent and popular way;

- a transparent engagement of also the suppliers of materials is needed.

Materials can be classified in two groups:

- Non-renewable or bio-based, includes synthetics fibres, polyester, polyamide, polyacrylic, polypropylene, elastomers, plastic, metals and others.

- Renewable includes both natural textile fibres and manmade bio-based fibres, produced from cellulose.

In the next pages, these groups, together with the water and chemicals consumption in the fashion industry will be analysed.

3.5.2.1 NON-RENEWABLE RAW MATERIALS

Belong to this category the man-made synthetic fibres, consisting in synthetic polymers deriving from fossil materials. Their introduction goes back to the second half of the Nineteenth century, during World War II, and their distribution at large scale started after the war. At the beginning the production was concentrated in Europe, and then progressively moved to Asia. In 2012 indeed, Asia was leading fibre manufacturing with 66% share, while the production in Europe and America decreased from 58% in 1983 to 12%.

The two most common fibres are polyamide (nylon) and polyester. Their chemical elaboration creates threads that are ready for the following processes such as drawing, texturing and dyeing. The filaments can be cut into short fibres and are mixed with raw materials of different natures, such as cotton or wool. For this reason, they are very popular but at the same time also difficult to recycle, not being "pure fibres". Other reasons for their fast success in many different sectors (from fashion, to automotive and construction) are the technical performances such as tenacity, easy maintenance, high resistance, and water repellence, and the standardized and relatively simple production process.

Sometimes the contrast between natural and synthetic fibres is improperly associated with the fact that more sustainable fashion means fewer synthetic fibres and more natural one. This is not always true though, the production of synthetic fibres is limited by the availability of fossil materials, while the one of natural fibres by the presence of cultivable areas, pastures and water resources. The growth of demand for textile fibres will increase the need of synthetic fibres since the cultivable areas for natural fibres are inevitably reaching a limit and will be confined to luxury goods.

Analysing the environmental impact of the production processes for synthetic fibres, considering the need of the fossil materials, it can be said that:

- Less than 1% of the extracted oil is used, but need to be considered their limited availability

- Energy consumption is circa from three to ten times higher than natural fibres

- Emissions of CO_2 in the atmosphere are circa from +20% to four time higher than natural fibres

- Water consumption is low, from 60 to 120 litres of water per kilogram of fibre, much lower than most of the natural fibres (for example, for the production of 1 kilogram of cotton, circa 10.000 litres of water are required)

- Many oil-based chemicals involved in the production are dangerous for both for the consumers and the environment

- The biodegradability of synthetic fibres is very low, in most cases impossible

The synthetic fibres can be recycled through mechanical or chemical processes. The first one needs little energy, but the resulting output is degraded with respect to the initial use, so it can be used for other applications (down-cycling). The second one needs an even higher amount of energy respect to the first production, but the original value is maintained. Indeed, the chemical recycling's aim is not to reduce energy consumption but to reduce the fibre waste.

For the recycling phase is very important the quality of the material and the fact that they need to be uncontaminated and easily separable from other fibres. Therefore, it is important to keep this aspect in mind during the design phase.

Metals too belong to the non-renewable materials: gold, silver, steel, aluminium, nickel, and others that are often used in the clothing industry, especially for the production of functional elements, such as buttons, zippers, etc. The environmental and social impact of their production is connected to the mining activities. The campaign "No dirty gold" was launched in 2004 by Earthwork NGO, supported by the main jewellery retailers, trying to bring attention to this aspect. The recycling of precious metals is widespread, while regarding the non-precious metals there are no significant global data.

3.5.2.2 RENEWABLE

Renewable fibres represent circa 30% of the materials use and to this category belong:

- Natural plant fibre (cotton, linen, jute, hemp, agave, kapok, ramie, coir, pineapple, nettle, broom)

- Natural animal fibre (wool, silk, leather)

- Biopolymers obtained from natural materials and transformed by the chemical industry (such as viscose, acetates, triacetates)

Cotton. Mainly used in the fashion industry and in household goods, its production is concentrated (80%) in six countries: India, China, United States, Pakistan, Brazil, and Uzbekistan. Cotton production is a contradictory industry: highly automated in America and, on the other hand, exploiting female and child labour in poor African and Asian countries.

Wool. Thanks to its capacity to absorb water and moisture and retain heat, it is soft, elastic, and ideal for keeping warm. The main producer is Australia, followed by China, New Zealand, and India. In Italy the production of wool is not very relevant, but, on the other hand, the area of Prato and Biella is famous for the production of semi-finished products (yarns and fabrics). Recycling is becoming common, still needing energy, water, and chemicals, prolonging though the wool's life cycle and reducing waste.

Silk. Key player as a precious textile for its brightness and softness, is mostly produced in China, India, Uzbekistan, and Brazil. Como area in Italy is also famous for its silk weaving and printing. Silk comes from silkworms, in mulberries cultivations, which produce a filament to build a cocoon for protecting their larva.

Biopolymers. Created to replace traditional plastic, can be bio-based (derived completely or partly by biomass), biodegradable (degradable by the environment), compostable (absorbable by the environment) or not biodegradable. Their degree of sustainability depends on the kind of raw material used, it is higher with biomass procured from scraps of the agricultural or industrial supply chain production, while, on the other hand, it is lower for purposely created crops.

	COTTON	WOOL	SILK
CO2 emissions	1.8 tonnes CO2eq per tonne of fibre		Especially in the dyeing phase
Water consumption	Growth: 3000-7000 L per 1kg Production: 200 L per 1kg	Treatment: 8.5-16.5 L per 1kg Production: 20-122 L per 1kg	Used in the production and dyeing phase
Energy consumption	Relevant	15-19 MWh per tonne	Used in the production and dyeing phase
Hazardous chemicals	6.2% of the pesticides used in agriculture	Auxiliary formulas: 180-300 kg per tonne Colourants: 45-54 kg per tonne	Massively used in the dyeing phase
More	Biodynamic and organic cultivation practises try to reduce the water consumption and the use of chemicals		

FIGURE 12 - COTTON, WOOL AND SILK ENVIROMENTAL IMPACT (RICCHETTI, 2017)

3.5.2.3 WATER AND CHEMICALS

The water footprint of the clothing worn in a year by a British citizen is about 100.000 L, due in the majority by the natural or biobased fibres, as explained in the previous pages (*WRAP*, 2012). Moreover, it has been calculated by the World Bank that the global water consumption for the wet processing (dyeing, printing and finishing) is about 9 billion cubic meters per year (1 meter cubic = 1000 L), more or less 2.5 times the Garda Lake. Great part of the water consumed is also highly polluted due to pesticides and fertilizers,

used for the growth of natural fibres, and dyestuff and other chemicals in the wet processes of the product manufacturing.

There are three main approaches to the matter of pollution and release of hazardous chemicals in the environment: purification, minimization, and elimination.

Purification. Complex process, starting with the elimination of solids and then performing a biological treatment that cuts many organic substances and pathogen microorganisms. In Italy there has been the growth of consortium purification systems, often also engaging the public institutions, such as the most famous one in the Prato area. There is though the risk that if accidents happen, hazardous substances can be released in the environment. Sometimes these purification systems also include recovery processes of the chemicals or materials found in the waters.

Minimization. In order to minimize the usage of water and the risk of hazardous chemicals, the start is in the optimization of the production processes, for example in closed loop plants.

Elimination. Possible through technological innovations in processes and materials or by the replacement of the hazardous chemicals with others enabling the same rendering.

"The Greenpeace Detox campaign was conceived several years ago to push the big brand of Fashion to work in synergy with their suppliers to ensure an eco-friendly production chain. The goal was to remove all the chemical substances polluting and toxic for humans" (*consorziodetox*).

The fundamental principles of this campaign are to eliminate the emissions of hazardous chemicals (Greenpeace has classified 11 priority types) and to disclose and be transparent about the chemicals used, their analysis and their elimination.

Some steps regarding the recycling phase and the assessment of parameters have already been taken by some companies, such as Nike, who introduced recyclable assessment criteria in the design of new products. The luxury sector too is developing new initiatives, for example Kering group sets targets to improve sustainable performances, and computes, after production, the overall impact of the life cycle of the product. Gucci introduced 100% biodegradable shoes made out of APINAT and began encouraging the

use of recycled plastic for shoe heels. Bottega Veneta & Gucci both set up programmes to reuse waste leather scraps into shoe production or cuttings into organic fertiliser. Knickey, an organic cotton underwear startup, offers free shipping labels and a pair of new undergarments to anyone who wants to send them unwanted underwear and socks. California startup For Days sells access to its T-shirts through a subscription model, essentially taking responsibility for the entire life of its product. Similarly, organic bedding company Coyuchi offers a subscription programme for sheets and towels, along with traditional sales. When customers are done with a piece, they send it back for recycling and receive a new one. For Days says that it has a waitlist of 16,000 people willing to pay $38 for their first T-shirt". (Wicker, 2019)

3.5.3   ASSESSING SUSTAINABILITY

To understand where a company currently stands in its circularity and to allow for the setting of targets monitored by clear key performance indicators (KPIs), companies need a system of metrics that can guide their decision-making when adopting circularity in their corporate strategy (*World Business Council for Sustainable Development*, 2020). The indicators play an important role in highlighting progress towards sustainability goals, this is an important oversight (Kozlowski et al., 2015).

Companies have always had indicators for financial, operational or strategic goals. Lately, with the increasing interest in social and environmental issues, new indicators were developed related also to non-economic factors (Keeble et al., 2003). These indicators often follow the Global Reporting Initiative (GRI) approach, becoming in some cases standardised, or are in line with the Sustainable Development Goals of the United Nations (Searcy, 2009).

Furthermore, certifications about sustainability in the fashion industry are recognised to certify the validity of the actions taken by the companies. For example, BCI (Better Cotton Initiative), ISO 14000, family of standards related to environmental management, and OEKO-TEX, certification system for the textile industry.

In Italy there is ICEA (Istituto per la Certificazione ed Etica Ambientale) which issues the most common certifications among sustainable companies:

- GOTS (Global Organic Textile Standard)

- GRS (Global Recycle Standard)

- OCS (Organic Content Standard)

- RCS (Recycled Claim Standard)

- RDS (Responsible Down Standard)

- RWS (Responsible Wool Standard)

- FSC (Forest Stewardship Council)

- PEFC (Programme for the Endorsement of Forest Certification)

Recently, many brands in the fashion industry have decided to share sustainability reporting that typically contains a mix of qualitative and quantitative information. This information is often shared on web sites, but it may also appear in stand-alone reports focused on sustainability or in other documents such as annual reports (Kozlowski et al., 2015). The *Global Reporting Initiative* (2013) defines the sustainability reporting as the instruments that "conveys disclosures on an organization's impacts – be they positive or negative – on the environment, society and the economy".

However, while the use of indicators for sustainability reporting is growing, the lack of standardization, verification and the voluntary nature, raise questions regarding the completeness and accuracy of the claims (Adams & Frost, 2008; Davis & Searcy, 2010). For this reason, the GRI (2011) provided a guideline to support the reporting, and produced also a supplement that addressed the specific needs of the apparel industry, i.e., the Apparel and Footwear Sector Supplement (AFSS).

The GRI AFSS is the first guideline available to the apparel industry related to the selection of sustainability indicators and reporting. It identifies 34 sector-specific performance indicators, which fall into four categories: supply-chain standards and practices, economic, environmental, and social (*GRI*, 2011). It is important to consider that the sustainability reports are voluntary in nature so companies have discretion in terms of what to declare, so the extent to which the framework can be applied vary widely (Kozlowski et al., 2015). Shermann (2009) showed how the content and reporting styles

can be drastically inconsistent even between the two similar brands, belonging to the same industry and using the same reporting guideline.

Caniato et al. (2012) conducted a study of five cases exploring environmental sustainability in fashion supply-chains. The analysis was conducted by differentiating the supply-chain models utilized by the companies in identifying the following factors associated with environmental sustainability: the study found that while large companies utilized a good number of environmental KPIs, they did not cover all the dimensions suggested by the GRI. On the other hand, smaller companies did not quantify environmental performance using KPIs mainly due to economic reasons.

As *Fashion Revolution* states, the disclosure of information is important because it allows transparency and without transparency we cannot see or protect vulnerable people and the living planet. For this reason, Fashion revolution published the Transparency Index, by classifying 250 fashion brands and retailers on the basis of different social and environmental aspects.

However, transparency does not mean sustainability, indeed the increased trend in the adoption of CSR practices leads to discussion about the ethics of communicating sustainable actions for business purposes and as a consequence, the risk of greenwashing (Baldassarre & Campo, 2016).

3.5.4 GREENWASHING

"Greenwashing is disinformation disseminated by an organization so as to present an environmentally responsible public image". (Ramus & Montiel, 2005).

According to Winn & Angell (2000), commitment to environmental policies and implementation of environmental policies are two distinct constructs, indeed not necessarily the first is translated into the second one. Corporations have an incentive to publish environmental policy statements as the statements can positively influence public perceptions of company commitment to environmental protection and sustainable development. However, the problem is the lack of a mechanism of verification to know when the policy commitment results in internal green activities (Ramus & Montiel, 2005).

According to DiMaggio & Powell (1983) the behaviour of a company is influenced by the norms and the pressures that characterize the industry in which the company is, as a consequence, we could expect similar patterns related to committing to a set of environmental policies within the same industry.

Considering the fashion industry: in a November 2018 survey commissioned by the Changing Markets Foundation, which lobbies for sustainable solutions worldwide, only 12% of UK consumers agreed that the fashion industry informs them about the environmental and social impact of clothes manufacturing. The problem is that, even if the brands communicate changes toward more sustainable practices, many times they do not explain how the changes will be implemented. This is due to the lack of a standardised and legally binding framework to govern the information.

The EU Commission has been working on legislation that would request or mandate that fashion brands label their products with foot printing around water usage, carbon emissions and waste generated. (Wicker, 2020).

3.5.5 CORONAVIRUS IMPLICATIONS

The impact of the pandemic on the fashion industry was immediate. Due to public health concerns and social distancing measures, within days, governments around the world demanded the closure of non-essential retail, including fashion. Indeed, the retail sales in Europe has decreased 43,5%, with a decline of textile orders in Europe in April 2020 of 45% (*statista*).

COVID-19 has brought the existing inequalities across the fashion's global production network on the surface (Brydges & Hanlon, 2020). The crisis emphasized critical issues including overproduction, how to dispose of excess inventory as consumer discretionary spending decreases and the difficulties in managing the relationships between brands and suppliers (Biondi, 2020).

Some analysts think this can be a moment of revaluation and transition for the industry and that transition, if handled right, can spell opportunity (Cernansky, 2020). Giorgio Armani himself wrote an open letter to WWD claiming that "[...] the current emergency, shows that a careful and intelligent slowdown is the only way out, a road that will finally bring value back to our work and that will make final customers perceive its true

importance and value [...]". Forecast analysts agreed that the shock to the system could force brands to revaluate their business models, indeed with fashion shows cancelled, stores closed and a growing build-up of unsold inventory, some brands might have no choice but to change the way they operate in order to survive (Arnett, 2020).

The purpose that must drive the fashion industry is the environmental and social sustainability. Indeed, some see the period of stalled sales as an opportunity to ramp up their sustainability plans with an eye to circularity, a model in which all the materials in a garment are reused and never end up as waste (Cernansky, 2020).

Many brands reconverted part of their plants to produce masks and gowns for doctors, a new sense of community seems to have arisen that could lay foundations for a new "purpose driven" business model.

Furthermore, the COVID-19 pandemic has impacted on the consumers' behaviour and on the relationship between the brands and the customers. The development of digital platforms to replace the physical purchase offers the opportunity to increase engagement and attract new customers (Mcdowell, 2020). However, it must be considered that the pandemic has hit the most formative years of Gen Z (those born between 1997 and 2012) who represent the 40% of global consumers and this is the generation most likely to delay purchases during COVID-19, according to *GlobalWebIndex*. So, brands need to come across as genuine in their interactions with customers as well as supportive to the overall causes. Now is not the time to push sales, but to raise the community and build brand fidelity, indeed, the uncertainty of the situation means young people want transparency and support" (Maguire, 2020).

3.6 CONCLUSIONS

Sustainability has become a hot topic lately now that the unbalance between the industrial economy and the limited availability of natural resources cannot be further ignored. The circular economy is an alternative way from the linear model; indeed, it implies not to dispose of the final wastes, but to find ways to reuse, recover, recycle, and remanufacture. In Italy circular economy has gained relevance in recent years, indeed our country has reached the first position for circularity index in Europe and it is the first European country for the use of "second raw materials".

The literature review touched different topics. Starting with a theoretical background about circular economy, identifying enabling factors, barriers, and the business models that best fit in. Then it moved to what supply chain management is, and how it influences the relationships between the actors of the modern production and service structures. Merging these two concepts, circular supply chain management was introduced, with its related features. Relevant is the relational structure created in a supply chain, and how all the members are aligned and involved in pursuing the CE principles. Afterwards, getting to the core of the research, the fashion industry was outlined, with a focus on the Italian market. This sector represents a critical subject due to its great environmental impact, being the second most polluting sector. For this reason, a need for change, toward a slower fashion, has been strongly perceived.

Even if many brands are making progress to close the loop, there is still reluctance to see the shift from the standard linear system to sustainable business model (Fletcher, 2014). In the fashion industry especially, many barriers are present, such as the introduction of new technologies and new approaches along the designers, constrained by the type of fibres and materials used, or just the simple dynamic and meaning of fashion, which involves styles that change according to social and political trends and broader cultural movements. As mentioned above, some companies are developing new business models based on take-back programmes, but the next step is figuring out how to upcycle damaged older pieces into new materials, which requires constructing a vertically integrated supply chain that includes receiving, sorting, dyeing and sewing new pieces.

In order to really make the change it is important to recognize the urgency of the sustainability agenda in the fashion industry, finding new creative ways to address it

(Fletcher, 2008). According to Yang et al. (2017), it could be useful to include in the business model framework the value that remained uncaptured during the operations of the linear business model in order to make the company aware about the opportunities for more sustainable practices. This, of course, requires changes of the business model, the adaption of the strategy and the adjustments of the policies making it difficult to plan for and to set clear targets for a coordinated transformation.

The transparency allows to communicate directly with the customers and if the brand is able to well transmit its commitments in sustainability issues, it will have a positive impact on the value of the brand, it is indeed an opportunity to communicate to the customers and to the stakeholders a story through the clothes (Moorhouse & Moorhouse, 2017).

The education of the customers about the benefits arising from the sustainable business models is a crucial step in order to make the consumers aware that it is worthwhile to dedicate efforts toward increasing the value of existing garments. (Wang & Song, 2010). Goleman (2009), talked about Ecological Intelligence: "while social and emotional intelligence extend people's abilities to see from another's perspective, empathize, and show concern, ecological intelligence applies these capacities to an understanding of natural systems and melds cognitive skills with empathy for all of life".

In this scenario, the need of sharing sustainability information is strong, but it is not yet mandatory and globally standardized. This represents a problem, indeed, being sustainability reports done on a voluntary basis, companies have discretion in terms of what to declare.

Finally, a special chapter was reserved to the COVID-19 dramatic implications in this sector, with the decreased sales and the increased level of stocks. Although, some people think that something good can come out from this tragedy. Indeed, the effects of the virus in the fashion industry helped the spread of a new sensibility about the true importance and value, and the revaluation of slowing down the rhythm. Furthermore, some see the period of stalled sales as an opportunity to ramp up their sustainability plans with an eye to circularity, a model in which all the materials in a garment are reused and never end up as waste.

4 RESEARCH QUESTIONS

The first part of the research consists of a literature review in which academic papers were considered in order to provide a theoretical basis as concerns circular supply chain management, fashion industry and their overlap.

The theoretical background has provided the research gaps from which the research questions of the thesis were formulated. Indeed, the literature highlighted the need of change in the whole fashion industry, due to the increasing environmental impact of the sector. However, the transition from a linear model toward a circular one requires many steps and challenges to be taken.

Despite Italy is performing well in the implementation of circular business models in the manufacturing industry, there is not much evidence in literature about the development in the fashion sector. For this reason, the analysis is focused on the fashion industry in Italy, starting from the following research questions.

RQ1 How much do the companies in the fashion industry, who declare to be close to sustainability, know about their supply chain and involve the different actors?

One of the main barriers for the development of the circular business models is related to the supply chain management which is still linked to the linear model, resulting in a lack of collaboration and synergy among the members which are required by the circular economy. This is the starting point to investigate how much fashion Italian companies who present themself as incline to circularity, are actually aware about their relationships with the other actors of the supply chain.

RQ2 What sustainability means for the companies inclined to circularity? Is the vision reflected both internally and externally?

Companies need a system of metrics that can guide their decision-making when adopting circularity in their corporate strategy. However, there are no standards about the indicators to use in order to provide evidence about the sustainable performances of the company. The aim of the question is to understand the level of monitoring of the different actors about the implementation of sustainable actions, considering that the target companies analysed present themself as well performing in this area.

Moreover, it is important, of course, how the circularity of the company is passed on to the customer, being it a brand company, a retailer, or a final consumer. It is relevant to make clear and visible its relationship with sustainability, in order to be sure that its effort goes all the way to the final consumers. The question aims to understand if the effort of the companies is reflected both internally and externally.

RQ3 What is the current level of consciousness and interest about the subject among the final consumers and what leverages can be used in order to increase their inclination to sustainability?

From the literature review has emerged that one of the challenges for the development of circular business models is the need to understand the current consumers' behaviour and their attitude toward recycled products. Indeed, the theoretical background shows a cultural barrier due to the information asymmetry between customers and producers about the issue of sustainability in this sector. It is important to understand the level of awareness of the consumers in order to exploit the right levers to educate the people about the topic.

RQ4 Has COVID-19 impacted on the strategies or attitudes of the different actors?

The fashion industry, as many other sectors, is hit by the crisis due to the pandemic. As previously explained, the lockdown emergency emphasized critical issues that characterize the fashion supply chain. Some of the experts define this period as an opportunity to change the way companies do business and the consumers' purchase behaviours. Therefore, the last question wants to understand if there is actual evidence about the impact of COVID-19 in the whole supply chain.

5 METHODOLOGY

In order to build a consistent research, we followed a research framework that consists of four main parts: the theoretical background given by the literature review, the definition of the gaps, the research design, the analysis of the results and the consequential findings.

The following chapter describes the research design by outlining the research methodology conducted in order to answer the research questions. Deepening, the part is structured in research method, research approach, data collection methods, selection of the sample, and research process.

5.1 RESEARCH METHOD

In order to determine which type of methodology would have been more suitable for this work, we analysed the possible alternatives available that may be adopted in a research, focusing on SCM and sustainability fields. According to Yin (2014) the most common methods adopted are: case study, historical analysis, experiments, survey and archival analysis.

These five different research strategies must be chosen based on three main drivers, which are:

- The research questions developed and presented;

- The control degree that the researcher has over the behavioural events and variables;

- The type of focus, that can be on past or contemporary events.

The table below explains how the five research methodologies previously mentioned are related to these three drivers.

		Drivers		
		Form of research questions	*Requires control over behavioral events?*	*Focuses on contemporary events?*
Strategies	*Experiment*	How, why	Yes	Yes
	Survey	Who, what, where, how much, how many	No	Yes
	Archival analysis	Who, what, where, how much, how many	No	Yes/No
	History	How, why	No	No
	Case study	How, why	No	Yes

FIGURE 13 - RESEARCH METHODS

According to the aim of our research the method chosen is the survey to analyse the different actors of the fashion industry, understanding the different approaches (WHO), their awareness along the supply chain (WHAT) and their real commitment toward the sustainability issue (HOW MUCH). Furthermore, it does not require control over behavioral events, and it is a contemporary topic.

5.2 RESEARCH APPROACH

The research approach that was followed for the purposes of this research was the inductive one. According to this approach, the analysis begins with specific observations, which are used to produce generalized theories and conclusions. The inductive approach starts by looking at the focus of literature review and through investigation by various research methods, aims to generate theory from the research (Greener, 2008).

In our case, the research starts from the gap identified in the literature review and through the use of the statistical analysis aims to define the overall picture of the development of the circular economy in the Italian fashion industry.

5.3 DATA COLLECTION AND METHOD

The data for the research were collected with two different methods since the analysis involved different actors of the supply chain.

In order to have a meaningful sample the data regarding the textile sectors, the brands and the customers were gathered with surveys. The questionnaire is a self-report data collection instrument that is filled out by research participants. Questionnaires measure participants' perceptions and provide self-reported demographic information. They are usually paper-and-pencil instruments (i.e., participants fill them out), but are increasingly being replaced by the Web, with participants which go to and "fill out" (Christensen et al., 2015).

Strengths of questionnaires

- Good for measuring attitudes and eliciting other content from research participants.

- Inexpensive (especially mail questionnaires, Internet, and group-administered questionnaires).

- Can administer to probability samples.

- Quick turnaround for group-administered questionnaires.

- Perceived anonymity by the respondent can be high if the situation is carefully controlled.

- Moderately high measurement validity (i.e., high reliability and validity) for well-constructed and validated questionnaires.

- Closed-ended items can provide exact information needed by researchers.

- Open-ended items can provide detailed information in respondents' own words.

- Ease of data analysis for closed-ended items.

- Useful for exploration as well as hypothesis testing research.

Weaknesses of questionnaires

- Usually must be kept short.

- Reactive effects might occur (e.g., respondents might try to show only what is socially desirable).

- Nonresponse to selective items.

- People filling out questionnaires might not recall important information and might lack self-awareness.

- Response rate may be low for mail and e-mail questionnaires.

- Open-ended items may reflect differences in verbal ability, obscuring the issues of interest.

- Data analysis can be time consuming for open-ended items.

- Measures need validation.

The surveys were drafted on the basis of the actor to whom it was addressed, indeed it is important to ensure a link between each question and the concepts that lie in the research gap, as the appendix shows. Indeed, for both the **brand** companies and the **textile** companies we outlined questions aiming to answer the research questions:

- understand their awareness about the supply chain and their relationships with the different actors

- investigating their approaches to the following sustainability factors:

  o Recycling

  o Renewable energy

  o CO_2 emissions

  o Waste disposal

  o Hazardous waste disposal

- analyse the impact of the lockdown on their business strategy.

For the **consumers**, on the other hand, the questions aimed at understanding their shopping features, their knowledge about sustainability and their potential interest in increasing their awareness and changing their habits.

These questionnaires were constructed according to the principles described by Christensen et al. (2015).

Principles of Questionnaire Construction

- Write items to match the research objectives.

- Write items that are appropriate for the respondents to be surveyed.

- Write short, simple questions.

- Avoid loaded or leading questions.

- Avoid double-barreled questions.

- Avoid double negatives.

- Determine whether closed-ended and/or open-ended questions are needed.

- Construct mutually exclusive and exhaustive response categories for closed-ended questions.

- Consider the different types of closed-ended response categories.

- Use multiple items to measure complex or abstract constructs.

- Make sure the questionnaire is easy to use from the beginning to the end.

- Pilot-test the questionnaire until it is perfected.

Regarding the **retailers'** analysis, interviews were used as data collection method. It is possible to conduct the interviews in different ways: face-to-face, by telephone or electronically.

Here the questions aimed at understanding the relationship and the exchange of information between the brand company and the retailer, and the retailer and the consumers. The interviews allow to have more control over data collection, and it can probe participants for follow-up responses.

Strengths of interviews

- Good for measuring attitudes and most other content of interest.

- Allows probing and posing of follow-up questions by the interviewer.

- Can provide in-depth information.

- Can provide information about participants' subjective perspectives and ways of thinking.

- Closed-ended interviews provide exact information needed by researcher.

- Moderately high measurement validity (i.e., high reliability and validity) for well-constructed and well-tested interview protocols.

- Can be used with probability samples.

- Relatively high response rates are often attainable.

- Useful for exploration as well as hypothesis-testing research.

Weaknesses of interviews

- In-person interviews usually are expensive and time consuming.

- Reactive effects (e.g., interviewees might try to show only what is socially desirable).

- Investigator effects might occur (e.g., untrained interviewers might distort data because of personal biases and poor interviewing skills).

- Interviewees might not recall important information and might lack self-awareness.

- Perceived anonymity by respondents might be low.

- Data analysis can be time consuming for open-ended items.

- Measures need validation.

The interviews were conducted following an interview protocol, present in the first annex, in order to easily record participant responses. According to Castillo-Montoya (2016) the interview protocol was developed following this framework:

Phase 1: Ensuring interview questions align with research questions,

Phase 2: Constructing an inquiry-based conversation,

Phase 3: Receiving feedback on interview protocols

Phase 4: Piloting the interview protocol.

5.4   RESEARCH PROCESS

The form of the questionnaire used is a web survey, one of the internet-based methods, both for the **companies** and the **customers**. Indeed, participants are more often willing to give more honest answers to a computer or by email than to a person or on a paper questionnaire.

The electronic surveys have numerous advantages: one of the major advantages is cost, then, having access to a wide audience, regardless of their geographical location, being fast, being capable of having responses downloaded into a spreadsheet or a statistical analysis program, and being flexible in terms of layout because of the kinds of response formats that can be incorporated. However, one of the disadvantages of this method is the inability to ensure privacy and anonymity, particularly with e-mail surveys, because the respondent's e-mail address is generally included in his or her response. Another major disadvantage is that Web-based surveys often are sent to Internet lists or discussion groups, where the message asks members for their responses, therefore, is a type of volunteer sampling and often can result in non-responses.

For the **retailers** the interviews were personally carried out face-to-face and synchronously in the store, in order to have a direct contact with the respondents, to observe the store and to directly verify the approach of the shop assistants with the clients.

The interview technique, used for the retailers, has the advantages of allowing the interviewer to clear up any ambiguities in the question asked and to probe for further clarification of responses if the interviewee provides an inadequate answer. This method generally provides a higher completion rate and more complete respondent information. The primary weakness of this method is that it can take more time and it is possible that the interviewer might bias the responses.

5.5   SAMPLE SELECTION

As previously discussed, the aim of the research is a transversal analysis along all the fashion supply chain, for this reason the different samples were selected with different sample selection methods:

- Non-probability sampling for the analysis of **textile** and **brand** companies and **retailers**.

    o   Purposive sampling was chosen for the companies, indeed, the target sample are Italian small-middle firms which demonstrate interests and inclination to sustainability and to circularity.

    o   Quota sampling technique was applied for the retailers. Indeed, the sample selected for the retailers' analysis was chosen from the lists of brands analysed with the surveys in order to have a proportional number of respondents. Both mono brand shops and retailers were selected.

- Probability sampling for the **customers** analysis, a random sample was selected in order to generalize from the sample to all the Italian population.

6   RESULTS

In this chapter, we will analyse the results of our questionnaires and interviews, defining profiles for the brand and textile companies and the consumers.

The collection of data took a month and once received a sufficient number of responses, we started analysing them.

6.1   DATA COLLECTED

6.1.1   BRAND AND TEXTILE COMPANIES

The survey was sent through different channels.

- LinkedIn: allowed us to reach all the employers that could have the information required: the supply chain manager, the corporate social sustainability manager and in some cases even the CEO of the company.
- Instagram and Facebook: the social media allowed us to have direct and quick contact with the companies and in most of the cases a straight link with the people most involved in the business.
- E-mail: for the companies not active on social media the questionnaire was sent via e-mail or via chat-box present on the website.

Percentage of responses per channel
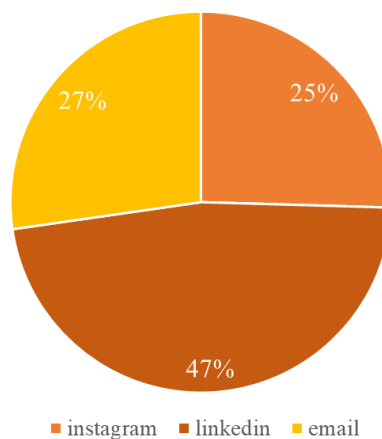
GRAPH 1 - PERCENTAGE OF RESPONSES PER CHANNEL

We ensured anonymity and we guaranteed that data would not be associated with the company in order to have more reliable answers, since nowadays this research topic is heavily discussed and gained a relevant significance.

For these two actors we received 21 answers for the textile companies, out of the 55 contacted and, on the other hand, for the brand companies, we received 30 answers out of 79. Many people responded enthusiastic about the subject and looked interested in the results, being it indeed, a contemporary and relevant topic.

6.1.2   RETAILERS

The interviews were conducted on the 28th of October, and it took circa 20-25 minutes per store for a total of seven retailers interviewed. We talked with the shop assistant present at that moment in the shop and presented ourselves as two students from Politecnico di Milano, working on their thesis regarding the Circular Economy and curious about the sustainability approach of the shop.

Unfortunately, because of the sanitary emergency, we could not conduct more interviews, but we think that the information gathered is still interesting and can help in answering our research questions.

6.1.3   CONSUMERS

For the consumer side, we used our social media in order to spread the survey, starting from the people we knew and asking them to forward it to as many people as possible. This was done on a Sunday afternoon, using WhatsApp, Instagram, Facebook and LinkedIn, hoping to get results in a week period. This network gave us 402 answers.

6.2 DEMOGRAPHIC DESCRIPTION

With this chapter, we want to outline the main characteristics of the companies and people who replied to our surveys. It is useful to truly understand the features and the story of the actors involved in our research.

6.2.1 TEXTILE COMPANIES

The textile companies who answered to our survey are located in the main Italian textile areas, indeed nine of them are between Como and Varese, three are from Prato and three in Piedmont, between Biella and Alba. The remaining part is distributed in Lombardy and Veneto. There are mainly middle size firms, and more than half of them claim to be present in the global market. The large majority is proud to be born as a family business, carried on during the years by the different generations, indeed seven of them have a history of more than 100 years, and the majority of the others of at least 50. We were able to gain a transversal sample also regarding the products, indeed four of them are specialized in wool, three in silk, one in jeans and the others in other kinds of textile.

6.2.2 BRAND COMPANIES

The brand companies that replied to the questionnaire are small-middle companies, two of them are start-ups just founded by young entrepreneurs. They are all Italy based, and the production sites are located in the North in the majority of the cases. Three of them are in the Centre (Prato and Rome) and one company is located in the South of the country (Catanzaro). Almost half of the brands sell also internationally through the online channels, indeed all the companies analysed use e-commerce, but still fourteen of them have retailers located in Italy. Most of them sell garments, one is specialized in the production of jeans, two of them in the realization of shoes and other two in the production of bags.

6.2.3 RETAILERS

The interviews were conducted in Milan, mainly downtown and in Garibaldi district. There were four out of seven monobrand shops and three retailers. All the interviewers were collaborative and did not seem bothered by our questions.

6.2.4 CONSUMERS

The demographic characteristics of our sample are a predominance (51.2%) of people aging between 18 and 24 years, 20.1% over 50 and 18.9% between 25 and 34, with a majority of women (60.7%). They mostly (52%) live in a big city (>800.000 inhabitants) and 35.2% in a smaller town (<150.000). The sample is balanced between students and workers and the 61.4% declares a salary lower than 25.000€.

6.3 DESCRIPTIVE STATISTICS

Once the data are collected, it is important to make them understandable. The next paragraph presents the descriptive statistics per each actor in order to summarize the research data.

6.3.1 TEXTILE COMPANIES

Concerning the awareness of the supply side, 95,5% of the textile companies knows the location of direct providers of their suppliers, and 90,8% knows at least the country of origin of the raw materials. The main crucial criteria for the choice of suppliers are the certifications about the treatment and origin of raw materials, also the management of waste, carbon emissions and the energy efficiency are considered, even if not decisive.

Regarding the implementation of sustainable actions, 68,2% of the companies use recyclable materials for at least 50% of the production, 22% of them state that 100% of the products are realized with recyclable materials. 73% uses renewable energy sources while 9% of the remaining percentage does not know this information. 45,5% does not track the carbon emissions and 18,2% is unaware about this topic, but 62,5% of the companies that monitor the CO_2 emission of their company have already implemented action to reduce the impact.

Regarding the waste management, 50% of the companies know if the waste is discarded or recovered, but only 9,1% know the entire chain of the actors involved in the waste disposal while 86% are thinking or already implementing actions to improve the waste disposal. More than half of the firms are engaged in the improvement of the re-use of water during the production process and are thinking of countermeasures to improve the water scarcity.

Furthermore, 64% of the sample provides information to the brand about how to handle the product in order to extend the cycle life and 68,2% of them are investing in R&D to guarantee more durable textiles.

Moreover, 63,6% claim that the COVID-19 has impacted their business strategy.

6.3.2 BRAND COMPANIES

Concerning the awareness of the supply chain, the majority of them knows the location of their suppliers, which are chosen based on the certifications of the raw materials and the waste management as main criteria, the energy efficiency and the carbon emission management of the suppliers seem to be less important. More than half of the companies claim they share information with a network of firms in order to pursue sustainability objectives, and they all provided examples about these collaborations.

Regarding the commitment toward the reduction of the environmental impact, more than half of the companies use recycled materials for the production of at least 50% of the clothes. However, the majority of the brands (65,6%) does not track the carbon emissions and does not use renewable energy resources (46,9%); great part of the left percentage: 28,1% in the first case and 31,3% in the second one, does not know this information. Almost 91% of the companies do not think about implementing actions to reduce the water scarcity and to facilitate the water reuse. Percentages about the knowledge of waste management are equally distributed without any particular relevance.

Regarding the customer-side, 56,3% of the companies evaluate the environmental impact of the use of the product after the purchase. The 87,5% communicates to the customers how to care about the product in order to extend the life cycle and the 65,6% offers a service repair. 40,69% offer a pickup service to the customers, and 28,1% would like to introduce it. More than half of those ones which have a physical store (53,2%) have implemented actions to reduce the environmental impact on their shops. The majority of the brands (75%) also gives to the retailers indications about how to communicate the mission of the company to the customers and 62,5% provide information about how to manage the unsold products.

Concerning the COVID-19 impact, 65,6% state that the lockdown has impacted on their strategy, fostering the development of online channels, and trying to raise awareness about the importance of sustainability.

6.3.3 RETAILERS

Four out of seven stores considered were mono brand shops and they were all completely aware about the brand's engagement in the sustainability issues. Indeed, two of them present themself by introducing the project, and describing the characteristics of their products, what makes them unique, without our explicit question, by highlighting both the benefits in terms of social and environmental impact. The third one, claims that they usually do not present the project because their consumers already know about their products, but since they have also other retailers, they communicate to the resellers their mission and how to transmit it to the consumers. The last of the stores seemed to focus its attention more on the singularity of the handmade products instead of communicating the environmental sustainability actions implemented to produce them. All four shops do not implement specific actions to reduce the environmental impact in terms of energy or heating savings, but they state that they pay attention in the heating and lighting usage. They do not offer "take-back" service at the end of the life of products, and in one of the cases this is due to the longevity and durability that characterize the products. Especially two of them are characterized by a great involvement of the customers during the purchase, by explaining the importance of the awareness about the products and how it is made.

The other three shops analysed were multi brand retailers, in this case the brands do not give directions about the communication of the mission of sustainability, one of them did not even know about the sustainable performances of the brand analysed. However, one of them was more willing to tell the story of the recycled products to the customers even if it is not requested by the brand itself. None of them implement actions to reduce the environmental impact in the store.

Regarding the management of unsold clothes, there are not specific policies implemented in all the stores considered (mono and multi brand). One of the stores claimed that there is not a high level of unsold because the production is not collections, but the products

are realized on the basis of the materials available, and another one sends at the end of the season the remaining clothing to their outlet.

6.3.4   CONSUMERS

Concerning the actual purchase behaviour, the customer sample is characterized by a shopping frequency of once a month and once every three months, the 88% prefers to buy in physical shops often or always, and the two main reasons for the purchases are a real need (81%) or the willingness to express the personality (42%).

78.4% realizes or at least is aware of the environmental impact of the textile industry and 76.4% knows what sustainable fashion is.

An important role is represented by fabrics, indeed 85% of the sample declares to consider them an essential or at least an important priority in the moment of the purchase. Indeed, for 49.3% recycled fibres are criteria for choosing the brand, and for 70.9% are natural fibres. Moreover, 35% watches out for information about the materials on the labels and 27% about the location of origin of the product. A predictable result is that prize also results as a main driver of the choice, 91% considers it important or essential, followed by comfort, preferred by 89% of the sample. Sustainability is in fourth place with 48%, indeed the brand's commitment in this topic is an important criteria for the 50%. The fashion trend is the feature impacting less: 91% states that never, or only sometimes, is the reason for the choice, while 74% that is a not important or marginal driver.

The sample is balanced on the purchasing of sustainable clothes: 46.8% declares to have never bought these clothing while the other half, 47.3% sometimes and 6% often. Most of the people who have never bought sustainable clothing (43%) are because they do not know where to buy them, while 25% because they were not aware of their existence. An interesting data is that only 9% declares a lack of interest in the subject and 13.4% that would not buy sustainable clothing if they were more expensive than the other offers of the market.

Concerning the inclination toward a more aware attitude, at the question if they would be interested to listen to the shop assistant about the information of the product, leading maybe to an actual purchase, only 5.7% answered that would refuse, while 60.9% would

be glad to hear. There is a tendency not to throw away old clothes, indeed 32% gives them to charity, 31% donates and 30% throws them in the separate collection for used clothing.

Finally, the majority (60%) declares that COVID-19 did not change their attitude toward shopping.

6.4   INFERENTIAL STATISTICS

The descriptive statistics has outlined the main features per each actor analysed, but the goal is to go beyond the immediate set of data and to deduce some interesting characteristics of the sample analysed. For these reasons, the inferential statistic was performed, identifying some profiles for each actor, and identifying the main leverages that can be used to increase the consumers potential interest in sustainability.

6.4.1   BRAND AND TEXTILE COMPANIES

The objective of the statistical analysis computed for both brand and textile companies is to assess a maturity model in order to describe the current level of awareness and collaboration of the companies in Italy, as our research questions state.

For both actors, brand and textile companies, the data collected were analysed starting from a subdivision of the questions into the main areas associated with the research questions:

- the **level of awareness of the supply side** considering also the knowledge of the materials purchased by them;
- the **implementation of actions** aiming at reducing the environmental impact and their **monitoring**;
- the **waste management** and the knowledge of the actors involved in it;
- the **end of life product management**, considering if the products are made by materials that allow the recycling and the reuse;
- the **communication with the customer side**, in the case of the textile it includes the amount of information shared with the brands in order to make the products more durable. For the brand this area includes the communication with the final consumers, concerning also the actions taken by the retailers.

A numerical scale (from 1 to 5, the lower the score the lower the level of awareness or the engagement in implementing actions) was assigned to each answer in order to have quantitative results per each actor. Then, all the scores of the areas were weighted to give the same importance to each area. However, not all the questions were taken for the quantitative analysis, indeed some of them were asked only to verify and deepen the awareness related to the topics touched.

The following tables summarize the questions considered for the quantitative analysis grouped in the different areas.

	Textile companies
Level of awareness of the supply side	Requirement in the choice of suppliers: emissions management
	Requirement in the choice of suppliers: waste management
	Requirement in the choice of suppliers: energy efficiency
	Requirement in the choice of suppliers: raw materials origin and treatment certificates
	Knowledge about the addresses of raw materials suppliers' suppliers
	Knowledge of the origin of all the raw materials used
	Collaboration with other companies on sharing information and achieving common sustainable goals
Monitoring and implementation of actions aiming at reducing the enviromental impact	Renewable energy sources usage
	CO_2 emissions monitoring
	Implementation of actions aimed at reducing CO_2 emissions
	Implementation of actions aimed at introducing new processes for water reusage and recycle
	Implementation of actions aimed at solving water scarcity problems
Waste management	Knowledge about the end life of production waste
	Implementation of actions aimed at improving production waste management
	Knowledge about hazardous waste management
End of life product management	Products are composed by materials that can be recycled with appropiate infrastructures
	R&D investments aimed at extend products lifecycle
Communication with the customer side	Inform the customers about how to take care of the products in order to extend its lifecycle

TABLE 3 – TEXTILE COMPANIES QUESTIONS AREAS

	Brand companies
Level of awareness of the supply side	Requirement in the choice of suppliers: emissions management
	Requirement in the choice of suppliers: waste management
	Requirement in the choice of suppliers: energy efficiency
	Requirement in the choice of suppliers: raw materials origin and treatment certificates
	Knowledge about the addresses of raw materials suppliers' suppliers
	Knowledge of the origin of all the raw materials used
	Collaboration with other companies on sharing information and achieving common sustainable goals
Monitoring and implementation of actions aiming at reducing the enviromental impact	Renewable energy sources usage
	CO_2 emissions monitoring
	Implementation of actions aimed at introducing new processes for water reusage and recycle
	Implementation of actions aimed at solving water scarcity problems
Waste management	Knowledge about the end life of production waste
	Implementation of actions aimed at improving production waste management
	Knowledge about hazardous waste management
End of life product management	Products are composed by materials that can be recycled with appropiate infrastructures
	Offer of products repair services
	Offer of "take-back" services
Communication with the customer side	Inform the customers about how to take care of the products in order to extend its lifecycle
	Evaluation of the enviromental impact of the product during and after the usage by the consumer
	Inform the retailers about how to transmit the sustainability mission to the final client
	Inform the retailers about how to deal with the unsold goods

TABLE 4 - BRAND COMPANIES QUESTIONS AREAS

Once the score per each area was calculated per each company, a Cluster Analysis was performed in order to group together actors that are at the same "maturity level".

The Cluster Analysis was performed with Minitab, a data analysis, statistical and process improvement tool. The clusterization of the companies is based on the five factors highlighted in the previous tables. The linkage method chosen is the Complete one and the distance measure is Euclidean. The following dendrograms show the results.

Textile companies	
Cluster	# of companies
1	6
2	3
3	4
4	3
5	6
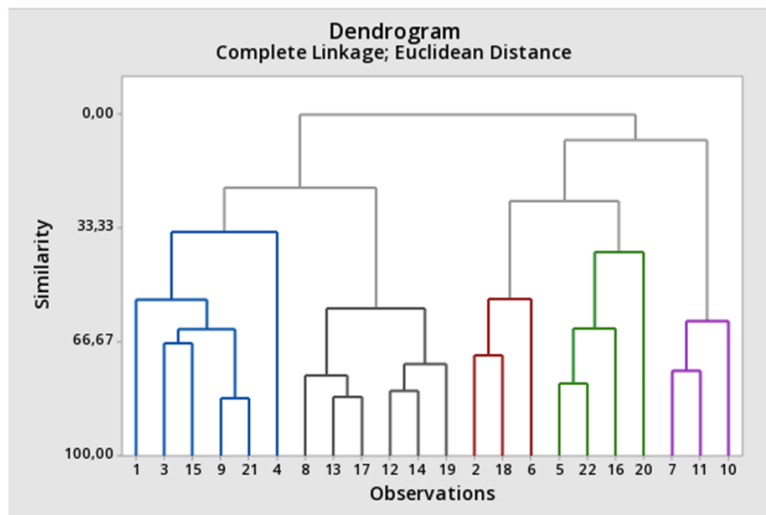
GRAPH 2 - TEXTILE COMPANIES CLUSTER ANALYSIS

Brand companies	
Cluster	# of companies
1	6
2	15
3	6
4	3
5	2
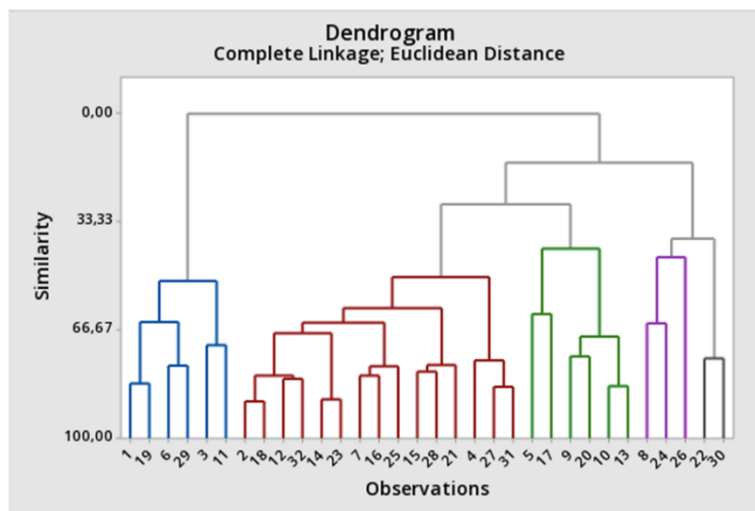
GRAPH 3 - BRAND COMPANIES CLUSTER ANALYSIS

Considering an acceptable similarity level of at least 34% for textile and 41% for brand, five clusters were obtained for each actor. The maturity assessment for each cluster consists in the evaluation of the average score of the group for each factor in order to

understand in which area the cluster is performing well or not. The following radar graphs show the results obtained for the textile companies.

Maturity assessment
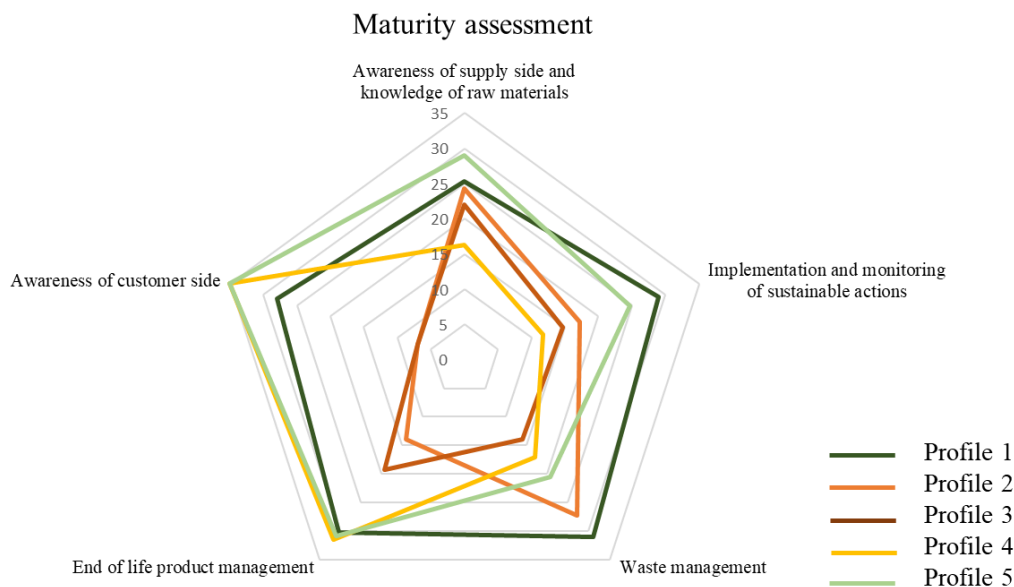
GRAPH 4 - TEXTILE COMPANIES MATURITY ASSESSMENT

Deepening, from the analysis we can describe the five categories of companies:

- The first one has uniform middle-high scores for all the areas indeed, it has scores higher than the average per each factor.

- The second one, is well performing in the awareness of the supply side and in the waste management, quite well in the implementation of sustainable actions, but it has low scores in the other two categories.

- The third cluster seems to focus its attention on the management of the end of life products and on the knowledge of the suppliers, but with lower scores than the average. It is lacking on the other aspects, especially in the contact with the customers where it is weak as the second cluster.

- The fourth group is really good in the relationship with the customer side and the end of life products management, but presents low performances in the implementation and monitoring of sustainable actions and the waste management.

- The fifth cluster performs quite well in all the categories of factors, it is excellent in the contact with the downstream part of the chain, but it should improve in the waste management area.

For the brand companies on the other hand:
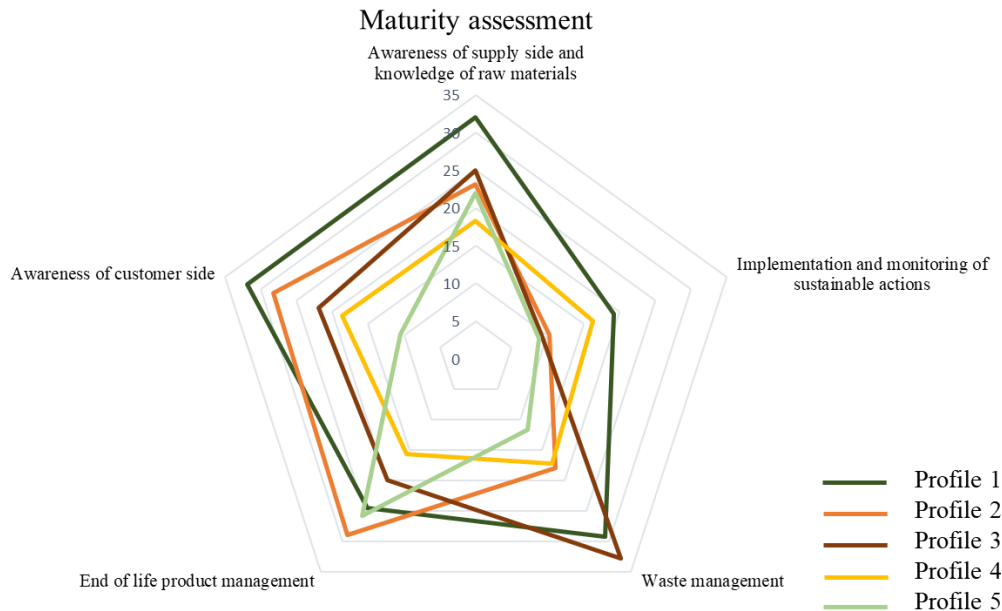
GRAPH 5 - BRAND COMPANIES MATURITY ASSESSMENT

- The first cluster is characterized by a good awareness of the supply chain both on the suppliers and customers' side. It is also performing well concerning the actions to reduce the environmental impact compared to the other clusters.

- The second group has the highest score on the end of life products management, but the lowest for the actions implemented to reduce the environmental impact.

- The scores of the third cluster are not equally distributed, indeed is well performing in the waste management, but weak in the actions implemented to reduce the environmental impact.

- The fourth group presents uniform scores along all the factors positioning itself in the middle of the scale.

- The last cluster identified is quite good in the relationship with suppliers and the management of the end of life of products but is not performing well in the other areas.

6.4.2 CONSUMERS

The aim of the inferential statistics for the consumers is to understand what different "types" were present in our sample, and what leverages can be used in order to exploit the potential interest in sustainability for each of them.

We started separating the questions of the survey in two categories:

- **Level of sustainability**, questions which indirectly asked how much the person is interested in sustainable fashion, cares about the topic and will potentially buy these clothing in the future.
- **Features**, questions which outlined the shopping characteristics of our sample, such as the frequency or the habits.

Sustainability profile	Priority - sustainability
	Brand requirement - sustainable committment
	Brand requirement - recycled materials
	Brand requirement - natural materials
	Brand requirement - second-hand
	Brand requirement - "take-back" service
	Brand requirement - certifications
	Have you ever bought sustainable clothing?
	If style, comfort, and quality were the same, would you buy sustainable clothing if more expensive?
	If in the shop, the assistant informed you about the product features, would you be more willing in buying it?
Factors	How often do you do cloth shopping?
	Where - physical shops
	Where - online shopping
	Where - second-hand markets
	Where - vintage shops
	Why - need
	Why - impulse
	Why - fashion trend
	Why - personality
	Priority - price
	Priority - brand
	Priority - material
	Priority - fashion trend
	Priority - comfort
	Are you aware about the enviromental impact of the fashion industry?
	Have you ever heard about "sustainable fashion"?
	Age

TABLE 5 - CONSUMERS QUESTIONS AREAS

For the first category of questions we calculated the Cronbach's Alpha, in order to understand if there was internal coherence in the answers. It resulted 0.8639, higher than 0.7, common threshold considered to confirm the internal coherence. Points were given to each answer in a scale 1 to 4, where 1 indicated low interest and 4 high, and the sum for each consumer represented his **"sustainability profile"**, our dependent variable.

For the second category, we performed a Factor analysis using Minitab, choosing as method of extraction Principal Components and as type of rotation Varimax. We obtained 11 significant **factors** (Variance > 1) and %Var=0.877:

- Inclination towards second-hand clothing

- Lack of interest in Fashion trends

- Shopping frequency

- Inclination towards physical shops despite of online

- Lack of awareness about sustainable fashion

- Age

- Lack of price priority

- Comfort priority

- Willingness to express the personality

- Lack of material priority

- Brand priority

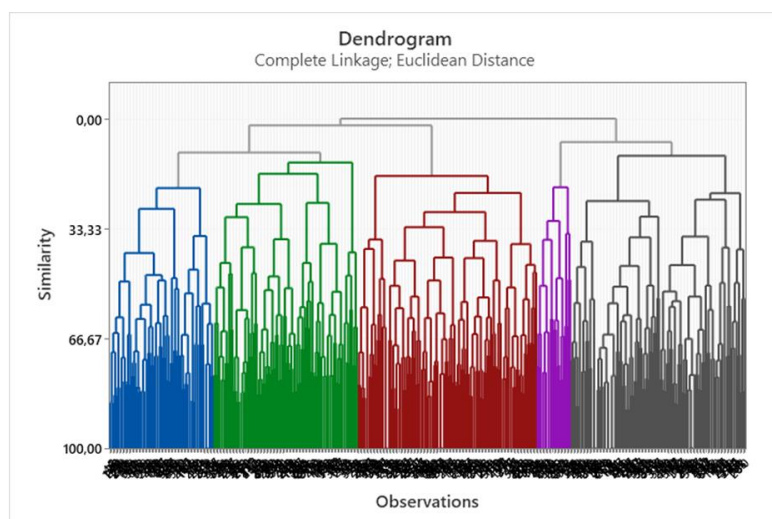| Variable	Inclination towards second-hand clothing	Lack of interest in Fashion trends	Shopping frequency	Inclination towards physical shops despite of online	Lack of awareness about sustainable fashion	Age	Lack of price priority	Comfort priority	Willingness to express the personality	Lack of material priority	Brand priority	Communality
Where - vintage shops	0,958	0,061	0,034	-0,003	-0,092	-0,073	-0,036	-0,028	0,097	-0,01	0,014	0,948
Why - need	0,958	0,061	0,034	-0,003	-0,092	-0,073	-0,036	-0,028	0,097	-0,01	0,014	0,948
Where - second-hand markets	0,828	0,036	-0,095	-0,053	-0,039	-0,035	0,016	0,066	-0,012	-0,039	-0,206	0,75
Priority - fashion trend	-0,081	-0,909	0,074	-0,072	-0,028	0,03	-0,056	-0,032	0,074	0,025	0,092	0,864
Why - fashion trend	-0,065	-0,803	0,289	0,06	0	-0,088	0,152	-0,044	0,103	0,021	0,104	0,791
Why - impulse	0,023	-0,112	0,893	0,029	0,029	0,076	-0,029	-0,151	-0,009	-0,006	0,021	0,842
How often do you do cloth shopping?	-0,051	-0,268	0,691	-0,146	-0,028	-0,028	0,158	-0,012	0,244	0,033	0,062	0,665
Where - physical shops	-0,124	-0,003	0,139	0,891	0,071	-0,1	-0,048	0,076	0,063	0,071	-0,046	0,862
Where - online shopping	-0,082	-0,037	0,291	-0,801	-0,051	-0,239	-0,048	-0,01	0,088	0,041	0,048	0,809
Are you aware about the enviromental impact of the fashion industry?	0,074	0,054	-0,062	-0,075	-0,869	0,079	-0,009	-0,142	0,099	-0,079	-0,021	0,815
Have you ever heard about "sustainable fashion"?	0,129	-0,092	0,061	-0,038	-0,818	-0,115	0,032	0,251	-0,04	-0,009	0,034	0,779
Age	-0,158	0,037	0,055	0,074	0,021	0,957	0,043	0,043	-0,057	-0,071	-0,038	0,964
Priority - price	0,042	0,059	-0,073	0,007	0,019	-0,043	-0,979	0,07	-0,042	-0,016	-0,042	0,979
Priority - comfort	0,004	0,068	-0,159	0,08	-0,066	0,047	-0,075	0,941	-0,007	-0,109	-0,055	0,949
Why - personality	0,168	-0,161	0,153	-0,002	-0,059	-0,061	0,044	-0,008	0,938	-0,023	0,015	0,968
Priority - material	0,045	0,039	-0,017	-0,033	-0,081	0,07	-0,017	0,104	0,02	-0,984	0,007	0,996
Priority - brand	-0,144	-0,178	0,064	-0,083	-0,01	-0,042	0,046	-0,053	0,016	-0,008	0,957	0,985
Variance	2,656	1,6468	1,5479	1,496	1,4668	1,0436	1,0302	1,0264	1,0039	1,0029	0,9939	14,9145
% Var	0,156	0,097	0,091	0,088	0,086	0,061	0,061	0,06	0,059	0,059	0,058	0,877

TABLE 6 - CONSUMERS FACTOR ANALYSIS

These factors represented indeed the main features of the shopping habits of our sample. With a Factor Analysis, Minitab provided us also the associated scores of each consumer for each factor.

Afterwards, we wanted to make sure that there were no outliers in our sample, so we deleted eight observations (GIGO) that resulted way out of range from a Boxplot Analysis.

Then we performed a Cluster Analysis on the scores obtained with the Factor Analysis in order to divide our sample in different groups, with similar characteristics and features. We choose as linkage method Complete and as distance measure Euclidean, obtaining 5 clusters with similarity level equal to 11.3%.

Consumers	
Cluster	*# of people*
1	65
2	111
3	89
4	21
5	108

GRAPH 6 - CONSUMERS CLUSTER ANALYSIS

After calculating the average of each factor and of the sustainability profile for each cluster, we were able to visualize the different types of customers of our sample:

Cluster	# of people per each cluster	Inclination towards second-hand clothing	Lack of interest in Fashion trends	Shopping frequency	Inclination towards physical shops despite of online	Lack of awareness about sustainable fashion	Age	Lack of price priority	Comfort priority	Willingness to express the personality	Lack of material priority	Brand priority	SUSTAINABILITY PROFILE
1	65	-0,34	-0,42	-0,11	0,37	-0,38	-0,40	-0,31	0,06	-0,31	0,24	-0,53	22,80
2	111	-0,27	0,44	-0,05	0,39	0,34	0,07	-0,15	-0,01	0,26	-0,16	0,04	21,57
3	89	-0,05	0,16	0,49	-0,77	0,21	-0,29	0,03	0,38	0,10	0,16	-0,09	22,70
4	21	0,17	-0,19	-0,64	-0,35	0,60	-0,21	1,27	-1,06	-0,71	0,50	0,31	19,05
5	108	0,43	-0,28	-0,20	0,12	-0,40	0,44	0,07	-0,08	-0,04	-0,18	0,26	25,05

TABLE 7 - AVERAGE OF FACTORS AND SUSTAINABILITY PROFILE FOR EACH CLUSTER
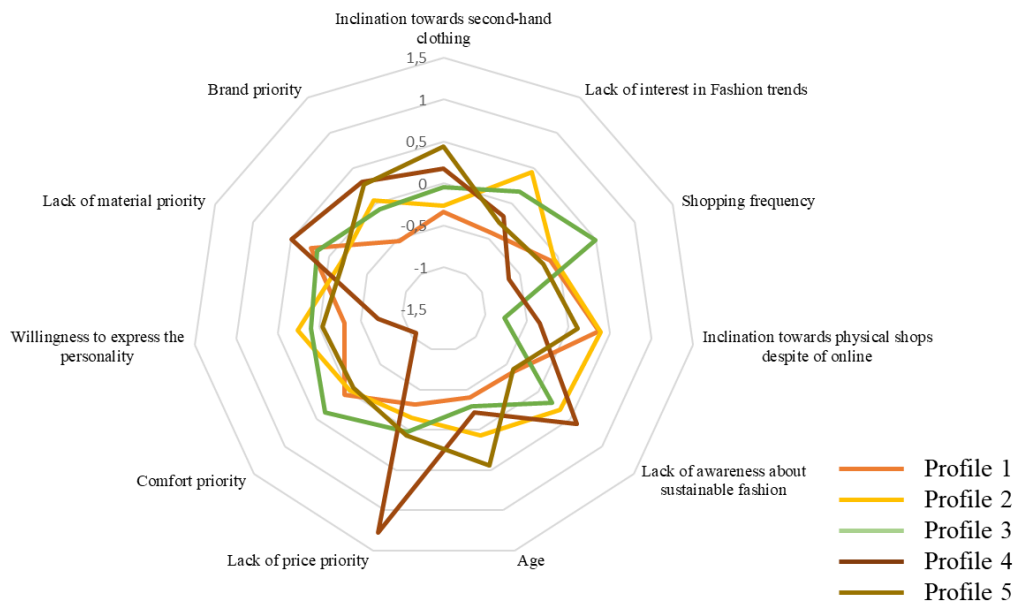
GRAPH 7 - CLUSTERS' FEATURES

Finally, we were able to perform a Regression Analysis with stepwise method (alpha= 0.05) for each customer profile, having as predictors the factors obtained and as response the sustainability profile. This analysis allowed us to understand which factors impacted more on the sustainability interest and inclination for each consumer profile.

Let's see now in detail the characteristics of each profile and the associated leverages.

Profile 1: **Trend addicted junior**

Main Effects Plot for Profilo 1
Fitted Means
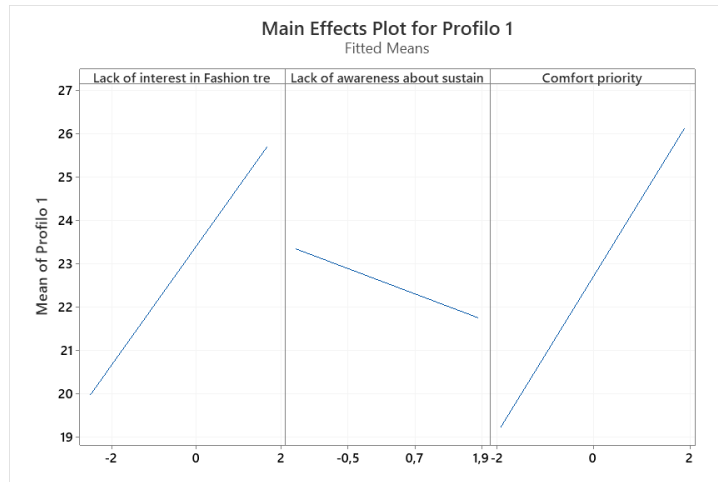
GRAPH 8 - MAIN EFFECTS PLOT PROFILE 1

The first profile is the youngest, who buys preferably in physical shops. He really cares about the fashion trends and the price. He is quite aware about the impact of the textile industry and sustainable fashion, but he does not care much about materials, he has an average sustainability profile.

The correlation between "Lack of interest in fashion trends" and the sustainability profile was statistically significant with $p = 0.045$ and a regression coefficient $= 1.372$, implying that as the interest in fashion trends increases, the interest in sustainability decreases, disclosing this one an important leverage since this profile is very interest in fashion trends. Another statistically significant correlation is with "Comfort priority" with $p = 0.001$ and a positive coefficient $= 2.398$.

95

Profile 2: **Alternative type**
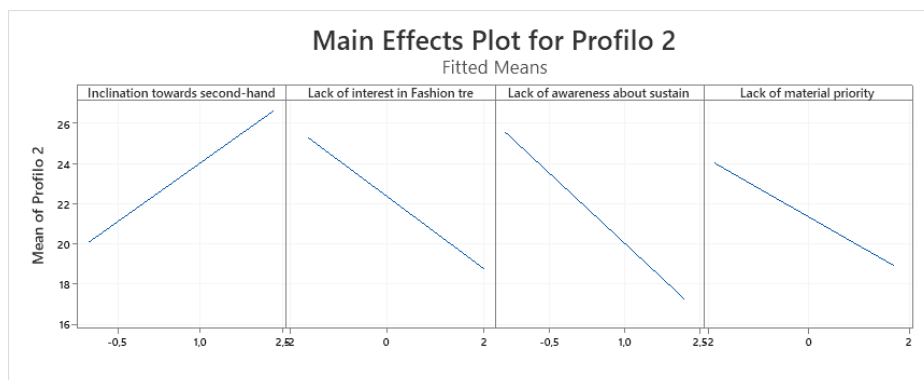
GRAPH 9 - MAIN EFFETCS PLOT PROFILE 2

He does not care at all about fashion trends, indeed he just wants to express his personality. He is not very aware about sustainable fashion but he cares about materials, he still represents an average sustainability profile. Preferably, he buys in physical shops, not inclined toward second-hand, and his choices are influenced by price.

The regression analysis for this profile found out four factors with high statistical significance. The first one is "Lack of awareness about sustainability" with $p = 0$ and a regression coefficient = -2.316, indeed as the knowledge about the impact of the fashion industry and the sustainability clothing increases, so does the potential of the sustainability profile. Then there is the "Lack of interest in fashion trends" with $p = 0.001$ and a regression coefficient = -1.790, implying for this profile an opposite attitude respect to cluster 1: the higher the interest in fashion trends, the higher the sustainability profile, being here a disadvantage since the profile is not interested trends. Also "Lack of material priority" has a negative regression coefficient = -1.416, implying a positive impact of the interest in materials, with $p = 0.013$. Finally "Inclination toward second-hand" has a positive impact too, with a regression coefficient = 1.933 and $p = 0.012$.

Profile 3: **Addicted shopper**
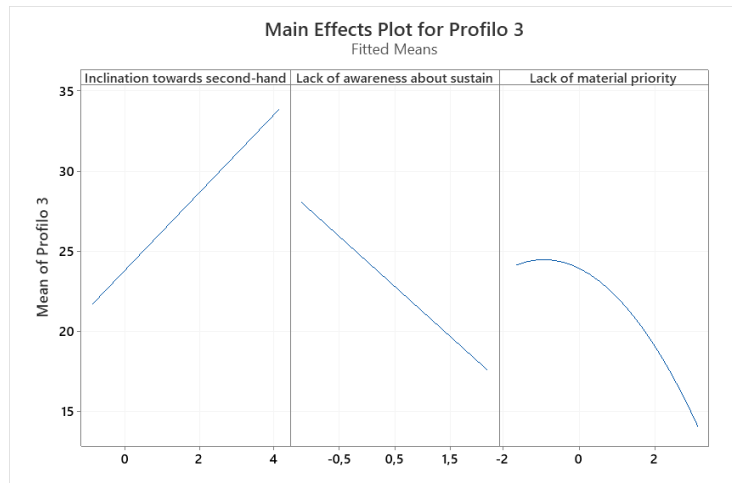
GRAPH 10 - MAIN EFFECTS PLOT PROFILE 3

The most shopping addicted, preferably online, in the middle of the range regarding second-hand shopping, looks out for comfort and ways to express his personality. He is not very interested in fashion trends or brand names. His awareness about sustainability is in the middle of the range, as his sustainability profile, with medium interest about materials.

Two factors gained high statistical significance with $p = 0$: "Inclination toward second-hand" and "Lack of awareness about sustainability", with relative regression coefficient of 2.863 and -3.173, suggesting also for this profile a positive impact of the second-hand shopping and the sustainable awareness on the sustainability profile. "Lack of material priority" has a statistically significant correlation too with $p = 0.002$ and regression coefficient = -1.248. Finally two interactions resulted significant: "Inclination toward second-hand" both with "Lack of awareness about sustainability" ($p = 0.037$ and regression coefficient = -0.969) and "Lack of material priority" ($p = 0$ and regression coefficient = -1.508).

Profile 4: **Brand addicted buyer**

Main Effects Plot for Profilo 4
Fitted Means
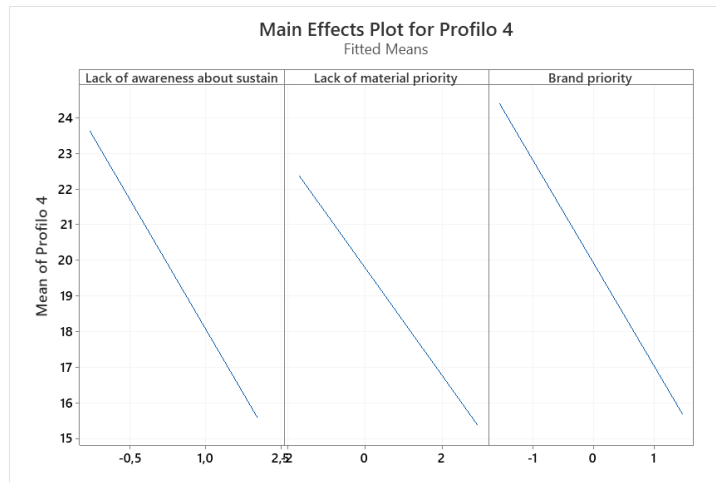
GRAPH 11 - MAIN EFFECTS PLOT PROFILE 4

The profile who buys with lower frequency and with the lower acknowledgment about sustainability and materials, indeed he is the profile with the lowest score on the sustainability profile. He cares about brand names, with no worry about the price and comfort, and watches out for fashion trends.

The correlation between "Brand priority" and the sustainability profile was statistically significant with $p = 0.009$ and regression coefficient = -2.897, suggesting that the interest in brand names decreases the interest in sustainability. Statistically significant are also "Lack of awareness about sustainability" with $p = 0.014$ and regression coefficient = -2.405, and "Lack of material priority" with $p = 0.034$ and regression coefficient = -1.512.

Profile 5: **Eco-friendly baby boomer**
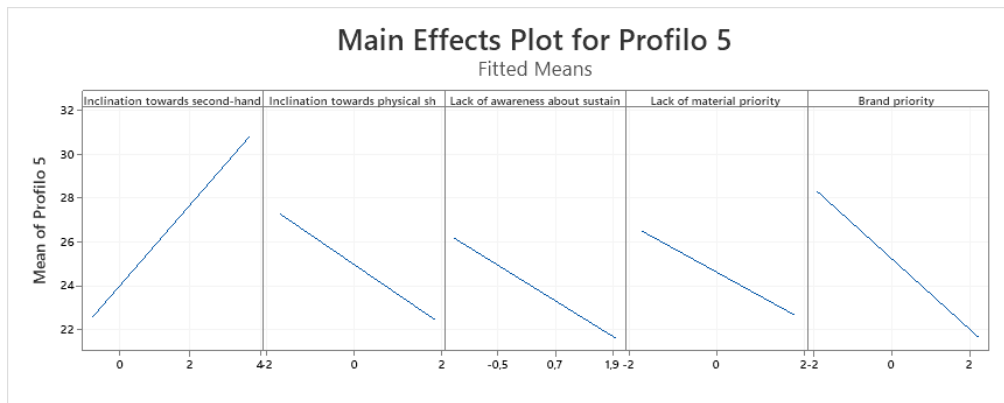
GRAPH 12 - MAIN EFFECTS PLOT PROFILE 5

The oldest profile is the one with the higher inclination toward second-hand shopping and the higher awareness about sustainability, indeed he really cares about the materials and has the highest score on the sustainability profile. He looks out for the brand names and does not buy very often.

Many factors resulted statistically significant for this profile. The first one is "Brand priority" with $p = 0$ and regression coefficient = -1.613, implying, as for profile 4, a negative relationship between the interest in brand names and in sustainability. "Inclination toward second-hand" is significant with $p = 0$ and regression coefficient = 1.993, while "Inclination toward physical shops despite of online" has $p = 0.145$ and regression coefficient = -0.770, indicating that second-hand and online shopping positively impact on the sustainability profile. Then "Lack of awareness about sustainability" and "Lack of material priority", as for many of the other profiles, negatively impact on the profile with $p = 0.012$ and $p = 0.015$ and regression coefficient of -1.358 and -1.094 respectively. Finally, also the interaction between "Inclination toward second-hand" and "Inclination toward physical shops despite online shopping" is significant, with $p = 0.005$ and regression coefficient = -1.350.

7   FINDINGS

Finally, in this chapter we can answer our research questions.

7.1   BRAND AND TEXTILE COMPANIES

From the literature review different interesting aspects led us to define our research questions, from which we developed our surveys. The following discussion about the results of the textile and brand companies answers to the first two research questions.

As previously said, we focused our questions on five areas, that we used to analyse the brand and textile companies:

1. Awareness of suppliers and raw materials

2. Monitoring of environmental performances and implementation of actions aimed at improving them

3. Waste management

4. End-life product management

5. Contact with the customer

Finally, we can analyse the level of each company profile on each area and draw some conclusions.

Maturity assessment
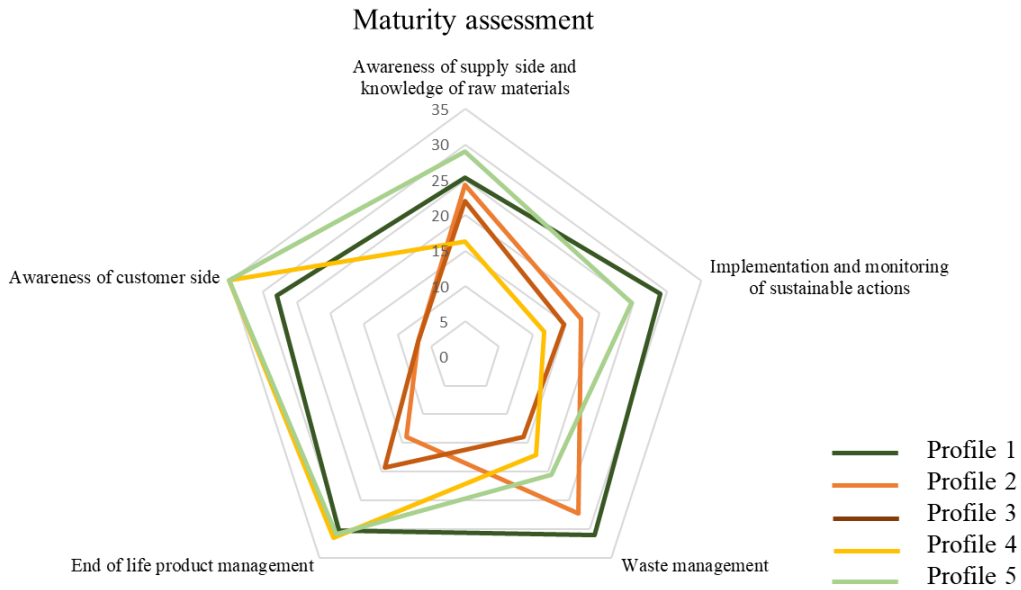
GRAPH 13 - TEXTILE COMPANIES MATURITY ASSESSMENT

Maturity assessment
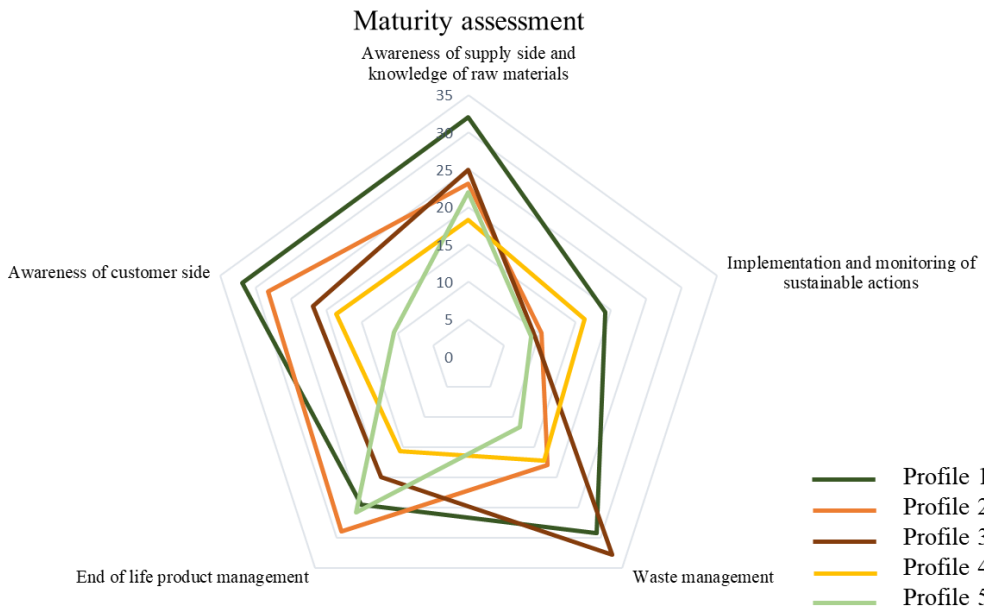
GRAPH 14 - BRAND COMPANIES MATURITY ASSESSMENT

RQ1 How much do the companies in the fashion industry, who declare to be close to sustainability, know about their supply chain and involve the different actors?

From the literature review arose that the circular model requires the participation of all the stakeholders involved and that sometimes this is difficult since the strong focus on linear models is often present. It is important to share a common vision, inspiration, and motivation on the future of CE, with cooperation between internal and external stakeholders to allow the exchange of information. External stakeholders are both in the upstream of the chain, as suppliers, and in the downstream, as customers. The customer side, especially regarding the final consumers, is critical also because of the cultural barriers, indeed the lack of knowledge of the environmental impacts of the products and services creates asymmetry and diffidence about recycled materials. Their role is also important since it is required to be active in the recovery of products. Indeed, education and persuasive communication are fundamental.

The brand companies of our sample have high positions in the suppliers side and this is the same also for the textile companies, so it means that they are aware of the importance of being in collaboration with the upstream of the chain.

On the other hand, on the customer side, the brand companies are uniformly distributed along the scale, but the profiles 3, 4 and 5 should improve their commitment. While among the textile companies, it is noticed that the companies are ranked or in the highest part or in the lowest one, this means that the profile 2 and 3 are lacking in the communication with their customers.

RQ2 What sustainability means for the companies inclined to circularity? Is the vision reflected both internally and externally?

There are many barriers to the CE and some of them are actually impacting the textile companies of our sample. For example, the institutional barriers that imply legal and bureaucratic difficulties in the reuse of second raw material and waste disposal, are encountered in the low points in "end-life product management" and "waste management".

"End-life product management" can be linked to the aim of slowing and closing the resource loops, trying to use materials that can be recycled or reused, and researching

ways of extending the product life cycle. In the literature review, problems related to this in the fashion industry were described, especially related to the actual dynamic and meaning of fashion: styles that change according to social and political trends and cultural movements. Furthermore, closing the loops is strictly constrained by the type of fibres and materials used, and the creativity of the designer related to them. These barriers can explain the low scores of profiles 2 and 3 for the textile companies, although is remarkable, on the other hand, the high position of the other three profiles. Brand companies are uniformly distributed on the scale for this area, having both high and low scores.

For gaining a high score in "Waste management" it is important to be aware of what happens to the production and hazardous waste, and to think about actions aimed to improve these approaches. In order to do so though, waste management systems must be adapted, involving infrastructure and management investments, and the behaviours of the stakeholders engaged. Two out of five brand companies have high scores in this area, while the profiles of the textile companies are well distributed along the scale.

"Monitoring of environmental performances and implementation of actions aimed at improving them" is critical, indeed for monitoring the performances, investments in technologies and the right infrastructures are needed. Many tools of the Industry 4.0 were described in the literature review with this aim. Furthermore, the lack of standardization of the monitoring phase makes it difficult to be implemented, indeed there are no global mandatory rules on how to deal with indicators for sustainability reporting. There are some guidelines (for example the GRI) but it is far from being a complete approach, and also the companies that apply some of them, do not cover all the dimensions suggested. Moreover, for smaller companies it is hard because of economic reasons. All the brand companies of our sample have scores lower than half scale; this could be because of their small dimensions and the related difficulties in monitoring the performances. The textile companies on the other hand, larger than the others, are well distributed along the scale.

Finally, we want to draw conclusions about the companies of our sample recalling the Business Models Classification by Urbinati et al. described in our literature review. The following matrices classify the companies on the two dimensions: customer value

proposition and interface and value network, which evaluates the relationship with the suppliers and the internal activities.
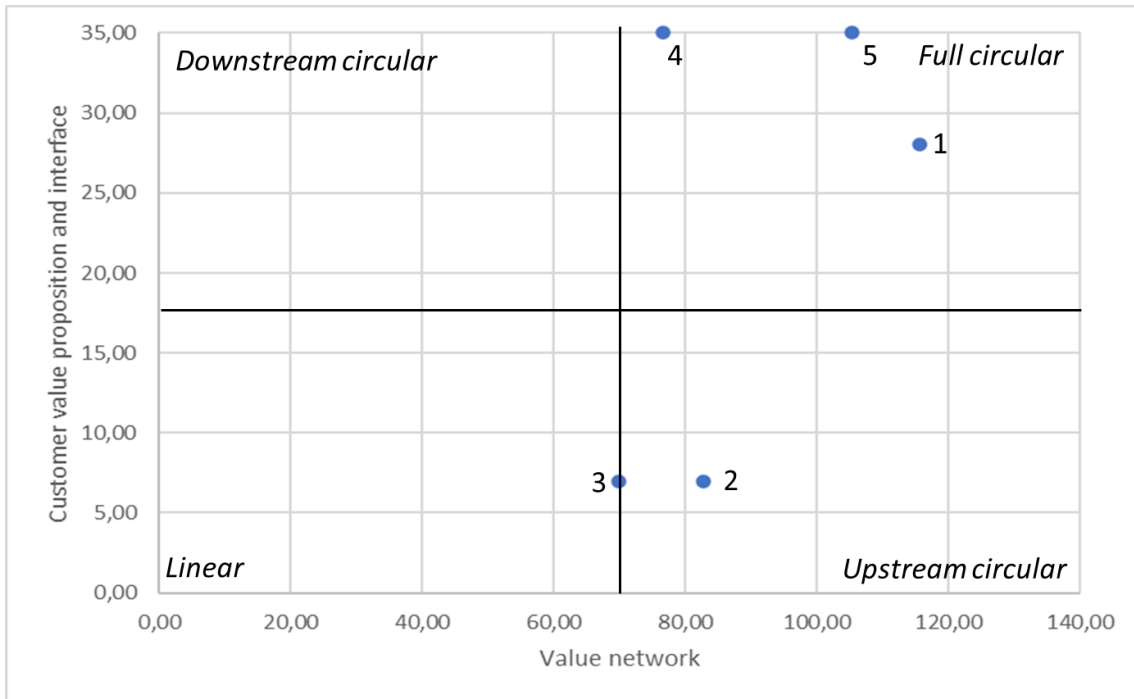
GRAPH 15 - TEXTILE COMPANIES CLASSIFICATION
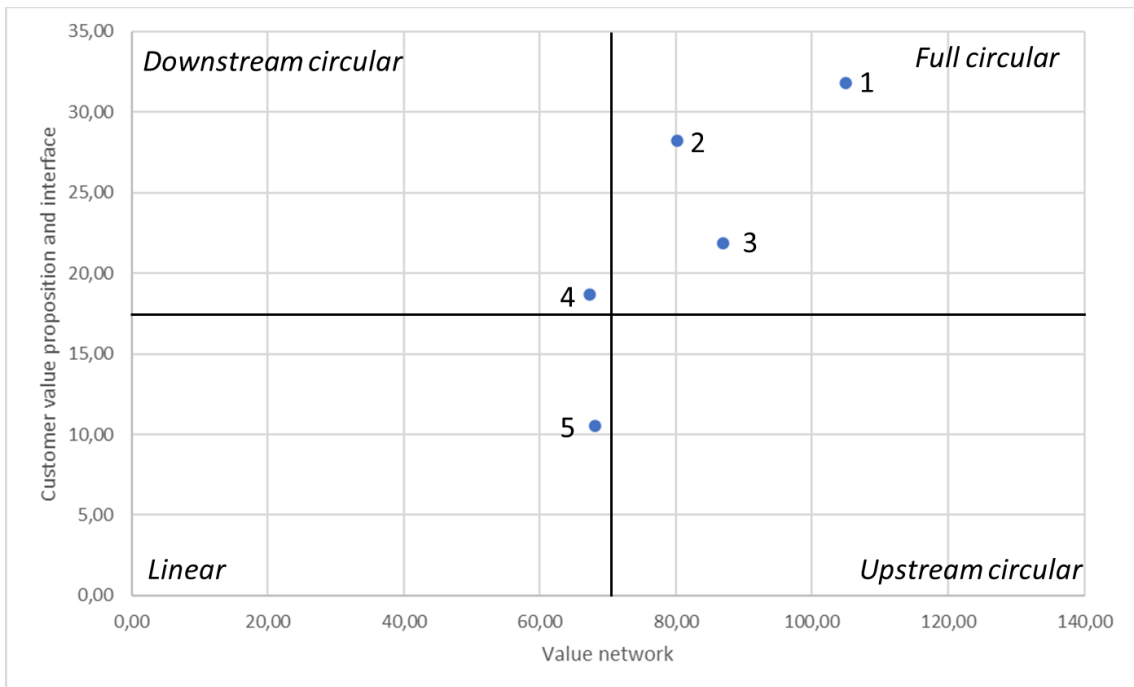
GRAPH 16 - BRAND COMPANIES CLASSIFICATION

The division between the textile companies is evident. Indeed there are three profiles in the upper right quadrant, close to full circularity, working well on both axes, but the other

two have very low scores on the customer value proposition dimension, implying a low commitment in sharing their principles downstream the supply chain.

Most of the brand companies are in the upper right quadrant, meaning that they are the closest to a full circularity and that they are working well on both axes. Indeed, as described in the literature review, the Italian fashion market is characterized by a relevant collaboration between the actors. The other two have low scores on both axes, representing low collaboration with the suppliers, low internal implementation of sustainable activities and low contact with the customer. These are critical aspects since, as we already said, the collaboration all along the supply chain is fundamental in order to spread the circularity principles and change the environmental knowledge about green behaviours. These results confirm that most of the companies who declare a circular commitment are actually implementing sustainable actions, while the others need to improve the relationships and the communication along the supply chain.

7.2 RETAILERS

The analysis of the retailers' interviews has shown that the mono brand stores are more aware about the brand's commitment on sustainability issues, and moreover, there is a greater involvement with the customers. Indeed, in most of the cases the products are valued for their history and their origin. However, as one of the shop assistants stated, often the typical customers of these stores already know those brands and their missions.

On the other hand, the multi brands retailers have shown a different approach, indeed they are selling different brands, with different missions, not all equally committed to sustainability practices, so the level of awareness is lower. As a consequence, there is not communication to the customers about the mission of the brand.

The analysis seems to highlight a lack of one step needed between the companies and the retailers which in some cases choose the brands of their collection on the basis of design and their personal taste, without being aware about the sustainability commitment of the company. However, we have to consider that for multi brand shops it is difficult to communicate to the customers the mission of each brand, but at least a first step could be done by the brand companies in increasing the awareness about what they are selling to

their retailers, in order to not stop their commitment and their goals halfway to the final consumers.

Furthermore, none of the stores implement actions to reduce the environmental impact in terms of energy savings, so this could be a further step: giving suggestions or directions to the stores in order to practically demonstrate sustainable commitment.

7.3 CONSUMERS

The discussion about the consumers result answers to the third research question:

RQ3 What is the current level of consciousness and interest about the subject among the final consumers and what leverages can be used in order to increase their inclination to sustainability?

Starting from one of the challenges described in the literature review, the transition toward circular business models depends on the understanding of the consumers' behaviour. The cluster analysis previously described allows us to understand and classify the different purchase behaviours of the customers. Indeed, on the basis of the factors identified, each group of people is more influenced by some levers rather than others. For example, a good leverage for the *Trend Addicted Junior*, can be to make sustainability become a style which people interested in fashion trends want to follow, something "important and cool", watching out though, to the *Alternative Type*, which does not care about fashion trends but just wants to express his personality. For *Brand Addicted Buyer* and *Eco-Friendly Baby-Boomer*, on the other hand, their interest in brand names is not fulfilled, and negatively impacts the sustainability profile. Positive impact on the second one is given by his second-hand preference and the online shopping.

We believe it is important to analyse the characteristics of the consumers in order to understand which factors could be exploited in order to increase what we called "sustainable profile". Even if the clusters have different characteristics, some levers are in common. For example, of course, the awareness about the environmental impact of the fashion industry impacts on the predisposition to keep more attention about the purchase decision. The focus on the materials is a relevant factor too that influences the sustainability profile of almost all the clusters. Therefore, these are two important

leverages that can be used by the companies, increase the general sensibility about the topic and focus on the materials they use in their production processes, since, generally speaking, 85% of the sample declares to consider them an essential or at least an important priority in the moment of the purchase.

Furthermore, even if 78% of the customers have already heard about the environmental impact of the fashion industry, 47% of the sample declared that they have never bought sustainable clothes, and the main causes are that they do not even know about their existence or they do not know where to purchase them. In detail, 65.5% of the people who declared that they have heard about sustainable fashion, have also actually bought some clothing, showing that if there is awareness, people are open to purchase. The remaining part who have not heard about it, on the other hand, is in majority of the cases because they do not know where to buy them, and because the search requires a lot of time. Only a small percentage (13.2%) because of a lack of interest. On the other hand, the people who were not aware about sustainable fashion, of course have not done purchasing, not because of lack of interest (14%), but mostly just because they did not know the existence of these clothing. This means that there is unexplored potential interest among the customers, and that a general lack of awareness and communication about sustainability in the fashion industry is a cause of missed purchases.

The results show the need of an alignment between the commitment that the companies are showing in improving the sustainable practices and the awareness that the customers have about it, because if the efforts and the environmental goals are not forward downstream, it will result in lack of awareness and interest and consequently lack of sustainable shopping choices.

7.4 CORONAVIRUS IMPACT

The analysis of the results allows us to answer also to the last research question:

RQ4 Has COVID-19 impacted on the strategies or attitudes of the different actors?

As previously said, the actual crisis that the fashion industry, as all the other sectors, is experiencing, emphasizes some critical issues already present along its supply chain. For this reason, we decided to ask the companies if the lockdown has changed their strategy and to the customers if they modified their purchase behaviour.

63,6% of textile companies state that the pandemic has impacted on their business strategy, indeed most of them declared that they introduced digital tools and online services. Only one company out of fourteen stated that the lockdown impacted as greater attention on the sustainability issue.

Similarly for brands, 66% has experienced an impact on the strategy due to the lockdown: most of them fostered or implemented the online sales, others took this period as an opportunity to raise the awareness of the customers about sustainable and ethical issues and to improve the communication about their commitment. Some of them claimed they started to recover unused garments and others to resell the unsold clothes. Two out of twenty-one, had to stop the production. One of the brand companies reconverted their business by starting to produce masks.

On the other side, the customers seem to react in the opposite way, indeed, 60% of them answered that the lockdown has not impacted on their purchase behaviour, however this answer is more spread among the youngest customers, indeed 51% of the people older than 50 years old confirmed a change in their purchase behaviour after the pandemic.

8 CONCLUSIONS

Our thesis started with a warning: we are consuming more than the Earth is capable of producing. Therefore, the term sustainability has been introduced: the ability of satisfying the needs without compromising the future of the next generations. To do so, a change of the modern "take, make and dispose" logic, common in the industrial economy, is needed. Hence the introduction of circular economy, a model based on the 3R principle "reduce, reuse, recycle", which aims at the reduction of waste, being regenerative by intention and design.

The research focuses on the fashion industry being indeed the second most polluting, and playing an important role in our everyday life, as one of the many ways people can express themselves and choose the world they want to live in, every time they shop.

For a complete theoretical background, we have analysed the history, the enabling factors, and the barriers of CE, focusing on the new business models. An introduction to supply chain was outlined, in order to integrate the two concepts in the one of circular supply chain management, where the relationships and the cooperation with all the actors involved was more than once pointed out as a fundamental aspect. Afterwards, we focused on the fashion industry, as the core topic of our research. We described its main features and the urgent need of change, felt even stronger since after the pandemic, which brought to light the unbalance of the current slow fashion structure.

Two main problems resulted from the literature review, the difficulty in measuring sustainable performances, and the lack of standardized and global ways to do it. Therefore, the communication of these actions, together with the one of companies' goals and interests, is weak and an alignment with the reality of facts is hard to determine.

We outlined four research questions, regarding the awareness of fashion companies about their supply chain, how they deal with measuring and communicating their performances, what characterises the attitude of the final consumers toward the topic, and finally if and how the COVD-19 impacted. To answer these questions, we defined surveys and interviews for all the actors of the supply chain, and to circumscribe the area of interest of the research, we decided to focus on the Italian market and on companies already

inclined toward circularity. Finally, we performed a statistical analysis, reaching interesting findings.

Indeed, it can be said that the majority of the Italian companies analysed which define themselves close to sustainable principles, are actually working on the relationships with suppliers and customers, and monitoring and implementing internal activities to improve their environmental impact. The textile companies, on the other hand, that are performing less well on our scale, are lacking on the communication with the downstream part of the chain, while the brand actors, which are not close to circularity, are missing out in the communication with retailers and final consumers, and in the internal monitoring and implementation of actions. This was evident also from the retailers' analysis, indeed the multi brand shops are not aware at all about the circularity of the products they sell, and the sustainable principles are not transmitted all the way to the consumers.

On the consumers side, different profiles and different leverages were outlined, delivering also a common conclusion that a greater awareness and better communication about the textile industry impact and sustainable fashion would exploit the hidden potential interest about the topic, resulting in greater sales.

In conclusion, we can say that sustainability in Italy is gaining more relevance every day and many people are potentially interested in the topic. Some are already on the right path, giving the example, but a majority is not provided yet with all the tools needed in order to alter the purchasing habits. Companies need to focus on the communication downstream, in order to facilitate the shopping of sustainable clothing and to educate the population about the urgent need of change.

8.1 LIMITATIONS

Our results are based on surveys and interviews, therefore on declarations of people which could represent not the reality. There is no way to know if what they have stated regarding their strategies or habits is the truth. Indeed, one of the weaknesses of the surveys that we saw is the fact that respondents might try to show only what is socially desirable. Therefore, it could be interesting a further study in loco which could prove if the practises they declare and communicate are actually implemented.

Moreover, the framework and the analysis could be replicated also on greater samples, especially for the companies, since this sector is fast-growing and every day there could be new relevant actors.

Further limitations come from the fact that our research is focused on the Italian market and on companies who claimed to be already close to sustainable principles. Therefore, our results cannot be applied to global markets or foreign consumers and we do not know at what point of the transition toward circularity the Italian fashion industry is.

Finally, it could be interesting to include a bigger team in the analysis, since the selection of the companies was based on their websites, implying room for subjectivity, and brainstorming together over the results would make the framework more reliable.

APPENDIX 1: QUESTIONNAIRES AND RQS

Survey aziende tessili	Criteria			
Domande	Informazioni di background	Conoscenza e coinvolgimento dei vari attori della filiera	Impegno per ridurre l'impatto ambientale	Influenza del COVID sulla strategia aziendale
Nella scelta dei vostri fornitori di materie prime, quali di questi criteri di sostenibilità considerate?		X		
La vostra azienda è a conoscenza degli indirizzi dei fornitori dei vostri diretti fornitori di materie prime?		X		
La vostra azienda è a conoscenza della provenienza di tutte le materie prime utilizzate per creare i vostri prodotti?		X		
La vostra azienda collabora con altre nella condivisione di informazioni e nel raggiungimento di obiettivi comuni sul tema della sostenibilità?			X	
Fornire un esempio di collaborazione con altre aziende nella condivisione di informazioni e obiettivi sul tema della sostenibilità			X	
I vostri prodotti sono realizzati con materiali che possono essere riciclati utilizzando infrastrutture di raccolta e riciclaggio?		X	X	
Usate fonti di energia rinnovabili?			X	
Quali fonti di energia rinnovabile utilizzate e in che percentuale?		X	X	
La vostra azienda tiene traccia delle emissioni di CO_2?			X	
Qual è il valore (in tonnellate) di CO_2 emessa all'anno dalla vostra azienda?		X	X	
La vostra azienda sta implementando misure per ridurre le emissioni di CO_2?			X	
Qual è il vostro obiettivo per tali misure volte alla riduzione delle emissioni di CO_2?			X	
Qual è il vostro grado di conoscenza sul fine vita dei vostri scarti produttivi?		X		
La vostra azienda sta implementando misure per migliorare lo smaltimento degli scarti di produzione?			X	
Qual è il vostro obiettivo per tali misure volte a migliorare lo smaltimento degli scarti di produzione?			X	
La vostra azienda è consapevole di come vengono smaltiti i rifiuti pericolosi?		X		
La vostra azienda ha istituito programmi per promuovere l'installazione di nuovi processi per il riutilizzo e il riciclo di acqua?			X	
La vostra azienda sta adottando misure per migliorare i problemi di utilizzo e scarsità di acqua?			X	
Qual è il vostro obiettivo per tali misure volte a migliorare i problemi di utilizzo e scarsità d'acqua?			X	
La vostra azienda fornisce indicazioni ai clienti su come prendersi cura dei prodotti in modo da prolungarne la durata (oltre a quanto richiesto dalla normativa)?		X		
La vostra azienda investe in ricerca tecnica, sviluppo e innovazione per prolungare la vita dei suoi prodotti?			X	
Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo la vostra strategia?				X
In che modo il lockdown e la pandemia per COVID-19 hanno cambiato la vostra strategia?				X
Numero di impiegati	X			
Vi chiederemmo gentilmente di scrivere il nome dell'azienda per facilitare la raccolta dati, assicurandovi che i dati saranno trattati in maniera anonima.	X			

Survey brand	Criteria			
Domande	Informazioni di background	Conoscenza e coinvolgimento dei vari attori della filiera	Impegno per ridurre l'impatto ambientale	Influenza del COVID sulla strategia aziendale
Nella scelta dei vostri fornitori di materie prime, quali di questi criteri di sostenibilità considerate?		X		
La vostra azienda è a conoscenza degli indirizzi dei fornitori dei vostri diretti fornitori di materie prime?		X		
La vostra azienda è a conoscenza della provenienza di tutte le materie prime utilizzate per creare i vostri prodotti?		X		
La vostra azienda collabora con altre nella condivisione di informazioni e nel raggiungimento di obiettivi comuni sul tema della sostenibilità?			X	
Fornire un esempio di collaborazione con altre aziende nella condivisione di informazioni e obiettivi sul tema della sostenibilità			X	
I vostri prodotti sono realizzati con materiali che possono essere riciclati utilizzando infrastrutture di raccolta e riciclaggio?		X	X	
Usate fonti di energia rinnovabili?			X	
Quali fonti di energia rinnovabile utilizzate e in che percentuale?		X	X	
La vostra azienda tiene traccia delle emissioni di CO_2?			X	
Qual è il valore (in tonnellate) di CO_2 emessa all'anno dalla vostra azienda?		X	X	
La vostra azienda sta implementando misure per ridurre le emissioni di CO_2?			X	
Qual è il vostro obiettivo per tali misure volte alla riduzione delle emissioni di CO_2?			X	
Qual è il vostro grado di conoscenza sul fine vita dei vostri scarti produttivi?		X		
La vostra azienda sta implementando misure per migliorare lo smaltimento degli scarti di produzione?			X	
Qual è il vostro obiettivo per tali misure volte a migliorare lo smaltimento degli scarti di produzione?			X	
La vostra azienda è consapevole di come vengono smaltiti i rifiuti pericolosi?		X		
La vostra azienda ha istituito programmi per promuovere l'installazione di nuovi processi per il riutilizzo e il riciclo di acqua?			X	
La vostra azienda sta adottando misure per migliorare i problemi di utilizzo e scarsità di acqua?			X	
Qual è il vostro obiettivo per tali misure volte a migliorare i problemi di utilizzo e scarsità d'acqua?			X	
La vostra azienda valuta gli impatti ambientali dei propri prodotti durante l'utilizzo da parte del cliente e al termine dell'utilizzo?		X		
La vostra azienda fornisce indicazioni ai clienti su come prendersi cura dei prodotti in modo da prolungarne la durata (oltre a quanto richiesto dalla normativa)?			X	
La vostra azienda offre un servizio di riparazione dei prodotti che produce e vende?			X	
La vostra azienda fornisce ai clienti un programma di ritiro del prodotto?			X	
Nei vostri punti vendita, avete implementato delle azioni volte a ridurre l'impatto ambientale?		X	X	
Quali azioni avete implementato presso il vostro punto vendita, volte a ridurre l'impatto ambientale?		X	X	
La vostra azienda fornisce indicazioni ai vostri punti vendita su come comunicare la vostra mission di sostenibilità al cliente finale?		X	X	
La vostra azienda fornisce indicazioni ai vostri punti vendita su come trattare l'invenduto?		X	X	
Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo la vostra strategia?				X
In che modo il lockdown e la pandemia per COVID-19 hanno cambiato la vostra strategia?				X
Numero di impiegati	X			
Vi chiederemmo gentilmente di scrivere il nome dell'azienda per facilitare la raccolta dati, assicurandovi che i dati saranno trattati in maniera anonima.	X			

Survey retailers	Criteria	
Domande	**Conoscenza e coinvolgimento dei vari attori della filiera**	**Impegno per ridurre l'impatto ambientale**
Siete a conoscenza del fatto che l'azienda abbia obiettivi volti a ridurre l'impatto ambientale e che si presenti come un brand sostenibile?	X	
Vengono imposte dal brand norme specifiche	X	
Implementate nel vostro punto vendita azioni volte a ridurre il consumo di energia? Lo store manager ne tiene traccia?		X
Il brand dà indicazioni su come gestire l'invenduto?	X	
Comunicate al cliente le azioni implementate volte e ridurre l'impatto ambientale?	X	
Fornite al cliente indicazioni sullo smaltimento dei capi?	X	X
Il cliente viene coinvolto nelle politiche di sostenibilità?	X	X

Survey consumers	Criteria			
Domande	**Informazioni di background**	**Abitudini del consumatore**	**Propensione alla sostenibilità**	**Influenza del COVID sulla strategia aziendale**
Quanto spesso acquisti un capo d'abbigliamento?		X		
Dove acquisti solitamente i capi di abbigliamento?		X		
Cosa ti spinge a fare un acquisto di un capo di abbigliamento		X		
Quali sono le tue priorità quando acquisti un nuovo capo di abbigliamento		X		
Sei a conoscenza dell'impatto ambientale del settore della moda?			X	
Hai mai sentito parlare di "moda sostenibile"?			X	
Quanto consideri i seguenti criteri nella scelta di una marca per un capo di abbigliamento?			X	
Hai mai acquistato/ acquisti capi d'abbigliamento sostenibili?		X	X	
Come mai non hai mai acquistato un indumento sostenibile? (Più di una risposta ammessa)			X	
Considerando che stile, comfort e qualità siano gli stessi, acquisteresti un capo di abbigliamento sostenibile se costasse di più di quello che pagheresti normalmente?			X	
Quale tra le sotto elencate condizioni aumenterebbe la tua propensione all'acquisto di capi di abbigliamento ecosostenibile?			X	
Quando leggi l'etichetta informativa posta su un indumento, poni attenzione su: (più di una risposta ammessa)			X	
Se al momento dell'acquisto il commesso ti informasse riguardo le caratteristiche del prodotto, saresti più propenso a comprare un capo di abbigliamento sostenibile?			X	
Una volta che hai deciso di non utilizzare più un determinato capo di abbigliamento: (Più di una risposta ammessa)		X	X	
Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo il tuo atteggiamento nei confronti degli acquisti di capi di abbigliamento?				X
Sesso	X			
Età	X			
Residenza	X			
Condizione professionale	X			
Reddito annuale	X			

1. Quanto spesso acquisti un capo d'abbigliamento?

Un paio di volte al mese	16,7%
Una volta al mese	32,1%
Una volta ogni tre mesi	37,3%
Due volte all'anno	13,9%

2. Dove acquisti solitamente i capi di abbigliamento?
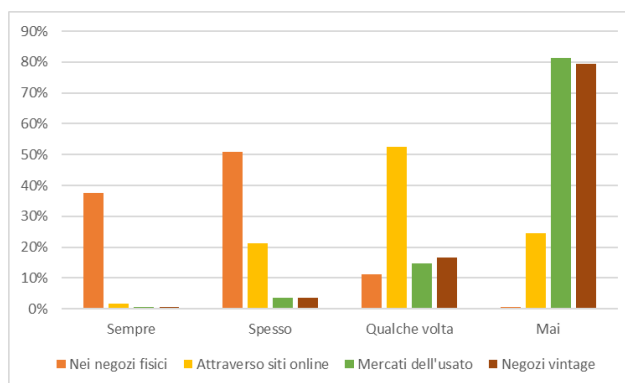
3. Cosa ti spinge a fare un acquisto di un capo di abbigliamento?
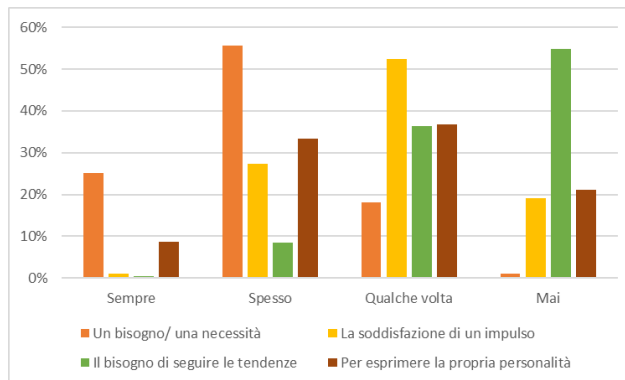
4. Quali sono le tue priorità quando acquisti un nuovo capo di abbigliamento?
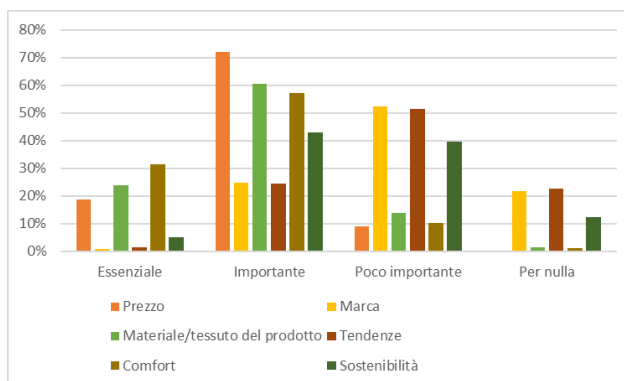
5. Sei a conoscenza dell'impatto ambientale del settore della moda?

No	21,6%
Sì, vagamente	49,3%
Sì	29,1%

6. Hai mai sentito parlare di "moda sostenibile"?

No	23,6%
Sì	76,4%

7. Quanto consideri i seguenti criteri nella scelta di una marca per un capo di abbigliamento?
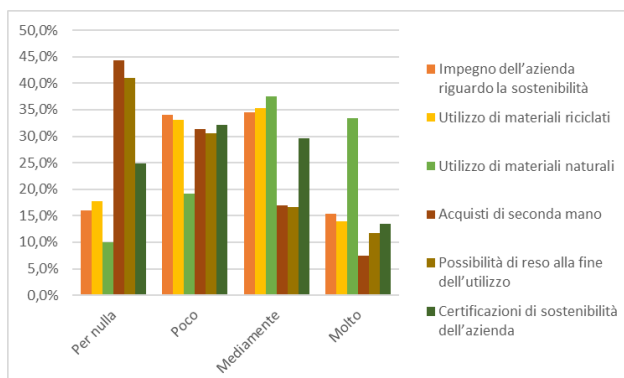
8. Hai mai acquistato/ acquisti capi d'abbigliamento sostenibili?

No	46,8%
Sì, a volte	47,3%
Sì, spesso	6,0%

9. Come mai non hai mai acquistato un indumento sostenibile? (Più di una risposta ammessa)
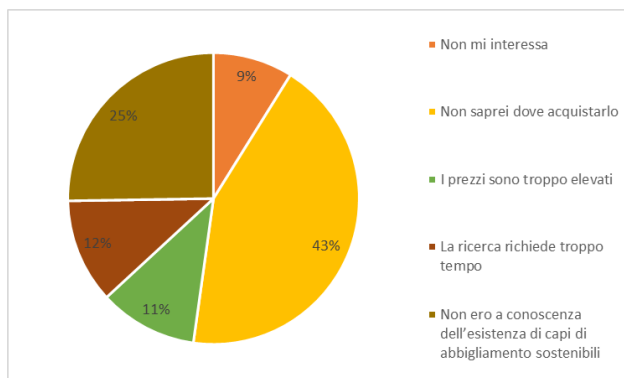
10. Considerando che stile, comfort e qualità siano gli stessi, acquisteresti un capo di abbigliamento sostenibile se costasse di più di quello che pagheresti normalmente?

No	13,4%
Sì	40,8%
Non lo so	45,8%

11. Quale tra le sotto elencate condizioni aumenterebbe la tua propensione all'acquisto di capi di abbigliamento ecosostenibile?
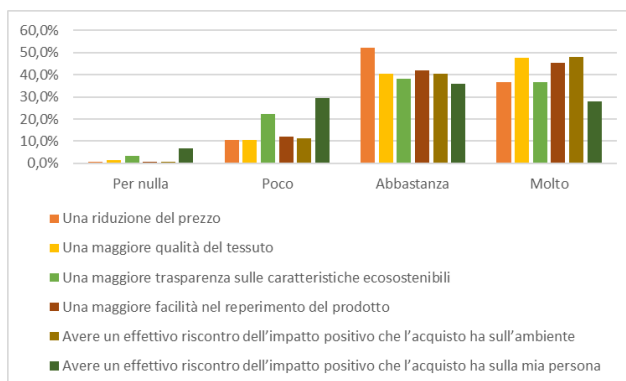
12. Quando leggi l'etichetta informativa posta su un indumento, poni attenzione su: (più di una risposta ammessa)
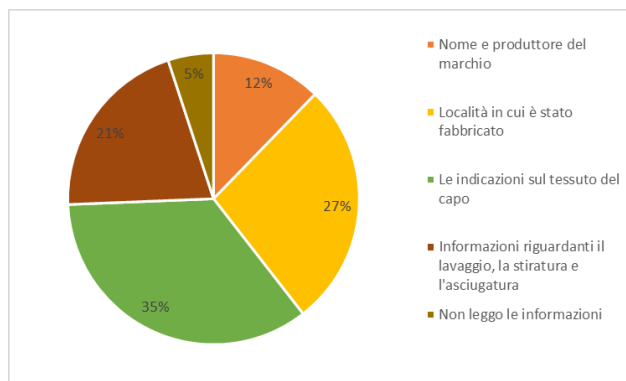
13. Se al momento dell'acquisto il commesso ti informasse riguardo le caratteristiche del prodotto, saresti più propenso a comprare un capo di abbigliamento sostenibile?

No, non sarei interessato	5,7%
Sì, ascolterei con interesse e probabilmente procederei all'acquisto del prodotto	60,9%
Non lo so	33,3%

14. Una volta che hai deciso di non utilizzare più un determinato capo di abbigliamento: (Più di una risposta ammessa)
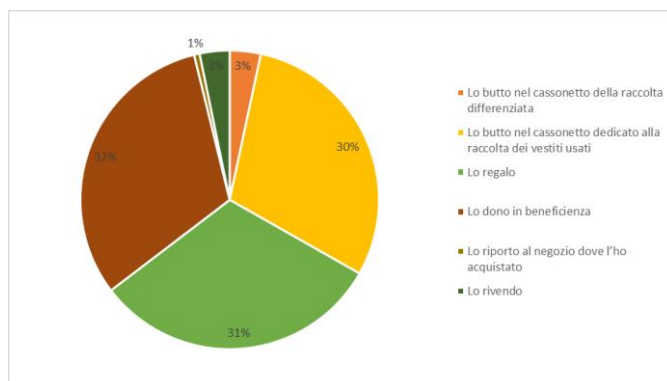
15. Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo il tuo atteggiamento nei confronti degli acquisti di capi di abbigliamento?

No	60,2%
Sì	39,8%

16. Sesso

F	60,7%
M	39,3%

17. Età

< 18	1,2%
18-24	51,2%
25-34	18,9%
35-49	8,5%
> 50	20,1%

18. Città in cui vivi

Numero abitanti [migliaia]	Definizione	%
< 150	Città piccola	35,2%
150 - 800	Città media	12,8%
> 800	Città grande	52,0%

19. Condizione professionale

Lavoratore	40,5%
Studente	55,5%
Disoccupato	4,0%

20. Reddito annuale

Minore di 25 000	61,4%
Tra 25 000 e 50 000	21,3%
Tra 50 000 e 75 000	8,9%
Maggiore di 75 000	8,4%

1. Nella scelta dei vostri fornitori di materie prime, quali di questi criteri di sostenibilità considerate?
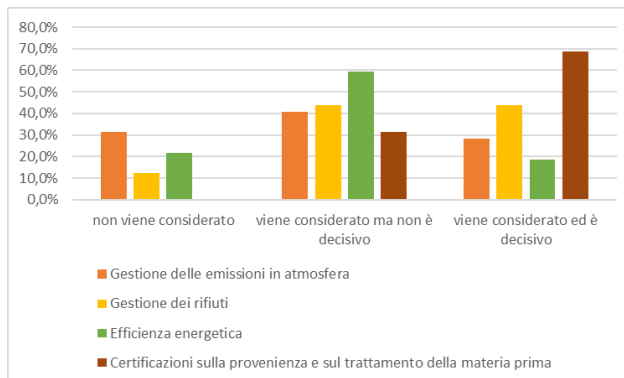
2. La vostra azienda è a conoscenza degli indirizzi dei fornitori dei vostri diretti fornitori di materie prime?

No	9,4%
Sì, ma non di tutti	43,8%
Sì, di tutti	46,9%

3. La vostra azienda è a conoscenza della provenienza di tutte le materie prime utilizzate per creare i vostri prodotti?

No	15,6%
Sì, sappiamo il continente di provenienza	15,6%
Sì, sappiamo il paese di provenienza	34,4%
Sì, sappiamo la regione di provenienza	34,4%

4. La vostra azienda collabora con altre nella condivisione di informazioni e nel raggiungimento di obiettivi comuni sul tema della sostenibilità?

No	21,9%
Sì	56,3%
Non sono a conoscenza di questa informazione	21,9%

5. Se sì, fornire un esempio di collaborazione con altre aziende nella condivisione di informazioni e obiettivi sul tema della sostenibilità

   Sono state ottenute 17 risposte aperte su 18 "sì", molto specifiche che al momento rimangono anonime poi decideremo.

6. I vostri prodotti sono realizzati con materiali che possono essere riciclati utilizzando infrastrutture di raccolta e riciclaggio?

No	12,5%
Meno del 50% dei prodotti è realizzato con materiali che possono essere riciclati	21,9%
Più del 50% dei prodotti è realizzato con materiali che possono essere riciclati	34,4%
Il 100% dei prodotti è realizzato con materiali che possono essere riciclati	31,3%

7. Usate fonti di energia rinnovabili?

No	46,9%
Sì	21,9%
Non sono a conoscenza di questa informazione	31,3%

8. Se sì, quali fonti di energia rinnovabili utilizzate e in che percentuale?

   Sono state ottenute 6 risposte aperte su 7 "sì" che vengono riassunte di seguito:

   - *Fotovoltaico 50%*

   - *Solare, ma non tutti i fornitori utilizzano energie rinnovabili, non sanno le percentuali*

   - *Centrali idroelettriche*

   - *Fornitore garantisce energia rinnovabile*

9. La vostra azienda tiene traccia delle emissioni di CO_2?

No	65,6%
Sì	6,3%
Non sono a conoscenza di questa informazione	28,1%

10. Se sì la 9, Qual è il valore (in tonnellate) di CO_2 emessa all'anno dalla vostra azienda?

   Sono state date 2 risposte aperte su 2 "sì" che vengono riportate di seguito:

   - *110*

   - *Non abbiamo dati, perché il progetto sul volume delle emissioni per la spedizione degli ordini è partita a ottobre 2020*

11. Se sì la 9, La vostra azienda sta implementando misure per ridurre le emissioni di CO_2?

No	0,0%
Sì, stiamo pensando ad azioni da implementare	100,0%
Sì, le azioni sono già in atto	0,0%

12. Se sì la 11, qual è il vostro obiettivo per tali misure volte alla riduzione delle emissioni di CO_2?

   Sono state ottenute 2 risposte aperte su 2 "sì" che vengono riportate di seguito:

   - *Utilizzare energia rinnovabile con l'installazione di pannelli fotovoltaici*

   - *Prima dobbiamo misurarle, poi appronteremo un piano*

13. Qual è il vostro grado di conoscenza sul fine vita dei vostri scarti produttivi?

Gli scarti vengono gestiti da aziende di cui si ignorano caratteristiche, tipologia di trattamento effettuata e successiva destinazione	18,8%
È noto se i gestori dei nostri scarti li destinano a smaltimento o a recupero	34,4%
È nota la filiera e le quantità di scarti inviati a riciclo	21,9%
La filiera dei nostri scarti è interamente nota e collaboriamo con i vari attori per ottimizzarla	25,0%

14. La vostra azienda sta implementando misure per migliorare lo smaltimento degli scarti di produzione?

No	15,6%
Sì, sono in programma ma non ancora applicate	46,9%
Sì, sono in atto procedure di miglioramento	37,5%

15. Se sì, qual è il vostro obiettivo per tali misure volte a migliorare lo smaltimento degli scarti di produzione?

Sono state ottenute 22 risposte aperte su 27 "sì" che vengono riportate di seguito:

- *I nostri capo sono prodotti con materiali e tessuti 100% rigenerati, l'obbiettivo è quello di restituire alle aziende che producono i filati, i capi finito (in disuso o scarti di laboratorio) per essere nuovamente inseriti nel ciclo produttivo*

- *Di base non abbiamo scarti di produzione per come gestiamo la produzione*

- *minimizzare gli scarti di produzione che finiscono in discarica*

- *0%sprechi*

- *Progetti di upcycling*

- *Ridurre l'impatto ambientale*

- *Progettare prodotto scomponibile dal consumatore finale in diversi componenti riciclabili*

- *Gli scarti di produzione sono impiegati nel ciclo produttivo per realizzare campioni, cartellini, produzione accessori e decorazioni per indumenti, riducendo quasi a zero lo spreco di materia prima.*

- *La maggior parte degli scarti di produzione dell'azienda è gestita internamente tramite processi di rilavorazione e riutilizzo creativo. Siamo una sartoria, quindi cerchiamo di destinare ogni ritaglio a uno scopo preciso per poterlo reintegrare nella produzione. L'obiettivo è*

l'ottimizzazione di questi processi e lo sviluppo di nuovi modelli/oggetti che possano essere prodotti riutilizzando un numero maggiore di ritagli.

- *Siamo una start up. Utilizziamo solo materiali organici o 100% rigenerati ed offriamo lo smaltimento gratis di ciò che vendiamo. Gli scarti di produzione al momento vengono utilizzati per produrre libri tattili per bambini.*
- *Ecosistema*
- *In realtà in quanto piccolo brand non abbiamo scarti, ovvero se ce ne sono vengono riutilizzati per altre finiture o creare pezzi unici, niente viene buttato*
- *Lo smaltimento dei rifiuti non è per noi un tema centrale in quanto produttori di maglieria calata. La nostra produzione avviene a partire dai filati per cui non produce rimanenze. Gli avanzi sono direttamente di materia prima che spesso utilizziamo per produzioni successive.*
- *miriamo principalmente alla riduzione degli scarti*
- *Migliore ulteriormente la differenziazione e attivare nuove forme di riutilizzo del rifiuto*
- *Puntare ad uno zero waste*
- *Ricupero degli scarti*
- *Riutilizzo degli scampoli per progetti di patchwork*
- *Riuscire a riciclare il 100% degli scarti*
- *ridurre sensibilmente lo scarto di lavorazione, trasformandolo in prodotto*
- *speriamo nello sviluppo di tecnologie e aziende che possano separare i layer tra tessuto e spalmatura per poter riciclare le componenti*
- *Conoscere la filiera per lo smaltimento*

16. La vostra azienda è consapevole di come vengono smaltiti i rifiuti pericolosi?

Gli scarti vengono gestiti da aziende di cui si ignorano caratteristiche, tipologia di trattamento effettuata e successiva destinazione	15,6%
È noto se i gestori dei nostri scarti li destinano a smaltimento o a recupero	31,3%
È nota la filiera e le quantità di scarti inviati a riciclo	31,3%
La filiera dei nostri scarti è interamente nota e collaboriamo con i vari attori per ottimizzarla	21,9%

17. La vostra azienda ha istituito programmi per promuovere l'installazione di nuovi processi per il riutilizzo e il riciclo di acqua?

No	90,6%
Sì, sono in programma ma non ancora applicate	9,4%
Sì, sono in atto procedure di miglioramento	0,0%

18. La vostra azienda sta adottando misure per migliorare i problemi di utilizzo e scarsità di acqua?

No	84,4%
Sì, sono in programma ma non ancora applicate	0,0%
Sì, sono in atto procedure di miglioramento	15,6%

19. Se sì, qual è il vostro obiettivo per tali misure volte a migliorare i problemi di utilizzo e scarsità d'acqua?

Sono state ottenute 4 risposte aperte su 5 "sì" che vengono riportate di seguito:

- *Noi intanto non utilizziamo filati ritinti e molta acqua viene risparmiata per questo processo*
- *Ridurre al minimo il consumo di acqua per la fase di lavaggio del prodotto*
- *Utilizzeremo tinture naturali che si estraggono a secco dalle piante e tingeremo senza uso di acqua e per i lavaggi verrà usata l'acqua piovana.*
- *non abbiamo una produzione interna ma collaboriamo con produttori virtuosi che stanno sviluppando tecnologie di tintura a bassissimo impatto e utilizzo d'acqua, nello specifico 1 litro d'acqua per un kg di filato*

20. La vostra azienda valuta gli impatti ambientali dei propri prodotti durante l'utilizzo da parte del cliente e al termine dell'utilizzo?

No	43,8%
Sì, valutiamo gli impatti durante l'utilizzo in termini di consumo energia, acqua, e rilascio di sostanze	12,5%
Sì, valutiamo gli impatti del termine dell'utilizzo e il relativo smaltimento o riciclaggio	18,8%
Entrambe le positive	25,0%

21. La vostra azienda fornisce indicazioni ai clienti su come prendersi cura dei prodotti in modo da prolungarne la durata (oltre a quanto richiesto dalla normativa)?

22. La vostra azienda offre un servizio di riparazione dei prodotti che produce e vende?

No	12,5%
Sì, attraverso il nostro sito web	9,4%
No attraverso con comunicazione sia online che offline	78,1%
No, ma vorremmo introdurlo	18,8%
Sì	65,6%

23. La vostra azienda fornisce ai clienti un programma di ritiro del prodotto?

No	31,3%
No, ma vorremmo introdurlo	28,1%
Sì, con spedizioni da parte del cliente o ritiro da parte nostra	25,0%
Sì, presso i nostri punti vendita	15,6%

24. Nei vostri punti vendita, avete implementato delle azioni volte a ridurre l'impatto ambientale?

Non abbiamo punti vendita	46,9%
No, non abbiamo implementato azioni	21,9%
Sì	31,3%

25. Se sì, quali azioni avete implementato presso il vostro punto vendita, volte a ridurre l'impatto ambientale?

Sono state ottenute 10 risposte aperte su 10 "sì" che vengono riportate di seguito:

- *Riduzione dei rifiuti e riciclo degli stessi*
- *E-commerce e con I partenze drop shipping*
- *Refashion*
- *Luci led, incentivo utilizzo bicicletta o mezzi pubblici per raggiungerci*
- *Energia verde, illuminazione a basso consumo, packaging sostenibile, scarti di produzione (scampoli di tessuto) in regalo, raccolta differenziata, arredamento da legno di riciclo.*
- *Fornitore Energia elettrica da fonti rinnovabili*
- *Utilizzo di corriere in bici per le consegne sul territorio milanese*
- *Raccolta differenziata, produzione dei prodotti secondo ordini, taglio dei singoli capi, scarto minimo, riuso di parte degli scarti, Imballi zero plastica, divulgazione via web, informazioni di trasparenza e consapevolezza su alternative al fast fashion*

- *Riscaldamento a legna, pannelli solari*
- *chi si presenta in bicicletta ha il 15% di sconto su tutti i prodotti*

26. La vostra azienda fornisce indicazioni ai vostri punti vendita su come comunicare la vostra mission di sostenibilità al cliente finale?

No	25,0%
Sì	75,0%

27. La vostra azienda fornisce indicazioni ai vostri punti vendita su come trattare l'invenduto?

No	37,5%
Sì	62,5%

28. Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo la vostra strategia?

No	34,4%
Sì	65,6%

29. In che modo il lockdown e la pandemia per COVID-19 hanno cambiato la vostra strategia?

Sono state ottenute 21 risposte aperte su 21 "sì" che vengono riportate di seguito:

- *Abbiamo deciso di implementare la comunicazione relativa al comportamento e ai corretti atteggiamenti sulle tematiche di sostenibilità, etica, ecologia ed economia circolare.*
- *Lancio ecommerce*
- *Puntare su online*
- *Abbiamo dovuto ridurre e quasi annullare la raccolta x il riciclo Tessile per problemi di sanificazione*
- *Già dallo scorso anno erano in programma diversi investimenti nel marketing per convogliare maggiore traffico al sito web che doveva essere migliorato e aggiornato per affrontare l'aumento del traffico online. Ad oggi e per il momento i fondi disponibili sono stati utilizzati per migliorare la piattaforma in attesa di reperirne altri per la pubblicità.*
- *Abbiano da subito dichiarato che il miglior riciclo parte dal proprio armadio prima ancora di un nuovo acquisto ed ora sensibilizziamo ulteriormente su ciò che ecologico o solo cruelty free.*

- *Puntando sul recupero capi inutilizzati*
- *maggiore trasparenza per far capire al cliente finale tutto quello che c'è dietro*
- *Ha reso necessario velocizzare e attuare alcune scelte legate a sostenibilità, ambiente, tracciamento filiera ecc a cui abbiamo sempre prestato molta attenzione.*
- *Maggiori vendite on line. Maggiore programmazione della produzione. Attenzione al magazzino. Turnistica produttiva*
- *Più digitale e social*
- *Abbiamo puntato di più sulla vendita online.*
- *Implementando la vendita online piuttosto che le fiere o i mercati di settore*
- *Abbiamo ridotto la produzione e attualmente abbiamo deciso di rimettere in vendita la merce invenduta delle passate stagioni e capi di archivio senza avviare una nuova produzione*
- *Puntando molto di più sull'online*
- *Chiusura momentanea dei negozi diretti e sospensione della produzione di collezioni moda; riconversione alla produzione e vendita di mascherine lavabili certificate ISS e CE*
- *aumentando l'offerta di nuovi prodotti e cambiando alcune strategie di vendita*
- *vogliamo lavorare molto di più sul digitale e andare diretti al consumatore, senza intermediari e al giusto prezzo*
- *Vendita esclusivamente online*
- *Purtroppo quest'anno non abbiamo prodotto e abbiamo esaurito il magazzino esistente*
- *Abbiamo rivisto le nostre spese, riconsiderato i prodotti, valutando quali fossero i migliori e scartando gli altri.*

30. Numero di impiegati della vostra azienda

    Media di 9, range da 1 a 140.

31. Vi chiederemmo gentilmente di scrivere il nome dell'azienda per facilitare la raccolta dati, assicurandovi che i dati saranno trattati in maniera anonima.

    Sono state ottenute 27 risposte su 32 che rimarranno in forma anonima.

32. Vi ringraziamo per la collaborazione, se foste interessati ad avere una telefonata di massimo un quarto d'ora per approfondire insieme l'argomento, potete lasciare di seguito un contatto.

Sono state ottenute 6 risposte su 32 che rimarranno in forma anonima.

1. Nella scelta dei vostri fornitori di materie prime, quali di questi criteri di sostenibilità considerate?
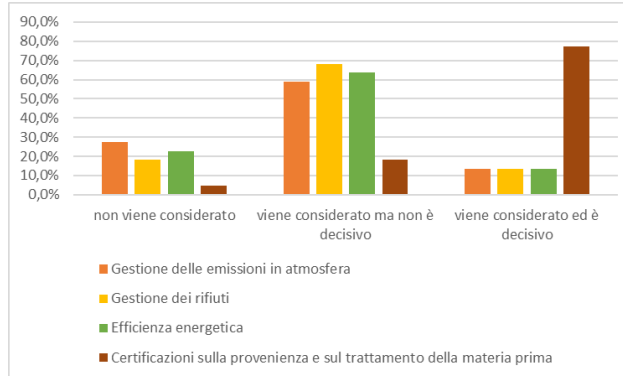
2. La vostra azienda è a conoscenza degli indirizzi dei fornitori dei vostri diretti fornitori di materie prime?

No	4,5%
Sì, ma non di tutti	50,0%
Sì, di tutti	45,5%

3. La vostra azienda è a conoscenza della provenienza di tutte le materie prime utilizzate per creare i vostri prodotti?

No	9,1%
Sì, sappiamo il continente di provenienza	0,0%
Sì, sappiamo il paese di provenienza	59,1%
Sì, sappiamo la regione di provenienza	31,8%

4. La vostra azienda collabora con altre nella condivisione di informazioni e nel raggiungimento di obiettivi comuni sul tema della sostenibilità?

No	13,6%
Sì	72,7%
Non sono a conoscenza di questa informazione	13,6%

5. Se sì, fornire un esempio di collaborazione con altre aziende nella condivisione di informazioni e obiettivi sul tema della sostenibilità

   Sono state ottenute 16 risposte aperte su 16 "sì" che vengono riassunte di seguito:

   - *Gruppi di lavoro di settore, tavoli tematici di SMI, Confindustria Moda*
   - *Obbiettivi quali ZDHC, Detox, riduzione consumi acqua*
   - *Bilancio di sostenibilità*
   - *Tracciamento della filiera produttiva*
   - *Certificazioni GOTS, GRS, FSC*

- *MRSL (Manufacturing Restricted Substances List) e PRSL (Product Restricted Substances List)*

6. I vostri prodotti sono realizzati con materiali che possono essere riciclati utilizzando infrastrutture di raccolta e riciclaggio?

No	4,5%
Meno del 50% dei prodotti è realizzato con materiali che possono essere riciclati	27,3%
Più del 50% dei prodotti è realizzato con materiali che possono essere riciclati	45,5%
Il 100% dei prodotti è realizzato con materiali che possono essere riciclati	22,7%

7. Usate fonti di energia rinnovabili? Domanda aperta: Se sì, quali fonti di energia rinnovabili utilizzate e in che percentuale?

Le risposte a queste due domande sono state unite nel seguente grafico.
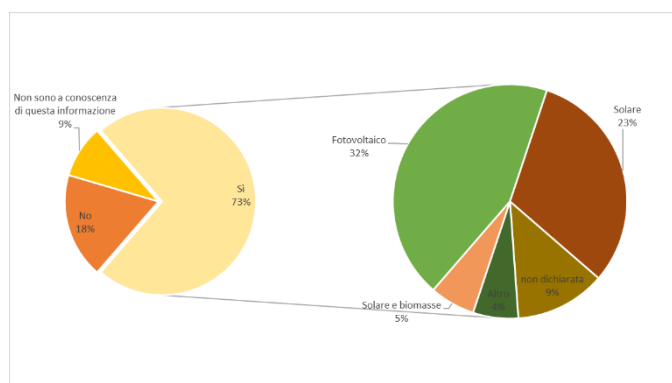
8. La vostra azienda tiene traccia delle emissioni di CO_2?

No	45,5%
Sì	36,4%
Non sono a conoscenza di questa informazione	18,2%

9. Se sì la 8, Qual è il valore (in tonnellate) di CO_2 emessa all'anno dalla vostra azienda?

Sono state date 8 risposte aperte su 8 "sì" che vengono riportate di seguito:

- *12.000*
- *Dato sensibile*
- *È un lavoro in corso, al momento abbiamo calcolato LCA sull'articolo iconico dell'azienda*
- *Vedasi bilancio di sostenibilità*
- *circa 10000 tonnellate*
- *Non ne sono a conoscenza*
- *2.000*

- *Al momento non ho questa informazione*

10. Se sì la 8, La vostra azienda sta implementando misure per ridurre le emissioni di CO2?

No	0,0%
Sì, stiamo pensando ad azioni da implementare	37,5%
Sì, le azioni sono già in atto	62,5%

11. Se sì la 10, qual è il vostro obiettivo per tali misure volte alla riduzione delle emissioni di CO2?

Sono state ottenute 7 risposte aperte su 8 "sì" che vengono riassunte di seguito:

- *Comprendere l'impatto del proprio prodotto*
- *Riduzione del 20%, 50%, 75%, generico "ridurre impatto ambientale"*
- *Carbon zero*
- *Obbiettivo di mezzi commerciali elettrici ed illuminazione a led dell'intera azienda*

12. Qual è il vostro grado di conoscenza sul fine vita dei vostri scarti produttivi?

Gli scarti vengono gestiti da aziende di cui si ignorano caratteristiche, tipologia di trattamento effettuata e successiva destinazione	9,1%
È noto se i gestori dei nostri scarti li destinano a smaltimento o a recupero	50,0%
È nota la filiera e le quantità di scarti inviati a riciclo	31,8%
La filiera dei nostri scarti è interamente nota e collaboriamo con i vari attori per ottimizzarla	9,1%

13. La vostra azienda sta implementando misure per migliorare lo smaltimento degli scarti di produzione?

No	13,6%
Sì, sono in programma ma non ancora applicate	45,5%
Sì, sono in atto procedure di miglioramento	40,9%

14. Se sì, qual è il vostro obiettivo per tali misure volte a migliorare lo smaltimento degli scarti di produzione?

Sono state ottenute 13 risposte aperte su 19 "sì" che vengono riportate di seguito:

- *riciclo per creazione di nuovi prodotti*
- *riciclare almeno 80% degli scarti di lavorazione*
- *gli scarti di produzione sono tutti riciclati*
- *siamo zero waste*

- *ottimizzazione scarti*
- *riciclo scarti tessili per imbottiture piumini*
- *l'obiettivo si prefigge la riduzione di materia prima e miglioramento rese*
- *riduzione dell'impatto ambientale attraverso il riutilizzo degli scarti industriali per la produzione di prodotti e/o energia*
- *riduzione del 50%*
- *stiamo sviluppando un progetto in merito all'economia circolare*
- *destinare il 100% del tessuto scartato al riciclo*
- *cerchiamo interamente di riciclare noi stessi gli scarti*
- *riduzione della quantità di scarti di produzione*

15. La vostra azienda è consapevole di come vengono smaltiti i rifiuti pericolosi?

Gli scarti vengono gestiti da aziende di cui si ignorano caratteristiche, tipologia di trattamento effettuata e successiva destinazione	9,1%
È noto se i gestori dei nostri scarti li destinano a smaltimento o a recupero	31,8%
È nota la filiera e le quantità di scarti inviati a riciclo	31,8%
La filiera dei nostri scarti è interamente nota e collaboriamo con i vari attori per ottimizzarla	27,3%

16. La vostra azienda ha istituito programmi per promuovere l'installazione di nuovi processi per il riutilizzo e il riciclo di acqua?

No	40,9%
Sì, sono in programma ma non ancora applicate	4,5%
Sì, sono in atto procedure di miglioramento	54,5%

17. La vostra azienda sta adottando misure per migliorare i problemi di utilizzo e scarsità di acqua?

No	40,9%
Sì, sono in programma ma non ancora applicate	13,6%
Sì, sono in atto procedure di miglioramento	45,5%

18. Se sì, qual è il vostro obiettivo per tali misure volte a migliorare i problemi di utilizzo e scarsità d'acqua?

Sono state ottenute 10 risposte aperte su 13 "sì" che vengono riportate di seguito:

- *riciclare quanta più acqua possibile così da diminuirne l'utilizzo (al momento siamo al 20% del depurato)*
- *in alcune fasi di lavorazione risparmio del 50%*
- *ridurre il consumo e aumentare il recupero*
- *recupero delle condense del riscaldamento in tintoria*
- *misuratori di consumo sui vari impianti*
- *50% dell'utilizzo dell'acqua e dei vapori*

- *progetti di depurazione, filtrazione e utilizzo*

- *riduzione dell'impatto ambientale, salvaguardia del nostro territorio e risparmio economico conseguente.*

- *riduzione consumi del 75%*

- *La mia azienda produce il 90% degli articoli con materiale riciclato e di conseguenza l'acqua che viene usata è una percentuale molto molto bassa. Nonostante questo stiamo cercando metodi per ridurre ancora questo consumo*

19. La vostra azienda fornisce indicazioni ai clienti su come prendersi cura dei prodotti in modo da prolungarne la durata (oltre a quanto richiesto dalla normativa)?

No	36,4%
Sì, attraverso il nostro sito web	4,5%
Sì, attraverso con comunicazione sia online che offline	59,1%

20. La vostra azienda investe in ricerca tecnica, sviluppo e innovazione per prolungare la vita dei suoi prodotti?

No	18,2%
Sì, ma non abbiamo ancora implementato delle misure	13,6%
Sì, e impatta sul design e composizione del prodotto	68,2%

21. Il lockdown e la pandemia per COVID-19 ha cambiato in qualche modo la vostra strategia?

No	36,4%
Sì	63,6%

22. In che modo il lockdown e la pandemia per COVID-19 hanno cambiato la vostra strategia?

Sono state ottenute 14 risposte aperte su 14 "sì" che vengono riportate di seguito:

- *La società sta rivedendo il suo business model e l'intera governance aziendale*

- *Presentazione della collezione con strumenti informatici e presentazioni a distanza*

- *Sul modo di lavorare e sulla tipologia di prodotto da proporre alla clientela*

- *Riduzione magazzino, selezione clienti e materie prime*

- *Maggior attenzione all'ecosostenibilità*

- *La strategia cambia per rispondere ai cambiamenti di domanda*

- *Non l'ha cambiata sul fronte della sostenibilità, dove continuiamo nel percorso di eccellenza intrapreso da anni. La strategia è cambiata in molti altri ambiti che però non credo siano oggetto di analisi*

- *Implementazione dei servizi on line*

- *Distribuzione, allestimento collezioni, vita dei prodotti*

- *Abbiamo implementato e promosso l'utilizzo di strumenti digitali*

- *Ci ha obbligati ad accelerare tutte le azioni di ottimizzazione del processo produttivo e riduzione dei consumi*
- *Introduzione della presentazione digitale*
- *Abbiamo digitalizzato la collezione*
- *Sicuramente dobbiamo stare molto attenti ai clienti che serviamo sia che fossero antecedenti al lockdown ma sopratutto a quelli successivi al lockdown*

23. Numero di impiegati della vostra azienda

Media di 198, in un range da 5 a 600.

24. Vi chiederemmo gentilmente di scrivere il nome dell'azienda per facilitare la raccolta dati, assicurandovi che i dati saranno trattati in maniera anonima.

Sono state ottenute 17 risposte su 22 che rimarranno anonime.

25. Vi ringraziamo per la collaborazione, se foste interessati ad avere una telefonata di massimo un quarto d'ora per approfondire insieme l'argomento, potete lasciare di seguito un contatto.

Sono state ottenute 7 risposte su 22 che rimarranno anonime.

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