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Circular economy & new product development in the fashion industry: a multiple-case study analysis on the role of collaborations

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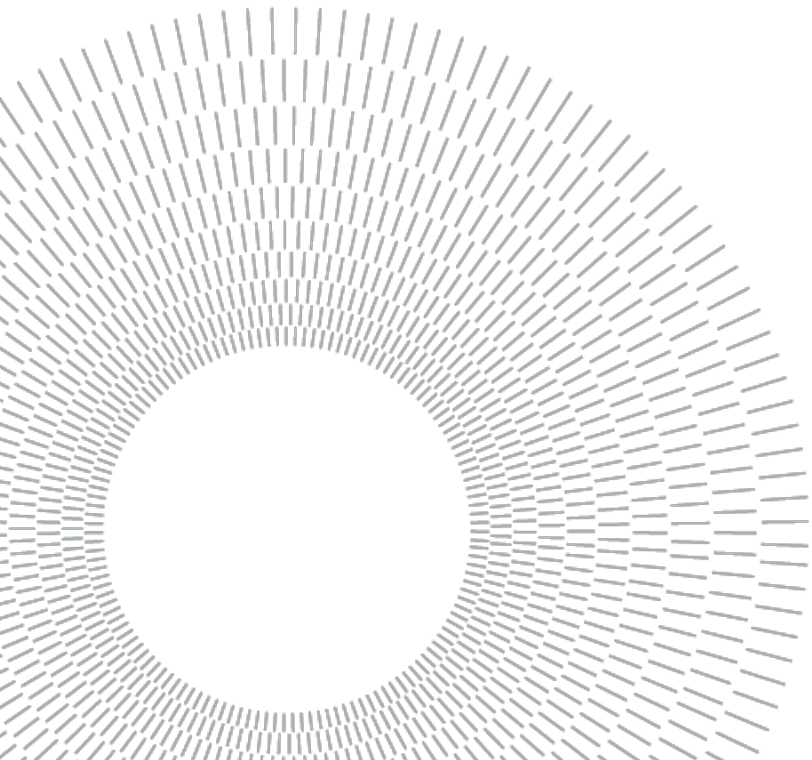


Abstract

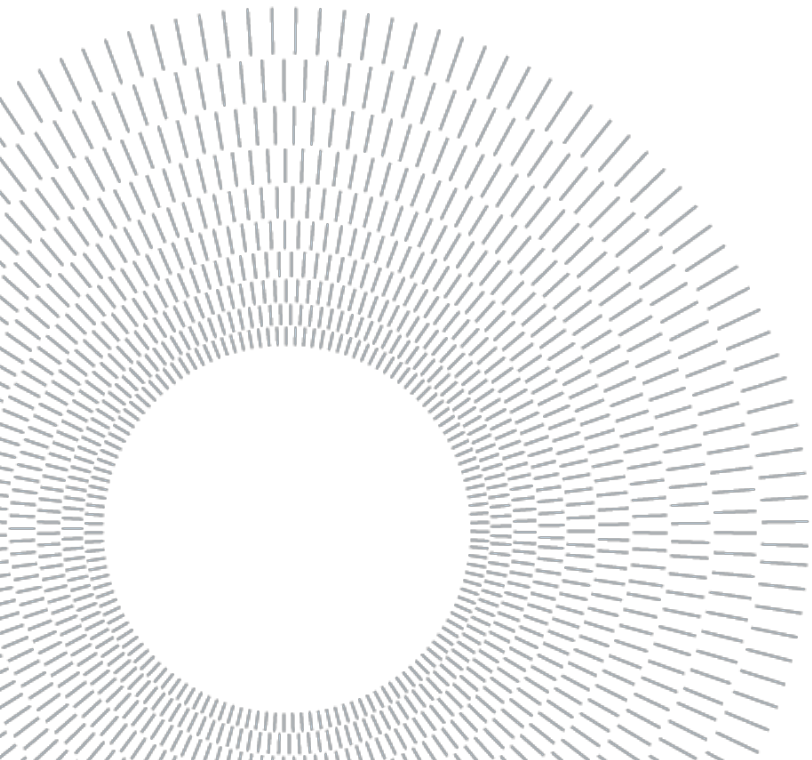
As the need to address climate change becomes more evident, businesses are rethinking their production systems to be more sustainable. In 2018, the apparel industry emitted 2.1 billion cubic meters of greenhouse emissions, making it a considerable contributor to environmental impact. Businesses have thus implemented circular economy (CE) in the sector to reduce, reuse, and recycle the materials utilized and thereby abolish the traditional take-consume-eliminate model. This thesis examines the impact of circular practices on product development processes in the fashion industry, as well as how stakeholder collaborations are critical in fostering a circular model. The first section examines the theoretical notions of CE and new product development (NPD), with collaboration acting as a link between the two. A framework has been constructed by merging two different models from the literature to analyze patterns in the sector. The first was created by Kalmykova in 2018, and it shows the primary circular practices related with the various steps of the value chain. Then, the Stage-Gate model assessed by Franzò et al. has been critical in defining the design stages of NPD: idea generation, product development, and commercialization. Six case studies from two units of analysis, luxury brands and fast fashion, have been examined through interviews and research, and the gathered data has been triangulated using meta-matrices to better understand industry patterns. The goal is to show if and how different circular practices could be linked to different stages of NPD, as well as the importance of collaborations in the transition to a circular business model. The adoption of collaborative circular practices has been deeply studied in a qualitative and numerical manner, and the results have revealed no significant differences between the two units of analysis. At the conclusion of the study, the originally designed framework has been then specified, reflecting the circular practices used throughout the NPD process. Furthermore, it has been demonstrated that collaborations are critical for the industry to shift their business model from linear to circular for the practices employed.

Key-words: Circular Economy; New Product Development; Fashion Sector; Collaboration; Real Cross-Case Study; Value chain

Abstract in italiano

La necessità di affrontare il cambiamento climatico è evidente, e così oggi le aziende stanno riprogettando i loro sistemi produttivi al fine di essere più sostenibili. Il settore della moda risulta tra i principali contributori ai danni ambientali, responsabile di 2.1 miliardi di metri cubi di gas serra nel 2018. L'economia circolare nel settore è stata introdotta dalle aziende al fine di ridurre, riutilizzare e riciclare i materiali impiegati ed eliminando quindi il normale modello di prendi-consuma-getta. Questa tesi analizza l'influenza delle pratiche circolari sui processi di sviluppo del prodotto nel settore della moda, e di come le collaborazioni con gli stakeholder assumano un'importanza rilevante per l'adozione di un modello circolare. Nella prima parte, sono stati analizzati i concetti teorici di economia circolare e di new product development (NPD), e la collaborazione è stato l'elemento di congiunzione tra i due temi. Per comprendere l'evoluzione del settore, è stato creato un framework combinando due diversi modelli provenienti dalla letteratura. Per primo, quello sviluppato da Kalmykova nel 2018, che tiene in considerazione le principali pratiche circolari associate ai diversi step della value chain. Poi, per il NPD, lo Stage-Gate model rivisto da Franzò et. al. è risultato fondamentale per identificare le fasi di progettazione: generazione delle idee, sviluppo del prodotto e commercializzazione. Sei casi studio appartenenti a due unità di analisi, brand di lusso e fast fashion, sono stati studiati grazie ad interviste e ricerche, e i dati raccolti sono stati triangolati con l'utilizzo di meta-matrici per comprendere l'andamento del settore. L'obiettivo era evidenziare come e se le diverse pratiche circolari potessero essere associate alle diverse fasi del NPD e comprendere il ruolo delle collaborazioni verso la transizione a un modello di business circolare. Un'analisi qualitativa dettagliata e un'analisi numerica sull'adozione delle pratiche circolari collaborative hanno consentito di giungere alla conclusione che le due unità di analisi non presentano particolari differenze. Il framework inizialmente ideato viene poi definito alla fine della ricerca, indicando le pratiche circolari implementate lungo il processo di NPD. Inoltre, si evince come le collaborazioni, per le pratiche implementate, siano fondamentali per l'industria al fine di trasformare il suo modello di business da lineare a circolare.

Parole chiave: Economia Circolare; Sviluppo di un Nuovo Prodotto; Settore della Moda; Collaborazione; Studio Incrociato Reale; Catena di Valore



Contents

Introduction

In recent years, environmental sustainability has emerged as a critical issue, particularly for companies with large environmental impacts. Global population growth, climate change and land and water scarcity are forcing companies to pay more attention to sustainability.

The fashion industry is among the most polluting and waste-producing businesses on the planet. The environmental impact is visible at various stages of the product's life cycle. Sourcing of raw materials requires high energy, water, and soil consumption and the manufacturing processes entail also chemical usage, and pollutant discharge into the environment (Jacometti, 2019). The transportation and distribution phases imply high fuel consumption and greenhouse gas emission, even if it is assumed that the consumer usage phase and product end-of-life have the biggest environmental impact. Indeed, consumer consumption necessitates the use of water, energy, and chemicals, as well as the discharge of microplastics into the environment (Jacometti, 2019). Only 20% of worldwide clothing waste is collected for re-use and recycling, while the remaining 80% is discarded or burned (Koszewska, 2018).

Nowadays, the fashion industry recognizes the importance of sustainability and it is working to develop creative solutions to become more responsible. The sector is acknowledging its social, environmental, and economic obligations, trying to promote sustainability along the supply chain (Pero, 2020). As a result, it has been decided to focus the research on the fashion industry, examining companies in both the fast-fashion and luxury fashion sectors. In this way, a comprehensive view of the fashion business may be obtained, as well as an understanding of whether there are disparities in the approaches to sustainability and CE between the fast fashion and luxury fashion industries. It is crucial to figure out if the fundamental differences between these two major groups have an impact on CE implementation.

Indeed, in terms of style, timeliness of new offerings on the market, and quality of supply at deferred costs, fast fashion and luxury companies are two opposed worlds. Fast fashion moves quickly and constantly offers new goods due to its short cycles: prototyping is fast, batches are small and varied, transport and delivery are efficient (Skov, 2002). Generally, these brands have low production and labor costs, which translates into low overall costs and higher volumes. These brands, such as

H&M, Zara and Mango, were created to satisfy people's desire to buy fashionable clothes at an affordable price (Ungaro, 2021). Customers' offers are always changing, and they quickly become outdated. Furthermore, these brands can operate with a turnover cycle that is much faster than in the past, thanks to the internet and globalization. From a sustainable point of view, given the pressure from environmentalists and NGOs, brands have internalized operating practices that are more sustainable than in the past. This is particularly complex because of the nature of these brands. However, many companies such as Zara and H&M have begun to incorporate CE practices.

To the other side, luxury fashion has a different influence on the market. As a matter of fact, among the main characteristics of these brands, there is a higher level of quality, guaranteed by a prestigious image within the market. They are known for their materials, symbolic functions and experiences that the goods may provide. This ensures that luxury brands can implement a premium pricing strategy, given what they are able to show to the market (Fuchs et al., 2013). Luxury corporations have begun to raise their awareness about sustainability, as consumers have begun to pay more attention to it. Moreover, luxury brands have inherent environmental protection attributes. Major brands' products are viewed by consumers as investments that must be passed down from generation to generation. Due to premium prices, limited production, and the exploitation of unique sales channels, scarcity is also a sustainability's component linked to luxury brands.

Both fashion industry typologies are attempting to turn their linear models into circular ones. CE aims to create economic systems that reduce resource waste and pollution while also minimizing energy waste. To achieve resource efficiency, CE introduces the concept of the 3Rs: *reduce, reuse* and *recycle*. CE practices require three main steps. The first concerns product planning and design, with the aim of extending the product life cycle; the second concerns the materials used in production; the third stage concerns with how to manage materials that are no longer usable preserving their original properties (Sehnem et al., 2022). In this way, materials can be reintroduced into the life cycle of products. Producers, consumers and other stakeholders play important roles in order to pass to CE, implying drastic changes in production and consumption patterns (Pinheiro et al., 2019).

The design of circular products requires the development of a new model, or at least a set of adaptable principles, strategies and approaches (Den Hollander et al., 2017). In this respect, NPD via innovation process and commercialization approaches represents an opportunity to improve product environmental impacts. Sustainable practices can help firms achieve environmental and economic benefits such as

optimizing raw material, energy and water consumption, by incorporating them into NPD (Pinheiro et al., 2018).

Furthermore, rather than focusing solely on their own information, companies must now rely on external sources and knowledge. The concept of Open Innovation has arisen in recent years, requiring collaboration between businesses that count on one another to produce and extract value. Collaborations are critical to CE implementation: in order to reach long-term goals, organizations must acquire knowledge and inventions from the outside and outsource their internal knowledge. Collaboration can thus emerge as a tool for achieving resource efficiency and clean technologies, allowing businesses to obtain a competitive advantage (Mishra et al., 2019), and assisting them in transitioning to a circular business model.

The aim of the present study is to investigate how fashion companies connect the three principles of CE, NPD and cooperation as a facilitator. All of these are considered necessary for fashion companies to transition from a linear to a circular business model.

The following questions will be asked in the study, based on the above premises: *"How and why companies transform their product development process to implement CE? Are collaborations enablers in the implementation of CE practices within the innovation process?"*.

The study will contribute to the existing literature by creating a framework for circular practices to be implemented at various stages of NPD, as well as examining how collaborators engage in the shift from linear to circular business models. The knowledge of CE and the role of collaborators in the sector will be increased thanks to the participation of luxury and fast fashion companies as case studies in the research. The methodology presented at the end of this dissertation is based on data triangulation from real-world examples of circular practices implementation.

1 State of the art

In this section, a review of the existing literature on CE and the different practices implemented by companies is proposed, with a subsequent focus on fashion companies. The second main theme addressed in this chapter is NPD, highlighting the main models present in the literature and useful for research purposes. Linking these two topics is the issue of collaboration and how it can lead to a change. In doing so, an attempt was made to identify existing gaps in this field of research.

1.1. CE

The term CE was coined to achieve sustainable development. This allows current needs to be met without compromising future generations, while also considering resource constraints and synergies and trade-offs between economic, environmental and social goals (Geissdoerfer et al., 2018).

CE aims to create economic systems that minimize the use and waste of resources, as well as reducing energy waste and pollution. To achieve these results, material flows are reconfigured from a linear method, i.e. resources-product-discard, to closed-loop methods, i.e. resources-product-discard-new resources. CE was defined by Nußholz (2017) as *"a paradigm that suggests a redesign of the current linear economic system, largely based on linear resource flows, towards closed-loop resource flows that can preserve the embedded environmental and economic value in products over time. The CE has the potential to lead to increased resource efficiency and generate environmental gains through reduced raw material extraction and waste generation"*. It is therefore possible to introduce the concept of closed-loop supply chain management (CLSCM) which focuses on the negative consequences of wasteful business operations (Lüdeke-Freund et al., 2019).

The main economic activities to achieve circularity can be traced back to the 3 Rs: *reduce*, *reuse* and *recycle*. Reduce refers to using less resources in the first place, as well as tight avoidance and source reduction. It comprehends the whole spectrum of steps and actions performed before a substance, material, or product becomes waste. The recovery and employment of items or their components is referred to reuse, and it encompasses both preparation for reuse and reuse itself. This activity

decreases the use of material and energy resources and reduces pollution and degradation of natural capital. Recycling, on the other hand, refers to recovery operations that occurs after collection: it includes organic material reprocessing, excluding energy recovery and reprocessing into materials that will be utilized as fuels or for backfilling processes.

CE represents an alternative model for understanding consumption and providing economic growth along with sustainability. It's commonly used interchangeably with the term "eco-efficiency". It is unclear whether it is a part of the CE, a synonym for it, or a result of it; certainly, it can be achieved in linear economies to boost resource productivity and reduce waste. As a result, the Ellen MacArthur Foundation (EMF) believes that distinguishing between two notions, eco-efficiency and eco-effectiveness, is appropriate. Eco-efficiency is characterized as a dematerialization and minimization method based on *"minimizing the volume, velocity, and toxicity of the material flow system"*. Instead, eco-effectiveness is defined as *"the transformation of products and their associated material flows such that they form a supportive relationship with ecological systems and future economic growth. The goal is not to minimize the cradle-to-grave flow of materials, but to generate cyclical, cradle-to-cradle 'metabolisms' that enable materials to maintain their status as resources"* (EMF, 2012). It has been suggested that the CE must necessarily coalesce around the concept of eco-effectiveness, rather than eco-efficiency.

1.1.1. Business model

CE implementation necessitates the development of new strategies and visions for product categories, services provided and sales channels, all of which add value to the company (Lewandowski, 2016). As a result, it is considered essential to introduce the business model concept, which combines the mechanisms of value proposition, value creation, value capture and value transfer (Franzò et al., 2021). Sustainable business models emphasize both economic and environmental value creation but necessitate the active participation of multiple stakeholders as well as a long-term perspective. Thus, sustainable dimensions - economic, environmental, social dimensions and a long-term orientation - can be linked with business model elements - value creation, value capture and value transfer (Geissdoerfer et al., 2018).

- Value creation: it refers to managerial practices for value creation. It is therefore essential to create a value network with stakeholders to ensure economic, environmental and social benefits.
- Value capture: it refers to the practices for capturing value. From the perspective of CE, it is critical to engage with the preservation of natural resources by gaining more value from a reduction in consumption.

- Value transfer: it relates to customer segmentation and organizational strategies for managing customer relationships, and it is situated between the production and capture of value.

Circular business models are considered as a subclass of sustainable business models and focus on creating value by reusing resources and minimizing consumption and waste. Therefore, business models' inputs and transformation processes are critical. Used and recycled materials are considered as production inputs, and external partners are fundamental: they must be aware of the benefits that may be achieved from these items. As far as the transformation process is concerned, it refers to how inputs are converted into value for the customer. This can be achieved through new product designs that are more compatible with CE principles, such as eco-design, lean and cleaner manufacturing principles.

Supply Chain Management (SCM) arises as a critical component of the transition from a linear to a circular business model. It is defined as the configuration and co-ordination of business functions, such as marketing, R&D, sales, finance, logistics and customer service, within and outside business units and the company. Circular SCM therefore aims to configure business functions to close, slow, intensify, narrow, and dematerialize material and energy loops, in order to minimize resource input, waste and to improve system performance and efficiency (Geissdoerfer et al., 2018). In this way, companies can gain a competitive advantage.

1.1.2. CE strategies

The CE value chain allows to define the various practices associated to CE. It is characterized by a closed loop of material flow (material sourcing, design, manufacturing, distribution & sales, consumption & use, collection & disposal, recycling and recovery, remanufacturing, and circular inputs) and it is driven by renewable energy. Materials can circulate in different loops, such as in the loop within node 5 via sharing or in node 8 via circular input (Figure 1.1). The fewer nodes that need to be traversed for the CE activity, the more value is preserved for that material. For example, the loop between consumption and use is more efficient than the loop between consumption, use and re-manufacture (Kalmykova, 2018).

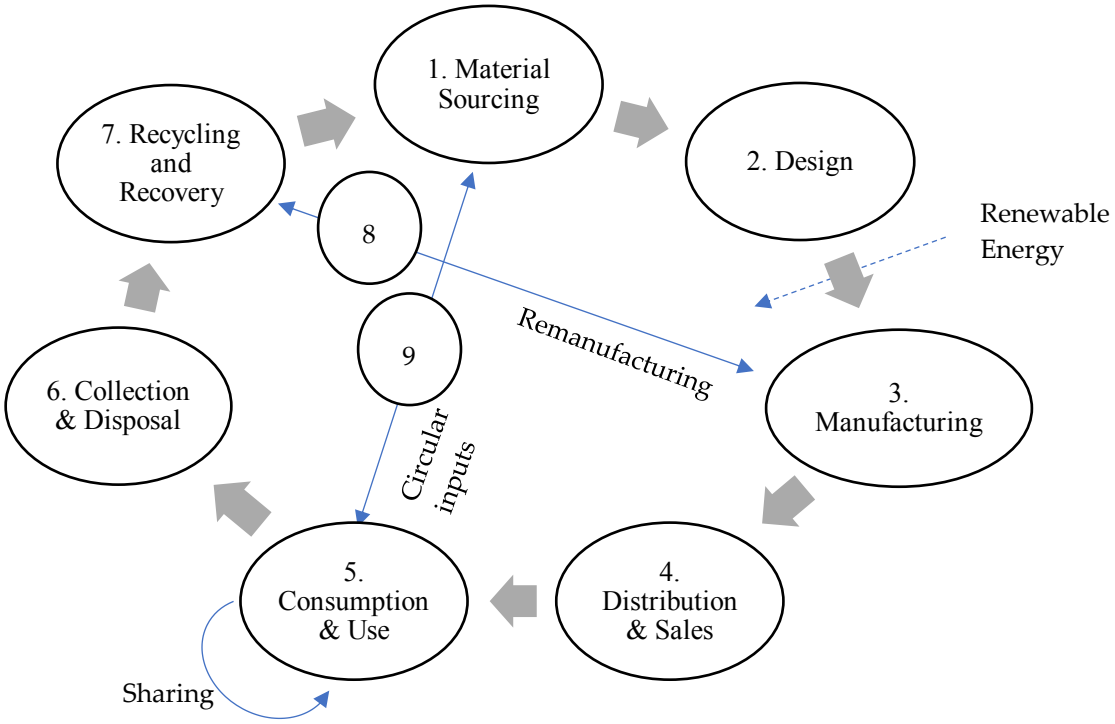


Figure 1.1: In CE, resources flow through the value chain. Each of these parts is associated with a number, which will be the reference for the practices in Table 2.
Source: Kalmykova, 2018

Subsequently, each of the different practices is associated with different nodes in the CE value chain (Table 1.1). These strategies identify the different methods of CE implementation that have been found in the literature. They are then suitable for the ReSOLVE framework:

- Regenerate (R): this activity proposes the utilization of renewable energy sources and materials as inputs, as well as a plan for ecosystem reintroduction.
- Share (S): simple actions like reuse or second-hand buying help to start the sharing process. New business models, on the other hand, add value by producing products that may be utilized by multiple people (and are accurately built to last longer).
- Optimize (O): within a circularity idea, continuous improvement must be pursued, for example, by boosting the performance of products/services with the help of new technologies and an ad hoc design that attempts to reduce waste in all life-cycle phases.

- Loop (L): this action fully embraces the circularity principle, which entails keeping resources in the life cycle for as long as possible. Circular techniques include remanufacturing, recycling, and anaerobic digestion.
- Virtualize (V): virtualization makes use of developing IT technology to convert physical items into digital ones (e.g. books, music, sopping).
- Exchange (E): exchanging outdated methods with new and more circular patterns using new materials, technologies, services can enable a disruptive transition to more sustainable and long-lasting production and consumption.

The EMF developed this theory, which consists of a collection of six actions that facilitate the transition to CE (Vinante et al., 2019). Some of the different practices are then associated with the different activities of the ReSOLVE framework.

1. MATERIAL SOURCING		
Diversity and cross-sector linkages	Creation of industry standards to encourage cross-sector collaboration through transparency, financial and risk management tools, regulation and infrastructure development and education.	O
Energy production/ Energy autonomy	Energy production from by-products and/or waste heat/process/waste recovery to support the operation of the plant.	/
Green procurement	A procedure in which public authorities/companies choose to purchase goods and services that perform the same primary function but have a reduced environmental impact, as measured, for example, by a life cycle assessment (LCA)-based comparison of goods and services.	/
Life Cycle Assessment (LCA)	LCA is an approach that is well-structured, thorough, and internationally standardized. It calculates all relevant emissions and resource consumption, as well as the associated environmental and health effects and resource depletion issues, for any types of goods and services.	/
Material substitution	By substituting more abundant/renewable resources for less abundant/renewable ones, the manufacturing process becomes more adaptable to price changes and resource scarcity.	/

Taxation	Taxes on technologies, products and inputs associated with negative externalities.	/
Tax credits and subsidies	Reducing resource taxes, such as on bio-based materials and products.	/
Extraction of bio-chemicals	Conversion of biomass into low-volume, high-value chemical compounds, resulting in biomass-derived heat, power, fuel, or chemicals.	L
Functional recycling	Excluding energy, process of recovering materials for their original function or other purposes.	L
High quality recycling	Recovery of materials in their purest form, free of contamination, for use as secondary raw materials in the manufacturing of goods of the same or comparable quality.	L
Industrial symbiosis	Exchange and/or sharing of resources, services and by-products between companies.	S
Restoration	Composting. After being broken down by microorganisms and other species, biological nutrients are returned to the soil.	R
Upcycling	Converting old materials into new, higher-quality, more functional materials.	
2. DESIGN		
Customization/made to order	Customers' demands and tastes are considered when creating products. It is possible to eliminate waste and avoid overproduction. Customers who are pleased with the product will return to the manufacturer to extend the product's service life and maintain their favorite features. The manufacturer has built-in customer loyalty.	/
Design for disassembly/recycling	Design that considers the need to dismantle products for repair, refurbishment or recycling.	L E
Design for modularity	Products that are made up of functional modules that can be modified to add new features and/or functionalities. The modules can be fixed or changed individually, extending the life of the product core.	E

Eco design	During the whole lifecycle of a product, it is designed with a focus on its environmental consequences.	/
Reduction	Design and manufacture that uses fewer materials and eliminates the usage of toxic compounds.	O
3. MANUFACTURING		
Energy efficiency	Providing essential services with less energy input, which can be accomplished through lower consumption and more energy-efficient operations.	/
Material productivity	The amount of economic value generated by a unit of material input or material consumption at the company level. GDP per material input/consumption at the national level.	/
Reproducible & adaptable manufacturing	A transparent and scalable production technology that can be replicated using locally available resources and skills in other areas.	/
4. DISTRIBUTION & SALES		
Optimized packaging design	Efficient package design solutions that adhere to rules and make use of packaging material that has reached the end of its useful life.	O
Redistribute and Resell	Resale extends the life of a product by allowing it to be used again. As a result, fewer products with the same function must be manufactured. It is possible to resell the entire product or its components.	/
5. CONSUMPTION & USE		
Community involvement	The community and other stakeholders' voluntary participation in arranging sharing platforms and giving product repair and replacement information.	/
Eco-labelling	A voluntary environmental protection certification that demonstrates a product's or service's environmental preference within its category. Third-party oversight of credible and unbiased product/service labelling is usually provided by public or private entities.	/

Product as a service or Product Service System	The producer owns the product and is responsible for its design, usage, maintenance, repair, and recycling during its lifetime. For the time it is used, the customer pays a rent.	/
Product labelling	Its goal is to provide consumers with complete information on contents, raw material origins, and other factors so that they may make informed judgments. In contrast to Eco-labelling, it does not express any environmental or other preference for certain items.	/
Re-use	Direct secondary re-use extends the product's life by allowing it to be used again. As a result, fewer products with the same function must be manufactured. It is possible to reuse the entire product or its components.	S
Sharing	For example, shared use/access/ownership of space and items, as well as sharing platforms that enable shared use. Space with multiple uses.	S
Socially responsible consumption	A socially responsible customer buys products and services that are thought to have a lower environmental effect and/or support business that have a positive social impact.	/
Stewardship	By conserving, recycling, regenerating, and restoring the resource, users are taking responsibility for its protection. In contrast to Extended Producer Responsibility, a common good, such as a natural resource, is considered.	/
Virtualize	Dematerialization. Electronic books/CDs, online purchasing, and the use of telecommunication to reduce the usage of office space and travel, for example.	V
6. COLLECTION AND DISPOSAL		
Extended Producer Responsibility (E.P.R)	An environmental policy approach that extends a producer's responsibility for a product to the post-consumer stage of its life cycle.	/
Incentivized recycling	A strategy, such as a deposit refund, for rewarding regular and recurring recycling of recyclable materials.	/

Logistics/Infrastructure building	Facilities that promote post-consumer collection and disposal that is cost-effective, timesaving, and ecologically friendly. Solutions that maximize collection.	/
Separation	Technical or man-made/inorganic constituents should be isolated from biological constituents. The biological nutrients should be recovered or destroyed naturally, whereas the technological nutrients should be employed for remanufacture.	/
Take-back and trade-in systems	Efficient take-back systems ensure that products are retrieved from customers when they have reached the end of their useful lives and are then remanufactured. Take-back systems could help maintain a steady flow of materials for remanufacturing.	L
7. RECYCLING AND RECOVERY		
By-products use	By-products from other manufacturing processes, as well as their associated value chains, are employed as raw materials for NPD.	/
Cascading	After end-of-life, materials and components are employed in a variety of value streams. Embedded extraction, labour, and capital are all preserved as the cascade progresses.	/
Downcycling	It is the process of transforming discarded products into new, lower-quality, or less-functional products.	/
Element/substance recovery	The process of recovering metals, non-metals and other reusable substances from a material waste stream.	/
Energy recovery	Combustion, gasification, pyrolysis, anaerobic digestion, and landfill gas recovery are all waste-to-energy processes that convert waste materials into usable heat, power, or fuel.	/
8. REMANUFACTURE		
Refurbishment/Remanufacture	Rebuilding a product by substituting reusable components for defective ones.	S L

Upgrading, Maintenance and Repair	Maintenance is the most efficient approach to keep or restore equipment to its optimum level of performance. Furthermore, after-sales service is seen as critical for gaining a competitive advantage and boosting a business. Repairs are also carried out as part of maintenance. Upgrade services are required to reduce product obsolescence and extend the product's useful life.	S L
9. CIRCULAR INPUTS		
Bio-based materials	Resource inputs or materials that can be easily renewed and last longer than a single life cycle.	R

Table 1.1: CE practices
Source: Kalmykova, 2018

1.1.3. Collaboration as enabler for CE

Collaboration plays a vital role in CLSC, which includes all areas from buyer-supplier relationships to SME integration and customer awareness. In fact, when closing or slowing down material cycles, it is necessary to consider the whole supply chain and involve all parties from design and raw material suppliers to final consumers, as well as service providers and information flows. These partners are considered crucial to create closed loop supply chains and thus move towards the transition to CE. Based on EMF's concepts of sustainable SCM, CE in supply chain collaboration is defined as *"connecting a network of actors in their supply chain by managing data transparency, material flows and exchanges, responsibilities, predictability and sharing benefits"* (EMF, 2013). This goes beyond the reverse and closed loop supply chain concepts, focusing on the new role of companies in redeveloping supply chains by partnering to close and slow resource loops (Leising et al., 2018).

From the literature an interesting framework has been analyzed in order to study CE in supply chain collaboration. Four different concepts are included in the framework:

- *Future vision*: it is crucial in transition studies and CE, especially at the beginning. Visions not only paint a vision of a possible future, but they also help different sets of actors collaborate effectively. Van der Helm (2009) proposes a three-part paradigm for analyzing visions. The first element of a vision is transformational components, which describe the difference between what is now and what could be in the future. These transformational aspects are frequently described using metaphors. The explanation using

words and visuals to describe and discuss the visions is the second aspect. The third aspect is a vision's attractiveness in terms of how it inspires, directs, and motivates people (Van der Helm, 2009).

- *Actor learning*: first-order learning and higher-order learning are the two forms of learning that can be distinguished. First-order learning provides new perspectives on choices for a specific situation and context. Higher-order learning, on the other hand, can affect the actors' problem definitions, values, and ambitions. It is essential to adopt new radical and long-term solutions as well as to maintain the necessary transformation processes.
- *Network dynamics:* different sorts of linkages connect supply chain organizations, corporations, and individuals. It's crucial to understand how networks evolve to change the links in a system. Three main aspects can be identified in industrial networks: (1) actors, (2) resources, and (3) activities to combine, exchange, or create resources. It is possible to identify (i) cultural components, such as the building of trust, (ii) collaborative elements, such as cross-functional activities inside or between organizations, and (iii) strategic aspects, such as organizational commitment for a project, when it comes to the interactions between actors. Network dynamics can be studied in the following way by integrating these elements:
    - Identification of key players and their primary responsibilities
    - Strategic partnerships between actors for organizational support, collaborative activities, and the establishment of cultural trust.
- *Business model innovation*: to supply environmental and social value while maintaining economic benefits, a business model redesign is considered crucial for the transition to CE. The categorization of sustainable business model archetypes is used to identify circularity in business models, both at the case level and the level of individual supply chain partners (Ritala, 2018). These archetypes include: (1) improve energy and material efficiency; (2) create value from waste; (3) replace with renewables; (4) provide functionality; (5) adopt a stewardship role; (6) encourage sufficiency; (7) reuse for society; (8) create inclusive value; and (9) create circularity.

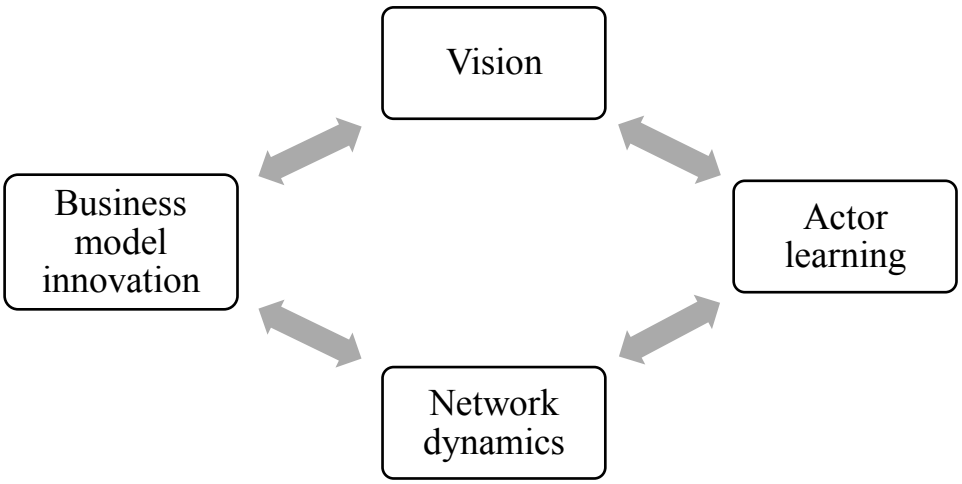


Figure 1.2: Framework for CE supply chain collaboration
Source: Leising et al., 2018

These four concepts are all interlinked (Figure 1.2). In fact, as knowledge is shared, a network is formed, resulting in cultural, strategic, and collaborative changes. The network is in turn linked to the concept of business model when it comes to value delivery: all the components of the supply chain, such as suppliers, distributors, customers and the company itself have the aim of improving performance by delivering value to customers. The business model is also linked to the vision, since a new vision generally requires a revision of the business model. Finally, to develop circular business models, there is a need for both high-level learning and new collaborations (network) along the supply chain. So, collaboration can be seen as enabler for the development of sustainable business models (Leising et al., 2018).

The evolution of the framework in Figure 1.2 was created by Leising in 2018 and shows how collaboration is key to supporting the CE. This consists of 5 main steps (Figure 1.3). The first concerns the preparation and development of the vision, where there is co-creation between customers and supply chain partners in order to create a vision for both product and process. This is followed by the involvement of the market and the supply chain, where the team for the realization of the project is built. This is where different types of collaborations arise, stimulating innovation and value creation. The third stage is process design and collaboration between supply chain partners to establish non-traditional contracts to define specifications and responsibilities. The business model and its implementation are the next step: here, the activities begin, and the business model is defined, which must include collaborative incentives to ensure circular performance. The last phase, the fifth, concerns use and preparation for re-use. Here, value retention of materials is ensured through reuse, repair or recycling.

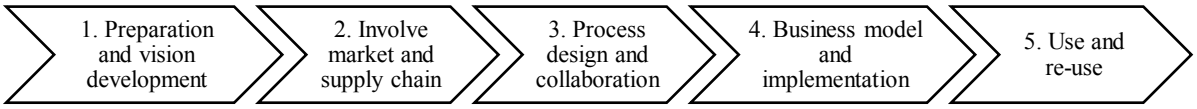


Figure 1.3: Tool for CE collaboration
Source: Leising et al. 2018

Companies can benefit from collaboration as they move towards circular business models. Collaboration thus emerges as an enabler (Figure 1.4) to accomplish resource efficiency and clean technologies, helping companies to gain a competitive advantage (Mishra et al., 2019). It helps companies in achieving their CE objectives, and businesses must develop innovative reuse and recycling design.

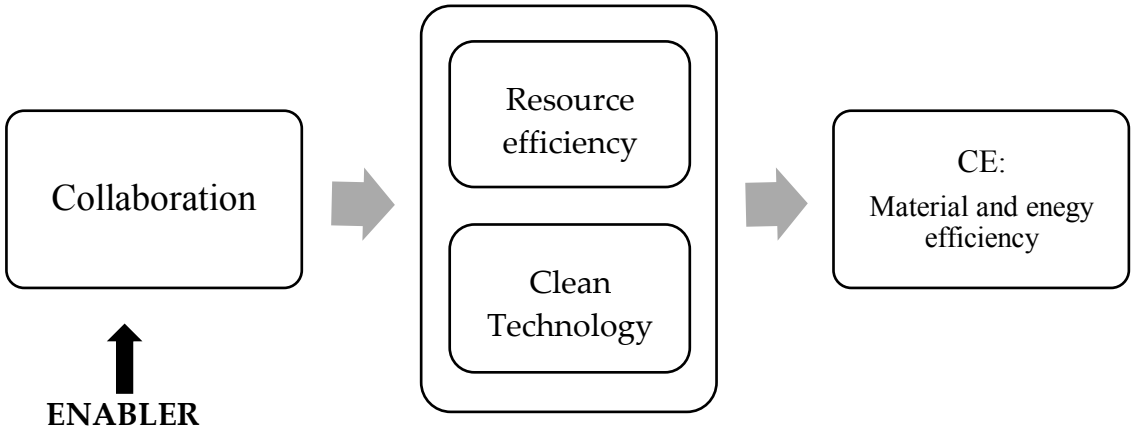


Figure 1.4: Collaboration as enabler for CE transition
Source: Mishra et al., 2019

Thus, there are several ways in which collaboration encourages the use of CE (Mishra et al., 2019):

- *Collaboration as shared understanding*: make it easier for organizations to share capabilities, such as product and process knowledge, to be more material efficient. Shared understanding may make the transition to CE easier by assisting in the development of new processes required for CEBM.
- *Supplier training*: when it comes to CE implementation, researchers usually aim for stakeholder involvement. Training suppliers could help to overcome the difficulties that arise during the outsourcing process while shipping materials/finished products, resulting in material savings and resource efficiency. New partnerships between local suppliers and companies add value; for example, training and certifying them to be new suppliers rather than offshore partners lowers costs and saves materials.

- *Stakeholder involvement*: enhancing the human capacity part of the supply chain. Co-development and technology investment could help businesses prepare for the CEBM shift.

Collaboration is crucial in order to implement CE practices. Yang et al. (2018) warn that *"making supply chains circular cannot be achieved by a specific company, as it requires collaboration between organisations across supply chains and other stakeholders from similar and/or different sectors"* (Hopkinson et al., 2020). In particular, collaborative activities are mainly focused on B2B relationships.

1.1.4. CE in the fashion industry

The fashion industry has always been linked with overconsumption and the current linear system consumes a lot of resources, causing a severe impact on the environment. Cotton production accounts for about 7% of all jobs in some low-income nations; each year 98 million tons of non-renewable resources are consumed; 93 billion cubic meters of water are added, with the emission of almost 1.2 billion tons of CO2 and 500 thousand tons of microplastic fibers into the seas (Gazzola et al., 2020). Another significant issue is textile waste, i.e. yarn, fabric leftovers, and other materials, and it is primarily generated during the clothing and textile manufacturing process (Hugo et al., 2021). But waste is also generated in pre-consumption and post-consumption processes, i.e. defective products, damaged products, or unsold products.

Environmental sustainability has been a crucial driver for the fashion industry's growth. The approach to sustainability influences the entire value chain, from the commercial proposition through customer interaction to product end-of-life management. The strategy entails converting a linear industrial system to a circular one. CE is designed to regenerate itself by using (Gazzola, 2020):

- Organic or renewable materials that can be reused and re-entered into the biosphere at the end of their life cycle.
- Technical or non-renewable materials that can be switched cyclically from manufacturing to consumption with minimal quality or value losses.

It aims to decrease environmental impacts, reduce waste output, and encourage sustainable supply chains. CE also promotes zero-waste design, reuse, repairability, and resource-sharing techniques to maximize a product's life cycle, along all steps of the supply chain (Hugo et al., 2021). Stakeholders in CE collaborate to maximize product value for a positive social and environmental impact. Many techniques have been utilized in the fashion sector in order to reach environmental sustainability goals (Caniato et al., 2012):

- The use of organic fibers - this implies the avoidance of pesticides, the reduction of CO2 emissions, resource scarcity and the benefit of soil.
- Reuse and recycling of materials, i.e., old clothes, manufacturing scraps.
- Vintage practices and second hand.
- Clean and information technologies.
- Green certifications - they are critical in certifying the legitimacy of the company's activity. Furthermore, many fashion brands have recently begun to offer sustainability reporting.
- Green product and process design - production technologies, product characteristics and materials used.

In addition, the main actions implemented by fashion companies over the years are mentioned in Table 1.2.

R's	Description
Reduction	▪ Reducing raw materials ▪ Reducing natural resources and chemicals ▪ Reducing consumption
Reuse	▪ Secondhand clothes and rented clothes ▪ Reusing natural resources and raw materials
Recycling	▪ Mechanical recycling ▪ Chemical recycling ▪ Upcycling

Table 1.2: Circular initiatives developed in the fashion sector
Source: Hugo et al, 2021

Beginning with *reduction*, fashion firms are attempting to optimize material resources in order to employ only what is required, hence decreasing waste (zero-waste practice). They are implementing innovative technologies that can lessen the use of natural resources such as water while simultaneously attempting to extend the product's lifespan. Organic fibers are being used by businesses to reduce the negative effects of chemical products, natural resource shortages, and CO_2 emissions. Then, companies are attempting to reduce their use of non-renewable/bio-based materials with limited biodegradability and difficulty recycling.

In terms of *reusing* natural resources and pre- and post-consumer raw materials, several fashion companies are introducing innovative strategies: secondhand clothing and rental acts are becoming increasingly essential.

Finally, in terms of *recycling*, textile wastes are processed and reused (mechanical recycling), synthetic materials are decomposed for repolymerization (chemical recycling) and previously discarded resources are reinvented (upcycling). It is the activity of processing resources to obtain recycled materials with the same, or lower, quality (Morseletto, 2020). Recycling is divided into:

- Closed-loop recycling: it takes place when *"a secondary good is shunted back to an earlier process in the same system where it directly replaces (''supersedes'') input from primary production of the same e.g. material"*[1].
- Open-loop recycling: it occurs when "*at least a share of the secondary good is used in different systems"*[2].

1.1.4.1. Barriers and drivers

It is particularly important to consider both barriers (Table 1.3) and drivers (Table 1.4) that fashion firms face when implementing CE practices.

Barriers	Short description	Stage
Market/economic	*Organizational* – Supply chain is complex, composed by a lot of stakeholders and interconnected processes.	Design, manufacturing, distribution
	Product – There is a lack of conscious fashion design specialists (now everything begins with environmentally friendly product design).	
Institutional	*Governmental* – The system is bureaucratic and complex: there is a lack of clear standards, laws, and certificates are expensive.	Design, manufacturing, distribution

[1] ILCD, 2010, 346 – Retrieved from https://eplca.jrc.ec.europa.eu/uploads/ILCD-Handbook-General-guide-for-LCA-DETAILED-GUIDANCE-12March2010-ISBN-fin-v1.0-EN.pdf
[2] ILCD, 2010, 346 – Retrieved from https://eplca.jrc.ec.europa.eu/uploads/ILCD-Handbook-General-guide-for-LCA-DETAILED-GUIDANCE-12March2010-ISBN-fin-v1.0-EN.pdf

Social/cultural	*Consumer culture* – Consumers are still strongly attracted to fast fashion purchasing and are unaware of the negative implications of excessive consumption.	Consumer usage
	Consumer culture – Due to clothing appearance and cleanliness difficulties, second-hand clothing and rental store are not still so used.	
Technological	*Technical challenges* – Problems in making recycling processes sustainable and post-consumer recycling technologies are not able to reach the desired level of quality.	Collection/recycling and manufacturing
Stakeholders	*Knowledge* – Consumers are aware of the repercussions of traditional fashion models: there is a lack of understanding about the environmental implications of various fiber manufacturing processes.	Consumer usage

Table 1.3: Barriers to implementing CE practices in the fashion industry
Source: Hugo et al., 2021

Drivers	**Short description**	**Stage**
Institutional	*Legal issues* – Companies begin to implement environmental measures to respect regulatory requirements. They act as alternatives for supplier evaluations and as instruments for presenting differentiated sales ideas to clients.	Design and manufacturing
Market/economic	*Circular models are profitable* – Via service-based business models that can reduce stock, and via value-based pricing strategy, it can increase profit. Furthermore, implementing green ideas may enhance income while decreasing costs by reducing energy use and packaging waste.	Design, manufacturing and consumer usage

	Fast fashion model in decline – New generations pay more attention to sustainable environment. Due to changes in customer behavior, fast fashion sales have been declining, creating opportunity for circular fashion.	Design, manufacturing, distribution and consumer usage
Stakeholders	*Consumers awareness* – Consumers are becoming more conscious of environmental and social issues, and they are putting pressure on fashion firms to change.	Collection/recycling, design, manufacturing, distribution, and consumer usage

Table 1.4: CE drivers in the fashion industry
Source: Hugo et al., 2021

In this context, sustainability necessitates also the engagement and collaboration of several actors: it is crucial to work with suppliers, manufacturers, retailers and fashion bureaus, post-consumer actors, service providers and independent experts.

1.2. NPD

NPD is a well-established area in the realm of innovation management study. Before analyzing in detail NPD process, it is important to define innovation in general. Innovation refers to the use of new technological and market knowledge to offer a new product or service to customers. Porter (1990) defined it as *''a new way of doing things that is commercialized''*. Indeed, it is known that nowadays companies must adapt and expand faster in continually changing markets: the purpose of businesses is to establish adaptive settings that consider consumer needs, technology advancements, new regulations, and expansion pressures (Şimşit, 2014). Schumpeter represented innovation as the primary driving force of progress and prosperity (Hagedoorn, 1996). Innovation management is the disciple of managing processes to enable an organization to respond to external or internal opportunities by introducing new ideas, processes, or products (Şimşit, 2014). Managing innovation in a quick and adaptable manner is extremely important for businesses to gain a sustainable competitive advantage.

When thinking about innovation, it generally refers to the introduction of new products or services, but, as Schumpeter pointed out, innovation can also refer to (Hagedoorn, 1996):

- The introduction of new methods of production
- The development of new sources of supply for raw materials or inputs
- The introduction of new markets
- The creation of new market structures in an industry.

Innovation includes the creation and introduction of a new concept, as well as the transformation of an idea into a product, method, or service. The process starts with the identification of a problem or the discovery of an idea. It continues through problem-solving and the development of production capacity to the launch of a new product or service into the market.

Innovation is classified according to where innovation occurs (Şimşit et al., 2014):

- *Product innovation* refers to the development of new products;
- *Process innovation* refers to new or improved production or delivery methods;
- *Marketing innovation* refers to changes in product design or packaging, promotion, product placement or pricing. It can be divided into *sustaining innovation* and *disruptive innovation*. The first refers to better, higher-margin products; the second refers to market products that are simpler, easier to use, less expensive and aimed at new or less demanding customers;
- *Structural innovation* is about the functionality of the working structure.

There are other two types of innovation according to the scope (Şimşit et al., 2014):

- *Incremental innovation* is used to improve a product by adding a new feature that is simple to incorporate;
- *Radical innovation* refers to entirely new steps as well as unexpected applications of established technology.

In this context, the NPD process refers to the practices adopted by firms while developing and marketing new items in terms of product innovation. Managers need to manage the creation and introduction of successful new goods that respond to customers' needs and have perceived technological superiority. They must also understand methodologies for planning, development, deployment, evaluation, and control of necessary competences throughout the NPD process in order to maximize the success rate of their new products (Tzokas et al., 2004).

The steps of the NPD process include the production of new product ideas, the development of an initial product concept, an evaluation of its business attractiveness, the actual realization of the product, market testing and the launch (Tzokas et al., 2004). Before passing from one stage to another, an evaluation process is needed in order to understand if the new product can be realized or not.

The NPD process differs by industry and by firm and it should be tailored to meet the company's specific resources and needs. Several models have been developed over time to conceptualize NPD as a sequence of interconnected phases, allowing the fundamentals of the complexity of processes to be encapsulated in a simplified explanation of stepwise progression or typical behaviors (Franzò et al., 2021).

1.2.1. BAH model

The BAH model, developed by Booz, Allen, and Hamilton in 1982, is one of the most historically significant models, setting the standard for later NPD models. The stages are as follow:

1. *New product strategy* connects the NPD process with the aim of the company, providing guidelines for generating new ideas as well as directions for creating selection criteria.
2. *Idea generation* realizes product ideas connected with the company goals.
3. *Screening and evaluation phases* try to filter ideas in order to understand which are the most relevant.
4. *Business analysis* assesses ideas based on quantitative research.
5. *Design and development* realize the product that can be produced.
6. *Testing* realizes tests to check business decisions.
7. *Commercialization* is responsible for production.

The model's limitation stems from the fact that NPD assumes that each stage of product development might provide a huge number of outputs (Hart et al. 1994). When a new product fails the concept test, the development process is suspended according to this model; nonetheless, a failed concepts test could result in a variety of outcomes.

1.2.2. The Stage-Gate model

Cooper (1983) proposed the Stage-Gate model, which is one of the most prominent models for NPD. It views the product life cycle as a series of interconnected phases and actions (Figure 1.5).

Figure 1.5: The Stage-gate model
Source: Franzò et al., 2021

Entering in detail, it is possible to define:

- *Idea* – It refers to the definition of a product idea which is usually the outcome of a match between technology possibilities and predicted market demand. A competitor's product, observation of unmet customer demands, or direct requests from customers are all possible sources of new product ideas.
- *Preliminary assessment* – In this phase information on the product idea's feasibility and attractiveness are captured. It refers both to a preliminary market assessment, to have an overview of the market and the identification of possible segments, and a preliminary technical assessment, in order to have some technical viability and some indication regarding the needed resources.
- *Concept* – It establishes what the product is, whom it is intended for, and how it will be marketed.
- *Development* – It refers to the realization of a prototype using a lot of technological resources, such as research and development, engineering, and industrial design.
- *Testing* – The aim of this phase is to confirm the product's design and functionality.

- *Trial* – It entails a ''dry run'' of the project's commercial aspects, including production, marketing, and product design. In order to solve difficulties during pilot production, changes to the final production facilities or procedures are frequently required.
- *Launch* – This phase refers to the commercial operations and implementation of the marketing plan.

The key characteristic of this model is that it includes a review phase at the end of each phase: if the project is accepted, the work will proceed to the next step. The three major phases – idea generation, product development, and commercialization – are used in order to simplify the process since the NPD process is based on different development stages interspersed with evaluative stages, as well as a number of iteration cycle (Franzò et al., 2021).

1.2.3. Collaboration as enabler for innovation

The Open Innovation model represents the most recent generation of innovation models. It is opposite to Closed Innovation, where NPD and marketing take place within the confine of the company. The Open Innovation model, introduced by Henry W. Chesbrough (2003), emphasizes idea management not only within corporations but also with other enterprises. *''Open Innovation requires cooperation among dispersed yet interdependent actors who rely on one another's capabilities for value creation and capture''* (Chesbrough et al., 2018). Chesbrough and Bogers (2014) defined Open Innovation as *''a distributed innovation process based on purposively managed knowledge flow across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model''.*

By externalizing unused ideas and technology and internalizing externally useable knowledge, Open Innovation generates value. This refers to the two main processes, as well as the coupled one (Enkel et al., 2009):

- The *outside-in process* involves integrating suppliers, customers, and external knowledge sourcing to enhance an organization's internal knowledge base.
- The *inside-out process* refers to gaining commercial gains by getting innovations to market faster than internal development.
- The *coupled process* combines outside-in and inside-out co-creation with partners through alliances, cooperation and joint ventures.

Chesbrough has used the ''innovation funnel'' to explain Open Innovation. In general, the funnel model depicts the innovation process like a tunnel with a bottleneck, from which only the strongest projects emerge: the larger the funnel's mouth, the more ideas will be brought into the company's R&D efforts (Barbieri et al. 2016). The model is divided into four phases: idea generation, R&D, product and market test and implementation. The two main phases of research and development are not confined within the organizational boundary, like in Closed Innovation: internal ideas can either follow the traditional internal path or be transferred to the outside and external ideas can be conveyed inside and combined with other internal ideas (Vanhaverbeke et al., 2014).

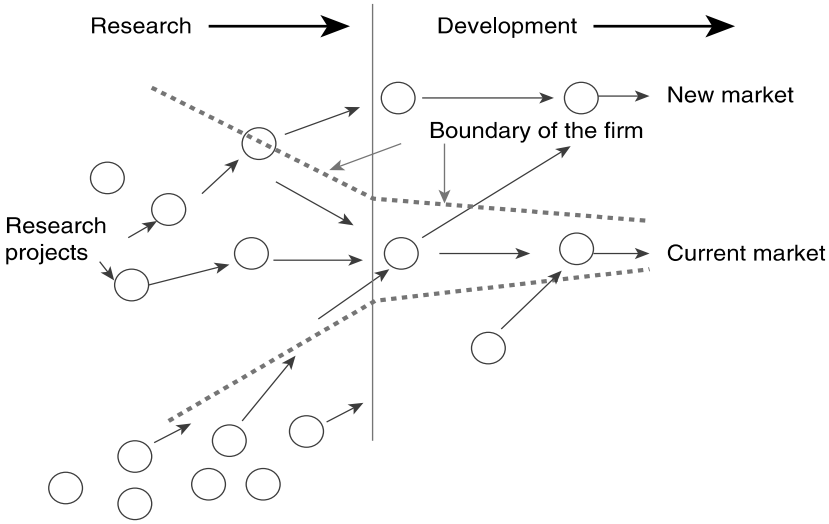


Figure 1.6: Open Innovation funnel
Source: Chesbrough, 2003

On the right side of Figure 1.6, the terms *''new market''* and *''current market''* refer to a company's business model: the heart of Open Innovation is business strategy thinking. It means that internal knowledge that does not support the company's business model is out licensed or sold, and external knowledge that fits with the business model is insourced in order to create new products or businesses (Vanhaverbeke et al., 2014).

The arrows that cross the *''boundary of the firm''* in Figure 1.6 reflect inter-organizational partnerships for bringing ideas and technology into the funnel (outside-in, i.e. research agreements, in-licensing agreements, corporate venturing, etc.) or for monetizing underused technologies (inside-out, i.e. alliances, licensing agreements, spin-offs). In the end, on the left side of the figure, there are R&D projects that start as ideas and mature into new business products. They require resources and capabilities both inside and outside: getting access to them is a primary driving force for Open Innovation (Vanhaverbeke et al., 2014).

With the closed innovation funnel a terminated NPD project is useless, whereas in the Open Innovation funnel the knowhow and technology developed by the project find external avenues to market (Grönlund et al, 2010).

2 Research purpose

The interaction of the three key themes of CE, NPD, and collaborations is used to identify gaps in the research. The inconsistencies aid in the formulation of the primary research questions. Then, the key models collected from the literature are selected, which can subsequently be used to define the theoretical framework.

2.1. Research questions

From the literature, few links emerged regarding the three main themes of this study. In particular, little research has explored the combination of CE and NPD, thus suggesting the need to expand such cross-disciplinary studies (Carvalho and Rabechini, 2017). Furthermore, it is critical to determine whether collaboration is necessary for CE to be implemented as part of the innovation process. As stated by Mishra, collaboration emerges as an enabler to achieve resource efficiency and clean technologies, helping companies gain a competitive advantage. Collaboration encourages the use of CE through partnerships such as shared understanding, supplier training and stakeholder engagement. The same considerations can be made regarding the innovation process through Open Innovation: it requires cooperation between actors who rely on the capabilities of others to create and capture value. In particular, it would be necessary to make a more detailed analysis of the issues mentioned above in the fashion industry, which has a strong environmental impact, but on the other hand has a high potential to innovate its processes to make them more circular.

The premises led to the definition of the research questions:

RQ1: How and why do companies transform their product development process to implement CE?

RQ2: Are collaborations enabling factors in the implementation of CE practices within the innovation process?

2.2. Theoretical framework

As stated by Hollander et al. in 2017, designing circular products requires the development of a new model or new principles, strategies and approaches. Given this premise combined with the research questions posed in the previous section, the aim of the research is to create a new framework that integrates the main CE practices and the process of NPD in the fashion industry. The model will also represent all actors involved along the value chain, understanding whether they are enablers for the transition to a circular business model. A further analysis is carried out to examine if there are any differences in the CE approaches used by fast fashion and luxury enterprises, the two main segments of the fashion sector. It is critical to figure out whether the two groups' features have distinct impacts on the adoption of CE practices. If this scenario occurs, the two groups will require two separate analysis frameworks.

Several theories from the literature are combined to construct the final framework, allowing for a holistic picture of the various topics covered in the literature. The theoretical framework is built using the Stage-Gate model for the NPD innovative process as a starting point. The model is divided into three stages. First, the idea generation phase, which is fundamental for the implementation of CE: the supply of raw materials as well as the concept of the product are necessary for the conception of a circular product. The second phase - product development - is crucial because companies here interact with the whole network of partners in the supply chain and the degree of circularity of products would be assessed and verified. The last phase – commercialization – is the marketing phase where companies should communicate the new circular characteristics to consumers (Franzò et al., 2021). It was decided not only to consider the three main phases - idea generation, product development and commercialization - but to go into details of each specific part in order to have a complete and detailed view of all the different steps of NPD development (Figure 1.5).

Regarding the literature on circular practices that can be internalized by companies, the model created by Kalmykova in 2018 is considered, which includes the practices associated with the different steps of the value chain (Table 1.1.) The study that is done in the course of the investigation is to try to understand how the practices, which were initially associated with the companies' value chain, can be translated into the NPD's Stage-Gate model. This derives from a detailed analysis of the case studies of the fashion companies taken into consideration, trying to understand how the activities can be interpreted from an NPD point of view.

Finally, the collaborations are integrated into the final model by analyzing how they took part in the implementation of the circular practices. For each practice, the entity is indicated and what role it plays, in order to understand whether it has a decisive impact in the transformation of the company's business model.

3 Research methodology

The process that was followed in the research is shown in Figure 3.1.

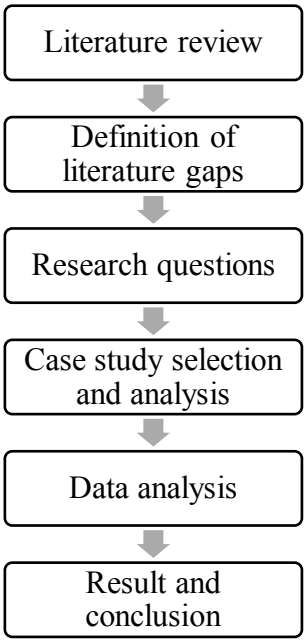


Figure 3.1: Methodology procedure

First, the research started with a detailed analysis of the literature on the meaning of CE with, the practices that are used by companies and how collaboration with external entities can influence processes that introduce circularity. Next, an overview of the fashion industry was performed, underlying the barriers and drivers in order to implement CE within the sector. Finally, the concept of NPD was introduced and main relevant models that have been built over the years, including the concept of Open Innovation that combines innovation with collaboration.

After identifying the gaps in the literature mainly concerning the connection between the different topics, the two research questions were asked and the initial framework combining the theoretical models was created. A qualitative study was then conducted utilizing a multiple-case study analysis technique in order to arrive at a final model and validate it through the final evaluation of the information and data acquired.

3.1. Case study methodology

After the literature review, it was clear that a simple search for articles related to CE and NPD in the fashion industry was not enough to answer the research questions. For this reason, it was decided to continue with a case study research. This approach facilitates the understanding of phenomena within a context, using a variety of data sources. In this way it is possible to understand the many faces that a phenomenon can reveal and explain. According to Jacobsen in a study conducted in 2002, the advantage of studying individual cases in detail is that it is possible to find information that is not available from the start. Therefore, case study research is a good method to create hypotheses and thus help in structuring future research. Indeed, this method can be used for exploratory reasons, as well as for descriptive reasons and to explain why certain events happen (Yin, 1981). The need to use case studies emerges when:

- after an empirical study, there is a need to examine a contemporary phenomenon in the context of real life;
- the boundaries between the phenomenon and the context are not very clear (Yin, 1981).

The case study strategy thus makes it possible to answer the questions "how" and "why" without manipulating the behavior of those involved in the study and when the investigator has little control over events.

The two main proponents and creators of the case study methodology were Robert Stake, who proposed a model in 2005, and Robert Yin, who wrote several publications ensuring that the topic of interest was explored and revealed (Hafiz, 2008). Both base their approaches on constructivism, which argues that truth is relative and depends on one's perspective. It is based on the concept of the social construction of reality (Searle, 1995).

The necessary steps to move towards the case study approach are:

- Define units of analysis
- Define the case study design
- Selecting the case study
- Collecting data
- Analyzing the data
- Conclusions

3.1.1. Unit of analysis

It is critical to think about the unit of analysis when posing research questions. This means defining a phenomenon that happens in a certain context, as said by Miles and Hubermann in 1994. The point is to decide whether one wants to analyze an individual, a process or, for example, the difference between different companies. In this dissertation, the unit of analysis is precisely to analyze the differences in the evolution of the product development process through the introduction of circular practices and collaborations between luxury fashion companies and brands operating in what is now called fast fashion. As the risk of asking questions that cover a very wide area is often present in researchers, it was decided to enclose the case around a context, namely the field of fashion. The definition of boundaries in a qualitative study could be compared to constraints or selection criteria in quantitative studies. In addition, they can also underline the depth of the study.

3.1.2. Case study design

The case study typology to use is determined by the study's ultimate goal. The different typologies have been defined by Stake (1995) and Yin (2002) and are presented in Table 3.1.

Case study type	**Definition**
Explanatory	Answer to a question concerning the hypothesized causal links in real-world interventions that are too complicated to be explained using survey or experimental methodologies. In evaluation language, the explanations would relate program implementation to program impacts (Yin, 2003).
Exploratory	Look at scenarios where the intervention being assessed doesn't have a definite set of results.
Descriptive	Describe a real-life situation in which an intervention or phenomena occurred.
Multiple-case study	Allows the researcher to compare characteristics between cases. The idea is to replicate the findings in different cases. Because comparisons will be made, the instances must be carefully picked so that the researcher can expect similar outcomes across cases or contrasting results based on a hypothesis.

Intrinsic	When the goal is to better understand the case, this strategy should be used by academics who have a real interest in the issue. It is conducted not because the case reflects other cases or shows a specific feature or problem, but because the case itself is of interest in all of its peculiarity and ordinariness.
Instrumental	It is employed for purposes other than comprehending a specific scenario. It elucidates a problem or aids in the development of a theory. The case is of secondary importance; it serves as a tool to aid knowledge of something else. Because it aids the researcher in pursuing the external interest, the case is frequently examined in depth, its circumstances investigated, and its everyday activities documented. The situation may or may not be representative of others.
Collective	Multiple case studies and collective case studies are similar in nature and description.

Table 3.1: Typologies of case study
Source. Yin, 2009

This thesis uses the method of multiple-case studies in order to understand the differences and similarities between different cases, analyzing the data in each situation and across situations. In this way, the research can bring contrasts and similarities to the literature, as well as provide it with additional notes such as theoretical models. Indeed, multiple-case studies guarantee a greater discovery of theoretical developments and research questions. According to Yin's study in 1981, multiple-case studies are appropriate when the same phenomenon has reason to exist in several situations. One of the benefits of using this methodology is that the evidence generated is strong and credible, making it easy for the researcher to clarify whether the results are valuable or not (Gustafsson, 2017).

A distinction can also be noted in terms of case study design. Indeed, Yin distinguishes between holistic and embedded studies in his 2009 research, in addition to emphasizing the distinction between single case and multiple case design (Figure 3.2). A holistic case study looks at cases as a whole. In fact, no logical sub-units are therefore recognized, necessitating an examination of the company's overall culture and strategy. Embedded design, on the other hand, is divided into multiple components, each of which examines each scenario from a unique perspective. The evidence is then assembled to form a complete picture of the outcome (Rowley, 2002).

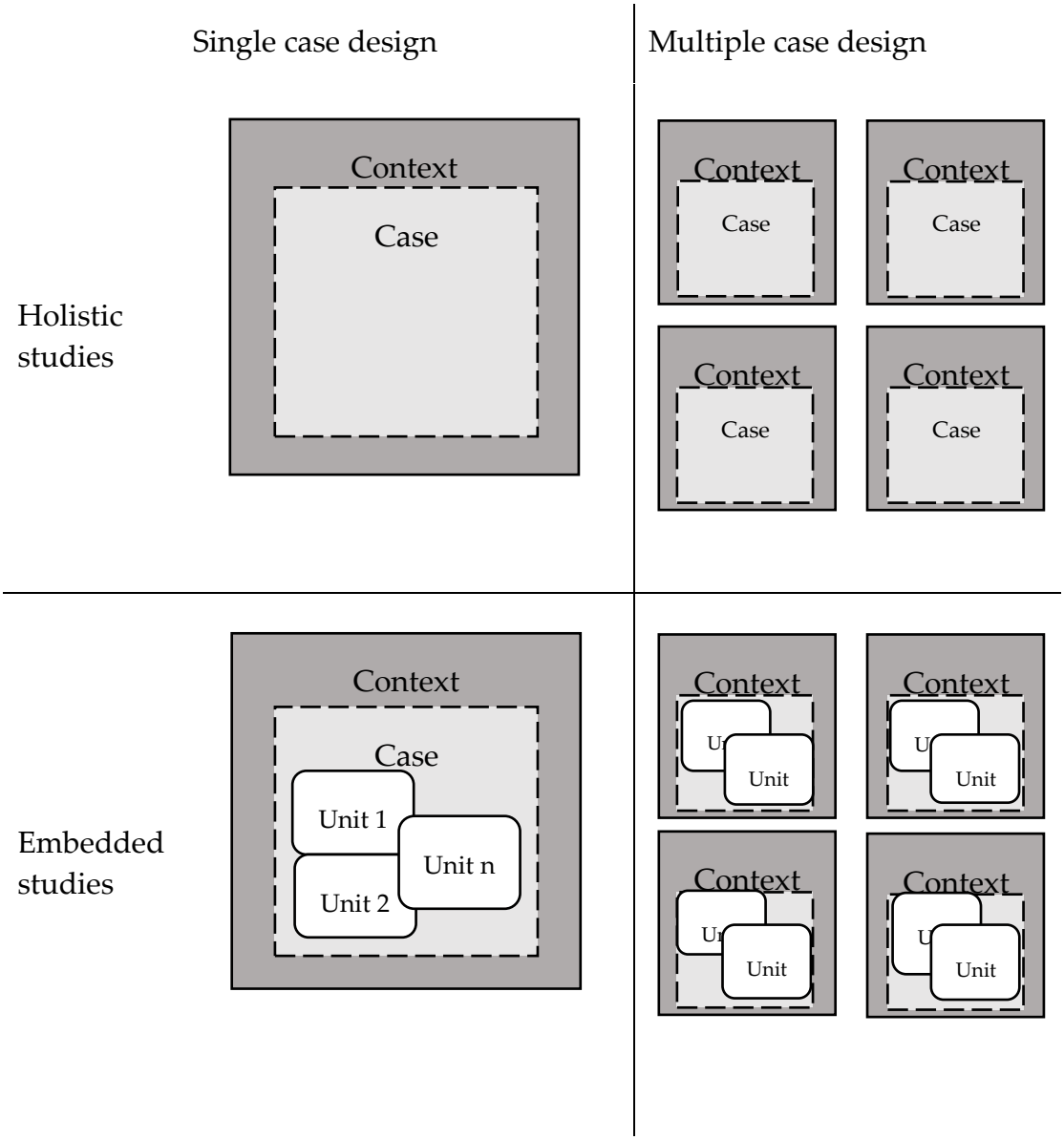


Figure 3.2: Typologies of case study design
Source: Yin, 2009

In the case of this dissertation, the objective is to identify how circular practices impact the different stages of the company's innovation process, namely idea generation, product development and commercialization. Therefore, the embedded method can give a less superficial and more specific view of the sub-units of the innovation process.

3.1.3. Case study selection

The selection of case studies is an important and frequently challenging part of research. Indeed, the ones chosen has the role of representing a much broader population of cases than the case itself. When making the selection it is important to consider

- that the sample is representative
- that there is a useful variation on the theoretical dimension of interest (Seawright et al., 2008).

Yin in 1994 proposed two different strategies for case study selection when there is a multiple design. The first is literal replication, in which the chosen cases are used to predict similar outcomes: in this scenario, three or four cases are chosen. The other type is theoretical replication, in which the outcomes of the selected cases may differ and/or disagree. For this reason, two or three sets of three or four cases each are selected in order to obtain different theoretical patterns and to have a higher degree of certainty of the results. External validation in terms of limited generalization of findings through logic replication is thus achieved. Nevertheless, the replication logic does not guarantee guidelines for the case studies selection (Shakir, 2002). It is then recommended to use the sampling strategies proposed by Patton in 1990. There are sixteen of them (Table 3.2), some more suitable for a single case design and the others more suitable for a multiple case design.

Types of purposeful sampling strategies	**Definition of the sampling strategy**
Extreme case	The case shows uncommon manifestations of the phenomena, such as remarkable successes and failures.
Intensity case	The case has a lot of information, but it's not an extreme situation.
Maximum variation	Despite their differences, cases display essential common patterns that cut across them.
Homogeneous	The variation between cases is minimized, the analysis is simplified, and the research is narrowed.

Typical case	Case illustrates what is typical, normal or average.
Stratified purposeful case	Case depicts features of a specific subset for comparison purposes only, not for generalization or representation.
Critical case	Case that allows for logical generalization to other situations because if it's true in this example, it's most likely true in all others
Snowball	Cases of interest from people who know people who know people who know cases, rich information rich, good examples for study, etc.
Criterion	Cases chosen based on a specified set of criteria
Theoretical	The cases are a representation of a conceptual model that are utilized to investigate and expand on it.
Confirming and disconfirming	Cases that expand on the initial analysis to look for exceptions or test different scenarios
Opportunistic	Cases that arise as a result of following leads in the field.
Random purposeful	Cases are randomly chosen from a large sample to increase credibility rather than for generalization or representation.
Politically important case	Because they are politically sensitive cases, cases are chosen or eliminated.
Convenience	Cases are chosen with the least amount of effort, time, and money. They're potential candidates for low-credibility, information-rich cases.
Combination	Cases are adaptable to various interests and requirements.

Table 3.2: Purposeful sampling strategies and their definitions
Source: Patton, 1990

In this dissertation, the approach called theoretical replication was adopted. As far as the sampling strategy is concerned, it was decided to use intensity cases based on a certain type of criterion. In particular:

- The theoretical replication was chosen because it was possible to give a certain degree of certainty on the results in order to create a theoretical model that could be credible. It was therefore decided to create two sets of cases, those related to fast fashion and those related to luxury brands, each consisting of three cases.
- The intensity cases are useful in order to achieve adequacy in the research, i.e. to demonstrate a fit both in the objective of the research and in the phenomenon of inquiry. It is therefore important that the selected case studies, being only three per set, are rich in information.
- The selection criterion of the cases is based both on the sector, which is precisely that of fashion, but even more important is the fact that the companies are marked by the implementation of CE practices.

The table below (Table 3.3) lists the companies that were interviewed with the description of the brand type with which they identify themselves. Total net sales of the companies in 2020 and data sources are also highlighted.

Company	**Sector**	**Net revenues in 2020 (mln USD)**[3]	**Data source**
GUESS	Fast fashion brand	1876,5	Interview + sustainability report + on-site publications
H&M	Fast fashion brand	20160,07	Interview + sustainability report + on-site publications
Benetton	Fast fashion brand	877,53	Interview + sustainability report + on-site publications
Burberry	Luxury brand	156,1	Interview + sustainability report + on-site publications

[3] Source: Statista

Gucci	Luxury brand	3,714.6[4]	Interview + sustainability report + on-site publications
Stella McCartney	Luxury brand	28,4	Sustainability report + on-site publications

Table 3.3: Description of the participating companies

3.1.4. Data collection

The process for obtaining the desired information for the research was carried out by triangulating data sources. Thus, it was possible to obtain accurate information and robustness in the final results (Anand et al., 2007). The main data sources were:

- Face-to-face interviews using IT tools such as zoom, teams and skype
- Illustrative material, i.e. sustainability reports, publications and newsletters
- On-site observations.

The primary source of information was interviews, when possible. The questions asked were open-ended and semi-structured, in order to give the interviewee the opportunity to speak as freely as possible without restrictions or interruptions. In the absence of some detail, the respondent was asked to provide more details regarding that topic. The interviews were then recorded, transcribed and reorganized in order to understand what information were needed for the research.

Other data sources were required as well (Table 3.3). Because of the variety, a protocol was developed to determine what kind of information were required for the study. The protocol specified, for example, what role the respondent should play within the company in order to provide the material actually needed, or which documents published by the company were useful for the analysis. Standards were defined to make the data more homogeneous from one case to another.

As far as the documents provided by the company are concerned, the one considered fundamental is the sustainability report that companies publish every year. These provide important and precise information on the thesis's topics and, like the interviews, provide a full assessment of the company's vision and aspirations from a long-term perspective.

[4] Kering Full Year Result. Retrieved from: https://www.kering.com/assets/front/documents/Kering_Presentation_2021%20FY%20Results_17022022.pdf

3.1.5. Interview protocol

A protocol was created to provide guidelines and a standard for the interviews. This concerned the process to be followed prior to the interview to introduce our research, what questions to ask during the interview and how to conclude the process.

Regarding the initial procedure, the "engagement" strategy was defined. The initial stage was to determine which companies should be targeted and which departments within those organizations should be contacted. An attempt was made to involve several bodies per company in order to obtain a better overview of the research. Then, for the interviews, the method of contacting the various actors of the selected organizations was decided, which was largely e-mails and LinkedIn. The core message was transcribed to explain the concept of the thesis and the purpose of the interview. In order to ensure honesty in the answers given, all interviewees were assured anonymity if requested. Following a positive response from the contacts, they were provided with a preview of the questions that would be asked and the list of circular practices that were identified in the literature phase, so as to prepare the interviewee for the content.

The actual interviews were then conducted via the IT channels Zoom, Skype and Teams. They were semi-structured and divided into four main phases:

- A first introductory part, where the respondent was asked for an overview of the company from a sustainable point of view and the interviewee's idea about it, and in the same way the main topics of the research were presented.
- In the second step, questions were asked regarding the company's idea of an innovative process prior to the introduction of circular practices.
- In the third step, the questions were like the ones in the previous step, but with a focus on CE, thus identifying the changes compared to a previous phase in which sustainability had not been taken into account.
- In the final step, the participants were asked to analyze the difficulties encountered in introducing circular practices and the forecasts and objectives that the company has set for the future from an environmental-sustainable point of view.

Table 3.4 presents in more detail the various stages that were tried to be carried out during the interviews.

Interview protocol	
1. Introduction	Presentation of the dissertation topics and general introduction of the company from a circular and sustainable point of view
2. Presentation of the innovative process prior to CE introduction	▪ description of the company's innovation process ▪ analysis of the activities carried out in the identified phases of the innovation process ▪ possible involvement of external bodies
3. Presentation of the innovative process after CE introduction	▪ CE introduction into the company's activities and practices implemented ▪ changes in the innovation process after the introduction ▪ involvement of external actors
4. Difficulties and future expectations	▪ difficulties in the introduction of circular practices ▪ expectations on the sustainable evolution of the company

Table 3.4: Interview protocol

3.1.6. Data analysis

"Data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of a study."
(Yin, 1994)

For the data analysis strategy, Miles and Huberman (1984) suggested an analytical method of data analysis, using arrays, displays and tables to show the data after reorganizing the information obtained from the interviews and the reports.

The analysis begins with a data reduction phase, which is the process of selecting, simplifying and transforming the raw data that appear from the notes. Subsequently, the data must be displayed, then assembled to allow conclusions to be drawn. This, together with the previous of reduction, are analytical activities that allow a better understanding of the set of information available for research. The final step concerns conclusions and verification, i.e. giving meaning to what is

shown by the data. This is achieved by noting regularities, patterns, possible configurations and causal flows (Miles et al., 1984).

"Formats must always be driven by the research questions involved and your developing concepts. Formatting determines which variables will be analysed in which ways. If a variable isn't included in the format, it won't get compared with another variable."
(Miles et al., 1994)

It was decided to employ matrices to display and analyze the data obtained. As a result, the condensed content is reorganized using rows and columns in a methodical manner. The matrix is a tabular format for grouping and organizing information so that it can be easily displayed in one location. This makes data analysis easier and allows for future cross-case research with other comparable cases. In particular, the type used in this research is called a meta-matrix, as rows contain multiple rows, and columns contain multiple columns (Miles et al., 1994). These show similar information from different sites. Meta-matrices are very useful when the focus is on data triangulation. To construct the matrix, the steps were as follows:

- Focus on the research questions and main variables, thinking about the available data;
- Make a set-up of the matrix using a text program, i.e. Microsoft Word;
- The variables in the columns and rows were clustered in such a way as to simplify the view, thus creating meta-matrices;
- The summarized and selected data are introduced into the matrix.

The meta-matrix for the study in question was created by placing the different companies that were considered for the case studies on the rows, grouped by their unit of analysis (i.e. fast fashion and luxury brands). The columns, on the other hand, were divided into "practices", i.e. the circular practices that were taken into consideration, and grouped by the stage of the value chain in which they are applied (Table 1.1). Collaborations, namely the partnerships and collaborations that were put in place by the company to implement that particular practice, are placed at the intersections of the matrix. They will eventually represent the junction between the NPD and the implementation of circular practices in the final framework (Table 5.1).

4 Case studies

In the following section, several companies in the fashion industry are examined. The first three, GUESS, H&M, and Benetton, are all fast fashion companies. The latter three, Burberry, Gucci, and Stella McCartney, belong to the luxury fashion industry. A predetermined study model is followed in each case. It begins with a review of the company and its sustainability strategy. The different circular practices are then highlighted at each phase of the value chain. The data has been gathered through interviews and/or a review of corporate reports.

4.1. GUESS? INC.

Guess is an American brand specializing in the production of clothing and accessories. It was founded in 1981 in California by the Marciano brothers. The company was born as denim producer with a particular manufacturing process imported from Europe, the stonewashing. It consists in the appropriate usury of the jeans so that the fabric is more malleable and therefore adapts to the female silhouette. Over the years, GUESS has founded several brands, including Marciano, GUESS Originals, GUESS Jeans USA and a line of Activewear. In 2016, GUESS designed its first collection of environmentally sustainable clothes called SMART GUESS. It mainly focuses on reducing the use of water and chemicals and seeks to adopt sustainable raw materials such as organic cotton, polyester and cellulose.

4.1.1. Sustainability

In order to better understand the strategies implemented by GUESS from a sustainable and circular point of view, an interview was conducted with different entities of the company from different departments. The information obtained was supplemented with data from the GUESS sustainability report for the year 2020/2021.

Entering in detail, since the last years, GUESS has aimed to integrate circularity into its operations and value chain. Therefore, it has set itself several targets to achieve in the next few years, mainly divided into three macro categories:

- To create with sustainable materials: as early as 2022 to have 30% of the global portfolio made up of more sustainable materials, to arrive in 2029 at a value of 100% in the use of recycled or bio-based polyester for all brands.
- To be part of the climate solution: this consists of announcing a roadmap to achieve Science Based Targets (SBTs)[5] as from 2021. They show companies how much and how fast they need to reduce their GHG emissions to keep the global temperature increase below 1.5 degrees Celsius. The goal is to achieve a 50% reduction in greenhouse gas emissions and, for the supply chain, a 30% reduction, by 2030.
- Optimize fashion with minimal waste: by 2023, achieve circular products for every major category in collections and have 100% of accessories and 50% of ecommerce shipments recycled or with recycled packaging.

4.1.2. CE practices in GUESS's value chain

4.1.2.1. Material sourcing

The circularity of products at GUESS starts with the careful selection of raw materials. GUESS's suppliers play a key role since, while the company designs the garments, suppliers manufacture and distribute the finished goods. And it is precisely in this phase of supplier selection where the first circular practice is found, what is called *diversity and cross-sector linkages*. GUESS takes a proactive approach in educating its suppliers through a code of conduct, in order to prevent misunderstandings from a social and environmental point of view. In this way, an insight and transparency in sourcing policies is guaranteed, encouraging the use of raw materials produced with a higher environmental standard.

For the last collections, the most used materials to produce clothes and accessories have been cotton (60.2%), synthetic materials such as polyester, nylon and spandex (28.3%), and manmade cellulose, i.e. viscose or rayon, modal and lyocell (9.8%) (Guess, 2021). The following materials are mentioned in the sustainable sourcing policies:

- Responsible cotton: GUESS aims for the inclusion of Better Cotton through the Better Cotton Initiative (BCI)[6], organic cotton and recycled cotton.

[5] The Science Based Targets Initiative (SBTi) encourages private sector climate actions by encouraging businesses to set science-based emissions reduction goals.
[6] BCI is a non-profit multi stakeholder governance organization that works to improve cotton cultivation and practices.

- Synthetic: it includes recycled fibers in products such as Polyester, Repreve (made from PET) and Tremore for sports products.
- Manmade cellulose: GUESS creates partnerships to source material from sustainably managed forests, closed loops and through innovative material sources. One of these is Canopy[7], through which it is able to trace the origin of viscose materials.

In this way GUESS can implement a further circular practice in the sourcing of materials, *green procurement*. GUESS obliges its suppliers to buy materials that are so-called nominated, i.e. certified by the company from a sustainable point of view.

4.1.2.2. Design

The design phase is perhaps the most impacted by CE innovation across the whole value chain. This is because each designer must consider specific images, sustainable products and procedures.

Starting from 2019, GUESS has started a project with the EMF called Jeans Redesign, which brings together different actors in the fashion industry to put CE into action. The project focuses mainly on the production of jeans and the aim is to extend their product's life cycle. Indeed, the materials used are more easily repairable and can be dismantled into different components so that they can be reintroduced into the production loop as new raw materials. Through this initiative, GUESS is able to implement two fundamental circular practices that are linked to the value chain design step. These are *design for disassembly/recycling* as regards the recovery of materials such as removable buttons, and *eco design*, since all the jeans produced have a strictly sustainable focus, starting with the selection of materials.

During its life cycle, a pair of jeans consumes over 2,700 liters of water and uses chemicals that are then released into the environment. Therefore GUESS, through the introduction of the *reduction* practice, pays particular attention to the management of water and chemicals. In particular, most of the water saving takes place in the laundry phase. Among the various innovative methods introduced by the company to reduce the use of water and chemicals are:

- Ozone with e-flow for fabric softening. The e-flow technology allows processing with nano particles, using less water and producing zero waste
- Laser treatment to destress the denim

[7] Canopy is a non-profit environmental organization that seeks to safeguard the world's ancient and endangered forests while also collaborating with businesses throughout the world to restructure unsustainable supply chains.

- Stonewashing with reusable stones
- Cleaner yarn and fabric dye processes
- Modern print processes such as digital printing and water-based ink.

The sustainable raw materials mentioned in the previous paragraph also contribute to reduced water consumption, such as organic cotton or recycled polyester. In the men's collection, a technique for dyeing trousers called ''Dry Indigo'' has been introduced. The fabric does not consume any water, instead it is dyed with a foam that is directly sprayed onto the fabric.

GUESS has also decided to introduce the EIM score developed by Jeanologia[8] (Figure 4.1) in its strategy to measure the company's impact from an environmental point of view: water consumption, energy consumption, use of chemicals and worker welfare. For each of these categories a score is calculated based on performance and they receive a final score corresponding to three colors. If the color is green the impact is low, if orange medium, otherwise if it is red the category has a high impact on the environment. GUESS, already several years ago, banned the production of all clothes belonging to this last group.

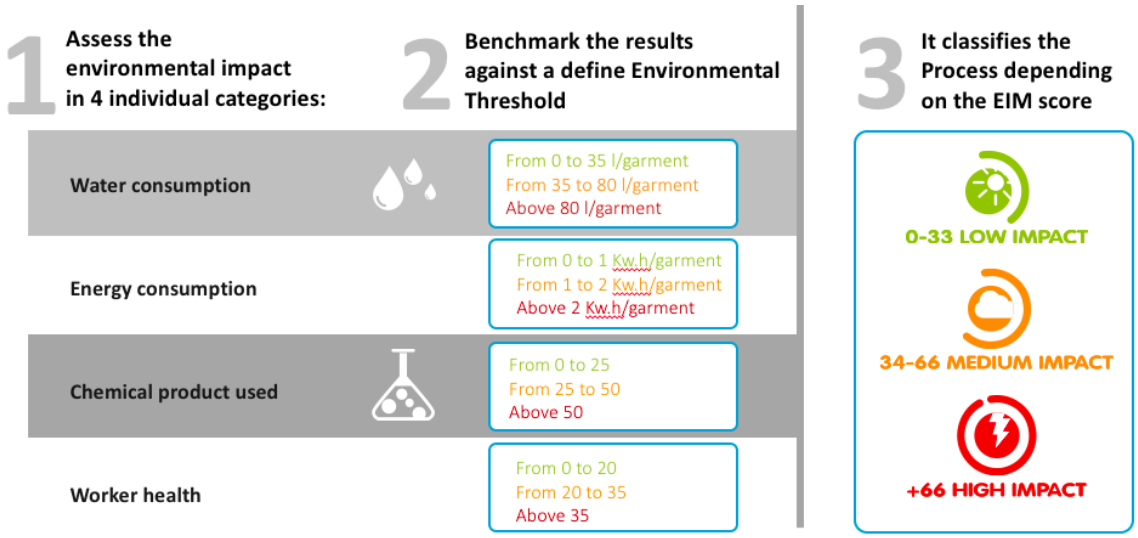


Figure 4.1: How the EIM score works
Source: www.jeanologia.com

[8] Jeanologia is a sustainable textile solutions firm that develops technology and environmentally friendly manufacturing processes with the goal of revolutionizing the textile industry.

4.1.2.3. Distribution & sales

GUESS works in order to reduce waste also from a packaging point of view. GUESS uses reusable bags and recycled paper for the packaging of the different products. The accessory boxes are certified by the Forest Stewardship Council (FSC)[9] and are printed with sustainable inks. Polyvinyl chloride, which is a common material from which the packages are made, has been banned by the company. The practice that best describes this behaviour is *optimized packaging design*.

Also, from the perspective of distribution and sales, but which could also be associated in the value chain with consumption and use, the practice of *redistribution and resell* is identified. This is done through a programme implemented by GUESS called GUESS Vintage. Key authentic pieces sold from 1981 to 1999 from all over the world have been made available to customers to encourage reuse and recycling of garments without the use of new raw materials for production. To promote the launch, the company has opened an outdoor Guess Vintage Seeding Suite (*logistics/infrastructure building* practice from collection and disposals) near its US headquarters and made the products available on their US website.

4.1.2.4. Consumption and use

In addition to the aforementioned *reuse* practice in which GUESS is committed to extending the life cycle of certain products, the company implements a further circular practice in product consumption and use. Through *eco-labelling*, GUESS informs the customer that the product complies with sustainable standards. The clothes, especially the jeans, subscribe to certain minimum requirements defined year by year upwards by the product development team, called Product Guide. In addition, third-party companies provide sustainability certifications related to products and raw materials used in manufacturing (Table 4.1). If the different products meet the requirements and sustainability certifications, they will be able to obtain the Guess ECO tag.

[9] The Forest Stewardship Council (FSC) supports environmentally friendly, socially desirable, and economically feasible forest management around the world.

MATERIAL	TYPE	CERTIFICATION
ORGANIC	ORGANIC COTTON ▪ No pesticides ▪ Safer for people	Organic Content Standard (OCS)[10] or Global Organic Textile Standard (GOTS)[11]
RECYCLED	RECYCLED COTTON ▪ Reduces waste ▪ Conserves natural resources RECYCLED POLYESTER & RECYCLED NYLON ▪ Reduces waste ▪ Reduces carbon emissions	Global Recycled Standard (GRS) or Recycled Claim Standard (RCS)[12]
RESPONSIBLE	TENCEL™ LYOCELL & MODAL - LENZING ECOVERO™ VISCOSE ▪ Made from renewable wood sources ▪ Sustainably managed forests protect ecosystems ▪ Lower emissions and less chemicals TENCEL™ LYOCELL WITH REFIBRA™ TECHNOLOGY ▪ Uses recycled cotton from industry cutting scraps	None

Table 4.1: GUESS ECO material
Source: https://www.guess.eu

[10] OCS is a voluntary international standard that establishes rules for third-party certification of certified organic input and chain of custody. The OCS's purpose is to boost organic agriculture production.
[11] GOTS is a non-profit certification that is advocated by prominent international organic farming organizations in order to assure responsible and sustainable textile production.
[12] RCS and GRS are voluntary international standards that establish requirements for third-party certification of recycled input and chain of custody. The standards have the same purpose in mind: to increase the usage of recycled materials.

4.1.2.5. Collection & disposal

The main practice identified at this stage of the value chain is *take-back and trade-in systems*, in which customers bring back products to be reworked to produce others. GUESS, in fact, has launched a take-back program called RESOURCED, in which customers are encouraged to return unwanted clothing to their stores for recycling. This is done through a partnership established with I:Collect (I:CO), a well-known global solutions provider and developer in the areas of old clothes and shoe collecting, reuse, and recycling (I:CO, n.d.). This ensures that the items are valuable even after a consumer has done wearing them, rather than ending up in landfills as waste. The partner company specializes in denim recycling, producing not only new clothes but also dog beds, bags, blankets, and cushions, as well as materials for music studio insulation. As a result, they are helping the environment by manufacturing something with products that already exist. The program is offered in all stores in the United States and GUESS had planned to expand the take-back program to Europe in 2020; however, this has been postponed because of the Covid-19 pandemic.

4.1.3. Collaboration

Collaboration with different stakeholders plays a key role in the whole value chain in order to move from a linear to a circular business model. GUESS has created a network with different partners to create strategic changes from a sustainable point of view for the company. Indeed, the main principle of this model is the circulation of information across the boundaries of the company, both from the outside to the inside and vice versa.

GUESS has started several collaborations to take advantage of sustainable best practices and guidelines in the textile and apparel industries. The relationship with the BCI, through which GUESS has employed Better Cotton for 13% of its output, is one of the most notable.

By taking part in the Jeans Redesign initiative, GUESS became a member of the EMF. Through this project, brands are urged to create jeans based on CE concepts, following the foundation's requirements (Table 4.2). In this way, jeans can last longer, be more easily recycled, and be produced in a more environmentally friendly manner. However, the guiding principles are founded on the bare minimum of durability, material sustainability, recyclability, and traceability. Since summer 2021, GUESS has started selling the first jeans designed for this initiative in Europe (Ellen MacArthur Foundation, 2021).

<table>
<tr><th>Jeans are used more</th><th>Jeans are made to be made again</th><th>Jeans are made from safe and recycled or renewable inputs</th></tr>
<tr><td>Designed and created to last longer
Durability of at least 30 washes</td><td rowspan="2">Design and produce jeans that can be disassembled, remade or recycled
include at least 98% cellulose fiber in all textile composition
use yarns made from cellulose (optional)
all components shall be easily disassembled</td><td rowspan="2">Production is safe for people and the ecosystem
made with chemicals that comply with ZDHC-MRSL[13]
the use of conventional electroplating, stone finishing, potassium permanganate and sand blasting are forbidden
mills apply the DHC Wastewater Guidelines[14].
the maximum water volume use in production is 30 L/m</td></tr>
<tr><td>Providing the customer with tools and services to maintain the physical and emotional appeal of the product
Providing information on how to take care of the jeans</td></tr>
<tr><td>Making jeans available through services and business models that keep jeans at their maximum value, such as rental and resale</td><td>Jeans are collected and sorted for reuse, reworked or recycled
make recyclable jeans easily recognizable</td><td>Made from renewable or recycled materials
the source of cellulose fibers was produced by regenerative, organic or transitional methods
include at least 5% recycled content in the fabric composition</td></tr>
</table>

Table 4.2: Jeans Redesign Guidelines
Source: Ellen MacArthur Foundation, 2021

[13] Zero Discharge Of Hazardous Chemicals Manufacturing Restricted Substance List – list of chemical substances banned from intentional use in facilities that process textile materials.
[14] See ZDHC Wastewater Guidelines V1.1

Finally, the Textile Exchange relationship is recognized as critical for the transition toward a circular business model. This is a non-profit association that develops, manages and promotes business standards and collects and publishes data to help brands measure, manage and track their use of sustainable fibers and materials. In this way GUESS is able to keep track of the sustainable certifications of sustainable materials used in production (Textile Exchange, n.d.).

GUESS also supports supplier training programs to overcome difficulties in sourcing sustainable materials and products. The training begins with onboarding, during which each new supplier is carefully briefed on the company's requirements and expectations. Then, in order to attain the optimum performance throughout the relationship, specific training on certain activities is provided.

The relationship with I:CO is the most recent sort of collaboration that GUESS has established to implement CE. GUESS has been able to implement a product take-back program as a result of this. Before reaching the final goal of recycling materials, the company goes through various processes (Figure 4.2). It all starts with the collection, in which customers return their old garments to retailers' stores, in this case GUESS stores in the United States. The clothing is then manually sorted and categorized in a sorting step, followed by a circulation phase. Innovative ideas involving textile-to-textile or closed-loop recycling are encouraged to implement circular processes. In closed loop recycling, non-wearable objects stay in the textile industry and are utilized to manufacture new clothing or shoes. In textile-to-textile, the fibers that are recovered are spun and reintegrated into the supply chains of the I:CO partners (I:CO, n.d.).

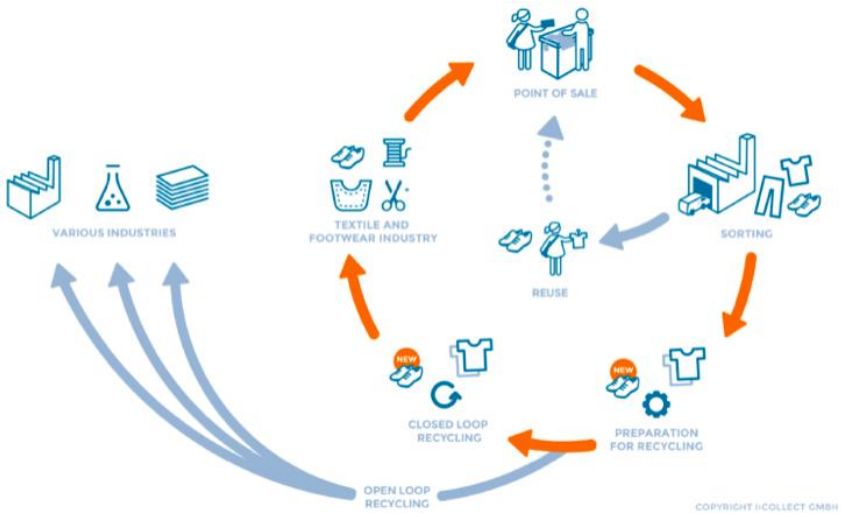


Figure 4.2: I:CO services
Source: https://www.ico-spirit.com/en/services/

4.1.4. Practices in the NPD framework

CE practices for GUESS have been classified according to the company's value chain (Table 4.3).

Value chain	Practice	Description
Material sourcing	Diversity and cross-sector linkages	Supplier selection and education through the Code of Conduct.
	Green procurement	GUESS helps suppliers in the selection of sustainable/certified raw materials that reduce environmental impacts; use sustainable materials such as recycled materials, BCI cotton, repreve, Tremore, polyester for sports products, manmade cellulose.
Design	Design for disassembly/recycling	Extend the jeans' life cycle recovering materials (EMAF's Jeans redesign).
	Eco design	Jeans are produced with a sustainable focus (EMAF's Jeans redesign).
	Reduction	Innovative practices to save water and reduce the use of chemicals (e-flow technology, laser treatment, stonewashing with reusable stones, cleaner yarn and fabric dye processes, digital printing and water-based ink); Dry Indigo.
Distribution and sales	Optimized packaging design	Products packaging are made in a sustainable way; FSC-certified paper.
	Redistribution and resell	Guess Vintage program.
Consumption and use	Eco-labelling	Guess ECO tag; material certifications (OCS, GOTS, GRS, RCS).
Collection and disposal	Logistics/Infrastructure	Guess Vintage Seeding Suite.
	Take-back and trade-in system	RESOURCED programme and I:CO.

Table 4.3 CE practices implemented by GUESS broken down by the different steps of the value chain

4.2. H&M

H&M is an innovative, customer-centric, and responsible fashion company. Founded in Sweden in 1947, H&M is nowadays one of the world's leading fashion firms that offers the best value for money while still being environmentally friendly. H&M is part of H&M Group that includes eight brands: H&M, COS, Weekday, Monki, H&M Home, & Other Stories, ARKET and Afound, with 153.000 employees and about 5.000 stores in 74 markets. Even if each brand has its specific characteristic and strategy, they are all united by a common goal: to make fashion more sustainable. H&M Group's vision is to make fashion accessible to all, allowing customers to express themselves through fashion and design while also opting for a more environmentally friendly lifestyle. H&M's concept has changed with the introduction of sustainability from *''fashion and quality at the best price''* to *''fashion and quality at the best price in a more sustainable way''*.

4.2.1. Sustainability

An interview was performed in order to gain a deeper understanding of H&M's strategies from a sustainable and circular perspective. The information gathered was complemented with data from the H&M 2020/2021 Sustainability Performance Report.

The brand's mission is *''to lead the change towards circular and climate positive fashion while being a fair and equal company''*[15]. H&M has a long-term goal of becoming a completely circular business that is climate positive and with a net positive impact on biodiversity by 2040. It is working to create an ecosystem that includes circular products (recyclable or sustainably sourced products that can recirculate multiples times), circular supply chain (fueling systems that recirculate products) and circular customer journeys.

The entire business is focusing on two key points in order to maximize its impact and improve sustainability performance in value chain: innovation and transparency (Table 4.4).

[15]See https://hmgroup.com/sustainability/leading-the-change/goals-and-ambitions/

Innovation	Transparency
New business models and ventures: H&M develops new products/services to increase usage and provide a variety of ways to access fashion (repair, reuse, etc.).	*Empowering informed choice:* the company provides customers with information about products' affects and journey, as well as inspiring and rewarding sustainable behavior.
New materials and processes: the company partners with startups and invests in firms that develop technology and software (H&M CO: LAB).	*Accelerating sustainable change in business and industry:* the company increases transparency in order to create accountability, comparability and opportunities for collaboration.
Digital transformation: H&M invests in 3D tools, AI and algorithms.	
Future of work: the company collaborates and innovates in a way that creates inclusive workplaces and contributes to a more varied society.	

Table 4.4: Key points in H&M's sustainable strategy
Source: H&M's Sustainability Performance Report 2020

4.2.2. CE practices in H&M's value chain

4.2.2.1. Material sourcing

In the initial step of H&M's supply chain suppliers are crucial in order to reach sustainability goals. H&M does not have its own factories and instead outsources production: it designs products, which are then produced and delivered by suppliers. The organization has a strong local presence in sourcing markets, which has resulted in excellent supplier relationship. In this way, it's important to educate suppliers about circularity and collaborate with them to discover sustainable solutions. Through the Code of Ethics for Business Partners and the Sustainability Commitment, H&M takes a proactive approach to train its suppliers. The Sustainability Commitment was developed with the purpose of incorporating sustainability into all global business partnerships and working closely with suppliers and business partners to achieve long-term benefits throughout the value chain. The first circular practice, *diversity and cross-sector linkages,* is identified during the supplier selection step.

Regarding material selection, the main natural and sustainable materials used by H&M are mentioned in Table 4.5.

Material	Description
Cotton	H&M uses organic cotton, recycled cotton, that comes from old garments, and cotton source through the BCI.
Wood-based materials	H&M produces some products and packaging made of FSC certified materials or using fibers from alternatives sources like agricultural residuals and by 2025 it aims to cover all products and packaging.
Man-made cellulosic (MMC) fibers	By 2025, H&M aims to source only MMC fibers that are recycled or FSC-certified sources. It is part of Textile Exchange and Forum for the Future's MMC Fiber Brand Round Table in order to harness the potential of MMC fibers to offer recyclable fabric and thread options.
Wool, cashmere, down & mohair	By 2025, H&M aims to source only wool from farms certified to the Responsible Wool Standard (RWS)[16] and only cashmere from farms certified to the Good Cashmere Standard (GCS)[17], or will replace cashmere with other non-animal fibers. The company is a member of Responsible Cashmere Round Table[18]. It has sourced all virgin down from farms certified by the Responsible Down Standard (RDS)[19] since 2016, and all mohair from farms certified by the Responsible Mohair Standard (RMS)[20] since 2020.
Leather	By 2025, leather will be chrome-free and originate from responsible sources. The company are trying to discover alternative materials, like bio-based materials. It is member of the Responsible Leather Round Table[21].

Table 4.5: Natural materials sourced by H&M
Source: H&M's Sustainability Performance Report 2020

[16] The wool is sourced from responsibly managed farms that fulfill high animal welfare and environmental impact criteria and retain traceability throughout the production process.

[17] Independent standard for sustainability certified cashmere.

[18] It is a neutral space for stakeholders with a keen interest in the cashmere industry's long-term viability to study, talk, and comprehend, as well as provide coordinated input into the solutions being produced.

[19] It guarantees that down and feathers are sourced from animals that have not been harmed.

[20] It addresses the welfare of goats and the land they graze on.

[21] It is a platform that brings stakeholders together to promote the adoption of measures that will result in measurable reductions in carbon emissions from tier 4 while also advancing animal welfare and worker fairness.

By 2030, H&M wants all its products to be recycled or sourced in a more environmentally friendly way. Indeed, the company is creating a lot of collaborations to reach this goal. H&M teams up with Danone AQUA on the bottle2fashion project, transforming wasted plastic bottles from Indonesia into recycled polyester and reducing the consumption of virgin raw materials. It also has created a partnership with Renewcell, in order to increase the use of Circulose material made from recycled cotton waste. Renewcell is a textile recycling company created with the aim of changing the global textile industry[22].

Moreover, H&M has adopted a lot of new sustainable materials, that helps the company to reduce the usage of water, pesticides and that reduce waste. Examples of natural materials are Lyocell, Vegea, EVO by Fulgar, Desserto, ECONYL, and Flwrdwn (*See Appendix B*). In order to find and test innovative sustainable materials, the company has collaborated with Bioextrax[23], testing bio-based, biodegradable substitutes for polyurethane foams, and has joined in the European Union projects DEMETO[24] and New Cotton[25].

H&M is clearly capable of implementing a circular approach for material procurement, the so-called *green procurement*, in which the corporation forces its suppliers to purchase materials that have been certified as sustainable by other companies.

The second practice discovered in this first supply chain's step is *life cycle assessment (LCA).* Materials are carefully evaluated using third-party validated lifecycle assessment data as well as external material benchmarks, such as the Sustainable Apparel Coalition's Materials Index (SAC) developed by a global multi-stakeholder fashion industry non-profit alliance (Sustainable Apparel Coalition, n.d.). It is composed by a set of different tools that verify the environmental impacts of products and of supply chain in general, such as the Higg Facility Environmental Module (FEM) or the Higg Materials Sustainability Index (MSI). *LCA* allows to evaluate and improve the environmental impact of products.

[22] See https://www.renewcell.com/en/section/about-renewcell/
[23] Company that develops bio-based technologies, accelerating the transition to a sustainable global economy.
[24] The DEMETO project aims to enable chemical depolymerization of PET on an industrial scale using a microwave-based process.
[25] Textile waste will be collected, processed, and regenerated into cellulose-based textile fibers over the course of three years. The fibers will be utilized to make a variety of fabrics for clothes that will be designed, manufactured, and marketed by international companies.

4.2.2.2. Design

Design is the first step toward circularity. As previously mentioned, the company aspires to make long-lasting items out of safe, recyclable, and sustainably sourced materials. H&M's design team is made up of a large number of experts who plan and produce collections for all seasons, completing a two-fold design process that involves developing collections a year in advance and collecting real-time design feedback as a consequence of a customer-driven product strategy. To make sustainable choices more visible, the organization must collaborate with customers to better understand their needs, difficulties, and desires. Indeed, they incorporate the *customization/made-to-order* procedure. H&M performs a large number of pilot projects and interviews. For example, they polled 3,630 customers in Germany, Japan, Russia, Sweden, the United Kingdom and the United States to discover more about their views on circular fashion models, such as buying used clothes and repurposing garments. H&M has also launched the H&M Lab, a new digital platform where it displays its latest services, products, and innovations (currently available only in Germany). The company can see which products/services have the greatest approval rates and which are particularly well appreciated by clients. The goal is to provide products and services that people will enjoy while also contributing to a more sustainable future (Martinez, 2019).

There are a lot of initiatives and projects recently developed by the company that can be associated with *eco-design*, *design for disassembly/recycling* and *reduction* practices. In particular,

- *Design for disassembly/recycling*, *eco-design* - In 2021, H&M launched a new collection called Innovation Circular Design Story. It was created with Circulator, a design tool that helps the design team to think about all stages of the garment development process, from estimated lifetime to materials and design concepts. Using this technology, users can receive advise on which materials, components, and design strategies are best for projecting their items based on the garment's purpose, considering frequency, duration, activity, and product access model. Then, from materials to fabric treatments, all of the components are evaluated for their environmental impact, durability, and recyclability.
- *Reduction* - H&M collaborates with the EMF to rethink denim designs and production. They've presented their first men's denim designs, which adhere to the EMAF's Jeans Redesign Guidelines. These jeans are 100% recyclable and made with safer chemicals using the Screened Chemistry technique. The denim fabric is created using a combination of organic cotton (up to 35%) and water- and energy-efficient dyes, reducing the chemical usage.

- *Design for disassembly/recycling* - the Green Machine, developed by HKRITA[26] with support from the H&M Foundation, is another noteworthy endeavor. It is the first technique in the world that can recycle mix textiles on a large scale without sacrificing quality. The machine only utilizes heat, water, pressure, and a biodegradable green chemical. It is modular and produces no secondary pollutants because it is a closed loop. This machine is the first in-store recycling system that transforms worn clothes into new ones. Loop shreds old clothing and makes a new one from the old fibers in just eight processes: cleaning, shredding, filtering, carding, drawing, spinning, twisting, and knitting.

4.2.2.3. Manufacturing

From the analysis, the main practice in manufacturing phase is *energy efficiency*. The company aims to set the standard for energy efficiency by employing 100% renewable energy in all of its operations. By the end of 2020, many H&M's supplier factories participated in energy efficiency programs. H&M is member of RE100 group[27] and it uses about 90% of renewable electricity purchased for operations.

4.2.2.4. Distribution and sales

H&M is attempting to reduce waste also in terms of packaging. The company is seeking to eliminate harmful components (e.g. single-use plastics), implement circular design and more sustainable materials, and reuse and recycle packaging to lessen their environmental impact. H&M's packaging goals are (H&M's Sustainability Performance Report, 2020):

- Reduce packaging across value chain by 25% by 2025
- Design 100% of packaging to be reusable, recyclable or compostable by 2025
- Make 100% of packaging from recycled materials by 2030
- Reuse or recycle 100% of packaging waste from own sites by 2025.

The company has created a novel e-commerce packaging method that replaces single-use plastic with FSC-certified paper. It also experiments new ways to eliminate unnecessary plastic, such as electronic labeling, removing the wrapping off underwear and socks, and covering beauty products with non-plastic alternatives. The business collaborates with the EMF, signing the New Plastic

[26] The Hong Kong Research institute of Textiles and Apparel.
[27] Global project bringing together the world's most powerful companies aspiring to 100% renewable energy.

Economy Global commitment[28], and is a member of the Fashion Pact[29]. H&M also collaborates with Pack4Good[30] to eliminate paper-based packaging fiber sources from ancient and endangered forests, reducing the amount of material required. These partnerships help the company to reach its sustainable goals by creating more environmentally friendly packaging. The practice that best fits these initiatives is *optimizes packaging design*.

Still from the perspective of distribution and sales, the practice of *redistribute and resell* has been identified. H&M launched the Garment Collecting project in 2013, which entails bringing all textile items or worn garments from any brand and in any condition to the stores. Then, the collected goods are divided into re-wear (good condition garments are sold as second-hand), reuse (textile products that are no longer wearable are converted into other products) and recycle (everything else is shredded into textile fibers). Through this project, H&M gathered 29,005 tonnes of textiles for reuse and recycling in 2019, which is almost 145 million T-shirts.[31]

4.2.2.5. Consumption and use

Transparency is achieved through disclosing relevant, accurate, and accountable information about the supply chain, business processes, and products[32]. It facilitates clients in comprehending the company's and items' backstories, as well as the company's development of trust and accountability relationships. This refers to the *product labelling* practice. The company is beginning to reveal how and where its products are made wherever possible. If the information is available for a certain product, it can be found under the new "Product Sustainability" section on the product's page. Consumers scan the price tag with the App's scan feature: if the item is available online, the Product Sustainability data can be found.

H&M applies also the Higg Index Sustainability Profile[33] on a limited range of products. Each product is given a score based on the environmental effect of the resources used to make it. Customers benefit from enhanced transparency and the capacity to make more educated purchasing decisions by receiving detailed information on the effects of water usage, global warming, fossil fuel use and water pollution on each product. These actions refer to *eco-labelling*.

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[28] More than 500 organizations have signed the Global Commitment, which promotes a CE for plastics.
[29] The Fashion Pact brings together a coalition of leading global fashion all committed to a set of shared goals focused on three main areas: halting global warming, restoring biodiversity and protecting the oceans.
[30] Canopy's initiative to support green packaging.
[31] See: https://hmgroup.com/sustainability/circular-and-climate-positive/recycling/
[32] See: https://hmgroup.com/sustainability/leading-the-change/transparency/
[33] Self-assessment standard for the clothing and footwear industry to assess environmental and social sustainability throughout the supply chain.

4.2.2.6. Collection and disposal

Customers are rewarded for their sustainable behavior with a 10% discount on their next purchase, incentivizing them to return their old things. This began in Sweden, where the H&M brand introduced Conscious Points, a new component of the current H&M membership scheme that compensates customers for taking more environmentally friendly acts such as using clothing recycling facilities. This is a clear example of *incentivized recycling* practice.

Another essential practice is the *take-back and trade-in system*, which is related to the Garment Collecting project previously discussed: it entails bringing all textile products or used clothing of any brand and in any state of wear to the shops.

4.2.3. Collaboration

Stakeholders, partnerships, and collaborations are crucial in order to move from a linear to a circular business model. H&M does not only collaborate with policymakers, academics and researchers, peers, innovators, investors, multi-stakeholder initiative, and non-profit groups, but also with business partners, such as suppliers, employees, and customers. By joining a variety of organizations and activities, H&M is able to boost its impact, learn, and collaboratively create change.

As previously mentioned, regarding the sourcing of sustainable materials, H&M collaborates with the Textile Exchange, with Bioextrax and with the Microfiber Consortium[34]. H&M also collaborates with Canopy and SAC, with the aim of improving the environmental impact of apparel and footwear products.

As regards the reduction of polluting and environmentally harmful chemicals, H&M is a member of Zero Discharge of Hazardous Chemicals to address the issue of hazardous chemicals in the worldwide textile and footwear value chain[35] .

One of H&M's primary objectives is to become climate positive by 2040, such as reducing absolute scope 1 and 2 greenhouse gas (GHG) emissions by 40% by 2030 and expanding annual renewable electricity sourcing to 100% by 2030. In this sense, the company collaborates with EP100 and RE100, global initiatives that urge important firms to double their energy productivity as part of global efforts to transition to a net-zero economy.

In the end, in order to move from a linear to a circular model and to design and produce in a more sustainable way, the main important collaborations are with

[34] It helps the textile industry create effective solutions to reduce fiber fragmentation and release to the environment during manufacturing and the product life cycle.
[35] See: https://www.roadmaptozero.com/about

EMF, I:CO, HKRITA and Stockholm Resilience Centre (SRC). The last is an international research center on resilience and sustainability science: its goal is to improve research on social-ecological system governance and management so that ecosystem services may be provided for human well-being and long-term sustainability[36]. H&M collaborates with the SRC as part of research effort with the EMF to develop a circular fiber system that functions within planetary boundaries.

4.2.4. Practices in the NPD framework

CE practices for H&M have been classified according to the company's value chain, and these are summarized in the table below (Table 4.6).

Value chain	Practice	Description
Material sourcing	Diversity and cross-sector linkages	Supplier selection and education through the Code of Ethics for Business Partners and the Sustainability Commitment.
	Green procurement	H&M helps suppliers in the selection of sustainable raw materials/certified raw materials that reduce environmental impact; use of sustainable materials: BCI cotton, Lyocell, Vegea, Evo By Fulgar, Desserto, Flwrdwn, MMC fiber, organic cotton, wood-based material, wool, cashmere, down and mohair.
	LCA	H&M evaluates materials using third-party verified lifecycle assessment data and external material benchmark: SAC's Materials (Higg Index).
Design	Customization	Pilot project and interview; H&M Lab.
	Design for disassembly/ recycling	Extend the product' life cycle recovering materials; the Green Machine; Circulator; the EMAF's Jeans redesign guidelines.
	Eco design	Production with a sustainable focus; Circulator.
	Reduction	Innovative practices to save water and reduce the use of chemicals; EMAF's Jeans redesign guidelines and the Screened Chemistry process; the Green Machine.

[36] See: https://www.stockholmresilience.org/

Manufacturing	Energy efficiency	100% renewable energy.
Distribution and sales	Optimized packaging design	Sustainable packaging; FSC-certified paper.
	Redistribution and reuse	Garment Collecting project.
Consumption and use	Product-labelling	Product Sustainability section.
	Eco-labelling	Higg Index; Material certifications (GCS, FSC; RDS).
Collection and disposal	Incentivized recycling	10% discount.
	Take-back and trade-in system	Garment Collecting project.

Table 4.6: CE practices implemented by H&M broken down by the different steps of the value chain

4.3. BENETTON

Founded in 1965 by the Italian Benetton family, today the Group is a leading fashion retailer, present all over the world with over 4000 stores. Benetton Group is formed by United Colors of Benetton, Undercolors of Benetton and Sisley. For this analysis, it has been considered the Group in general.

Through the union between Italian creativity and global research, the company offers style and quality garments while respecting the environment. It is a flexible company, built on the continuous search for innovation, through constant revolution of point of sales, a unique commercial network and universal communication. It is a modern casual chic style ambassador, deeply rooted in its Italian heritage and its DNA of color and knitwear. The points of sale are modular environments, designed in such a way to ensure that the collections, together with their colors and design, can be adapted more and more quickly to the demands of consumers (Benetton Group, n.d.).

4.3.1. Sustainability

An interview was conducted, and the information gathered was complemented with data from the Benetton Group 2020/2021 Integrated Report.

Benetton has always based its value on the concept of sustainability, aiming to become an increasingly circular company. Its ambition extends all the way from the selection of sustainable raw materials to the reduction of the environmental effect of operations throughout the whole production chain, with the goal of generating virtuous processes that progressively seek a CE.

- 80% fibers of natural origin for collections
- Elimination of chemicals
- Energy efficiency and sustainable packaging
- Extension of products' life cycle

4.3.2. CE practices in Benetton's value chain

4.3.2.1. Material sourcing

Currently, 80% of Benetton's materials are eco-friendly: they are of natural origin, recycled, regenerated, or certified by international organizations. Furthermore, about half of the products are mono fiber, making recycling easy.

Indeed, suppliers are critical to the company's success. They are chosen not only based on quality and competitiveness, but also on social, ethical, and environmental considerations. Suppliers must follow the Code of Conduct, which is based on respect for human rights and environmental preservation. In accordance with the objective of supervising its suppliers

- Benetton Group monitors almost 80% of wet process wastewater testing program, which is carried out by requesting suppliers to execute tests in accordance with the ZDHC Wastewater Guideline.
- From 2018, the Company has embraced the Higg Index. Benetton Group can use the Higg FEM to examine the suppliers involved in wet process production. It consists of about 80 questions to track a variety of operations (e.g., the adoption of environmental management systems, the use of water and energy, waste management, emissions into the atmosphere, and chemical use). The brand does not undertake follow-up visits or audits, but the supplier participates in a year-round process of continual improvement and openness.

The first circular practice, namely *diversity and cross-sector linkages*, is discovered in this first phase of the value chain. The company promotes cooperation with suppliers to foster transparency with certificates and controls to promote a collaboration that is sustainable in the procurement of raw materials.

Many conventional materials have been replaced with more environmentally friendly textiles, such as super-stretch organic cotton and recycled stretch lace for underwear, organic cotton for sleepwear, sustainable viscose for knitwear, and regenerated nylon for beachwear. The main natural materials sourced and used in production are mentioned in Table 4.7.

Material	Description
Cotton	Benetton sources organic cotton from certified supply chain. The company started to use it for the Undercolors Spring Summer 2020 collection, for the baby underwear pajamas and men's underwear; then in the Fall Winter 2020 collection, the company used organic cotton also for woman's items. The company also sources recycled cotton, that comes from pre- and post-consumption textile scraps, and from BCI Cotton.
Wool	In 2017, the Group joined the International Wool Textile Organization (IWTO)[37]: in this way, it can contribute to making the wool supply chain more sustainable and transparent. The company uses recycled wool, in particular for the children's line.
Linen	It is a naturally sustainable plant fiber: it requires much less water and no chemicals, and it is extremely durable.

Table 4.7: Sustainable materials sourced by Benetton
Source: Integrated Report Benetton Group 2020

Moreover, the company is introducing a lot of new recycled materials in production, such as ECONYL, recycled polyester and recycled polyester wadding, a material that can insulate from cold. It promotes textiles with at least 20% recycled polyester, sourced from verified suppliers that validate the origin, and re-use of manufacturing leftovers or end-of-life materials.

Benetton is therefore able to implement a circular technique, g*reen procurement*. The company pays great attention to the choice of raw materials, most of which are certified in accordance with standards set by the Textile Exchange.

[37] International body representing the interests of the world wool-textile trade and industry.

4.3.2.2. Design

Design means research for Benetton. It's a style that never stops looking for new materials and, as a result, adheres to buzzwords like utility, garment durability, ease of use and maintenance, and a strong focus on reducing environmental impact.

The designers begin the process with research, to capture contemporary trends. Then, they produce ideas based on color, fabric, and material quality, with a focus on product environmental consequences. As a result, the process known as *eco design* can be identified. It seeks to reduce production's negative environmental impact through sensitive design. To encourage recycling, product design is based on general concepts such as quality, durability, and uniformity of the materials utilized. Each item of clothing is designed for a much longer lifespan rather than for a single use over time.

Benetton focuses on processes that have a smaller environmental impact when it comes to treatments. To color garments, the company uses natural vegetable and mineral dyes with fewer chemical ingredients. Moreover, it uses cutting-edge processes for washing reducing water consumption. These actions are related to *reduction*. Indeed, limiting the use of polluting chemicals is one of Benetton's key goals: thanks to the Detox Commitment established in 2013, the company is on target to abolish 11 types of dangerous chemicals. The Detox Commitment was developed by Greenpeace, environmental association for climate protection, and it helps organization in the elimination of chemicals and in the reduction of pollution in wet processes[38].

4.3.2.3. Distribution and sales

Benetton is trying to reduce waste and pollution also in packaging. The company has created an eco-friendly packaging, with the shopper made of eco-friendly paper, processed using water-based inks and coming from an FSC certified paper mill. The packaging's boxes are made of 75% recycled material. Moreover, regarding online purchases, the company is planning to use biodegradable self-sealing bags. This refers to *optimize packaging design's* practice.

As for *redistribute and resell*, Benetton has partnered with Depop, an app that resells used clothing. This collaboration celebrates shared core values such as diversity, inclusion and sustainability. Depop is in fact the peer-to-peer social shopping app that aims at enhancing the history of the Benetton archive and the ability to buy used clothing in the US and UK.

[38] See: https://www.greenpeace.org/international/act/detox/

"Through this partnership, we are not only engaging our community of sellers to help extend the life of some of Benetton's most coveted garments, we are also working together to encourage, amplify and support creativity."
Massimo Renon (GDOWEEK, 2021)

4.3.2.4. Consumption and use

Three main circular practices have been identified in this phase. The first is *eco-labelling*: the company informs its customers that the product complies with sustainable standards. In 2017, the Group achieved the RDS certification, a system that ensures that down feathers and jackets used in the Benetton collections are generated from geese and duck reared for food in accordance with animal welfare principles and standards. Other standards used in the certification processes are: BCI, OCS, GOTS, GRS, RWS, and FSC.

Benetton provide consumer with information on its products and raw materials, achieving the *product labelling* circular practice: the ''Dress Safe'' project aims to raise consumer knowledge and reassure them about the quality and safety of clothing. The Group's goods securely meet the most severe international requirements in terms of the presence of dangerous substances and of factors that might cause asphyxia or entrapment in youngsters.

The third practice identified is *virtualize*. Benetton commits attention in the growing digitalization of its business. With a significant leap forward in e-commerce and the use of digital channels, the Group has achieved its goal of providing a seamless connection between the digital experience and the real world. The focus of the Group is to turn the points of sale into ''digital shops'', which will be accomplished by further expanding omnichannel marketing and working on a new app to assist the sales network. In 2020, the Groups launched the Content Factory, a platform for creating and sharing product and collection content such as technical explanations, photos, and videos. Through the implementation of that practice, the company is able to reduce resource and facilitate circular system.

4.3.3. Collaboration

The Benetton Group's commitment to a culture of respect, transparency, and traceability starts with a focus on internal stakeholders and the establishment of strong relationships with external stakeholders. The main entities belonging to these two groups are mentioned in Figure 4.3.

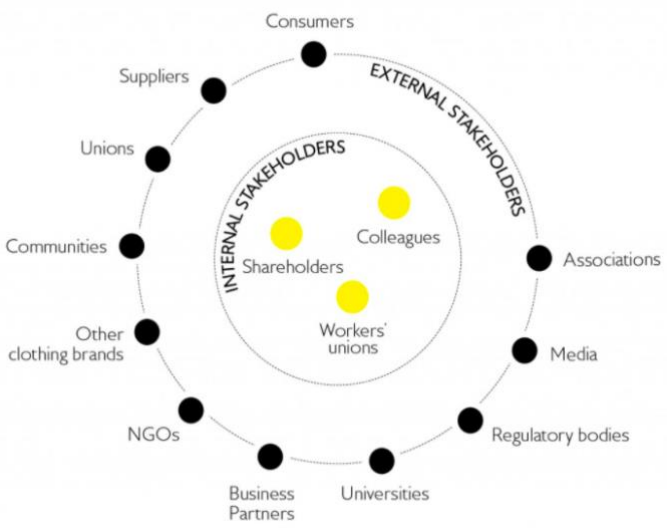

Figure 4.3: Relevant Benetton's categories of stakeholders
Source: Integrated Report Benetton Group 2020

Suppliers are crucial to the company's success. Benetton works with hundreds of them across the world, all of whom are chosen based on social, ethical, and environmental considerations in addition to quality and competitiveness. Benetton may become more sustainable if suppliers work in a sustainable manner: it is critical to educate them in this regard.

The Group is a member of the SAC, the largest partnership for sustainable manufacture, since 2017. Thanks to this collaboration, the company has implemented the Higg Index in order to monitor sustainability performance and engage suppliers in a process of continuous development about environmental management systems, water and energy usage, emissions into the atmosphere, and chemical use.

Benetton Group has committed to transformational resilience and long-term recovery by strengthening its participation in specialized working tables promoted by the SAC and ZDHC. The objectives are to create standard approaches and solutions for making the textile industry more sustainable while reducing negative environmental repercussions and generating positive social benefits in communities. Moreover, the company is member of the IWTO.

Benetton teams up with Depop for the selling of secondhand goods. This two-part collection highlights Benetton's diverse personality and emphasizes color. All of the items are chosen by second-hand and vintage clothes customers from the United Kingdom and the United States.

Finally, Benetton engages with Woolmark Company[39] to guarantee the quality and sustainability of wool collections. Woolmark is dedicated to creating and supporting more responsible wool use, as well as assuring manufacturers and customers that wool is a sustainable choice for the fashion industry.

4.3.4. Practices in the New Product Development framework

CE practices for Benetton have been classified according to the company's value chain, and these are summarized in the table below (Table 4.8).

Value chain	Practice	Description
Material sourcing	Diversity and cross-sector linkages	Supplier selection and education through the Code of Ethics; audits, Higg FEM.
	Green procurement	H&M helps suppliers in the selection of sustainable/certified raw materials that reduce environmental impact; use of recycled materials.
Design	Eco design	Products are designed with a focus on their environmental consequences.
	Reduction	Reduction of energy consumption and chemicals; cutting-edge techniques; Detox Commitment.
Distribution and sales	Optimized packaging design	Eco-friendly packaging
	Redistribution and reuse	Depop
Consumption and use	Eco-labelling	RDS Certification; BCI; OCS; GOTS; GRS; RWS; FSC
	Product labelling	Dress Safe
	Virtualize	Apps and digital shops

Table 4.8: CE practices implemented by Benetton broken down by the different steps of the value chain

[39] See: https://www.woolmark.it/

4.4. BURBERRY

Founded in 1856, Burberry is an important British luxury brand. It makes high-end apparel, leather goods, accessories, fragrance, and beauty items that combine the greatest workmanship and design with cutting-edge technology. Since the foundation, Burberry has been powered by creativity:

''At Burberry, we believe creativity opens spaces.
Our purpose is to unlock the power of imagination to push boundaries and open new possibilities for our people, our customers and our communities''.[40]

The company's mission is founded on four primary values, which are listed in Table 4.9.

Creatively driven	**Open and caring**
▪ Finding beauty in every detail ▪ Putting passion and creativity in everything the company do ▪ Committed to excellence ▪ Challenging the ordinary to pursue the extraordinary	▪ Harnessing strength in diversity ▪ United to achieve common goals ▪ Responsible, guided by its conscience ▪ Upholding a legacy of respect and inclusivity
Proud of its heritage	**Forward thinking**
▪ Inspired by its past, as it creates its future ▪ Globally minded, learning from others ▪ Championing contrasts from royals to rebels ▪ Representing Britain on the global stage	▪ An open space for imagination ▪ Free to explore, push boundaries, pioneer ▪ Unafraid to stand out ▪ Its creativity drives it forward

Table 4.9: Burberry's values
Source: Burberry Environmental Social and Governance 2020/2021

It aspires to be the leading luxury brand in the United Kingdom, providing stakeholders and communities with long-term, high-quality growth and value. The following are the three main points of its strategy (Burberry, 2020):

[40] See: https://www.burberryplc.com/en/company/our-purpose.html

1. *Communication* - inspire customers and create a strong network of communities.
2. *Product* - maintain focus and innovation around outwear and leather goods cornerstones, and also enhance the ready-to-wear lines, building a strong presence in everyday luxury products.
3. *Direct to customers* - upgrade direct-to-consumer channels to provide a premium, genuinely omnichannel experience.

Products are made in Burberry-owned facilities as well as through global suppliers. The company sells its products through a network of independently owned and operated businesses, and online. It also aspires to provide a seamless omnichannel experience that is in line with the brand's vision, along with a great service that is tailored to the needs and desires of its customers. Consumers are at the center: Burberry pays attention in understanding consumers' needs and it desires and to inspire them with luxury goods.

4.4.1. Sustainability

An interview was conducted, and the information gathered was complemented with data from the Burberry 2020/2021 Strategic Report – Environmental, Social and Governance.

The company's goal is to reduce environmental impact and support social growth. It does this by pushing boundaries, developing industry-leading standards and innovative solutions to create substantial system change.

It is possible to summarize the company's sustainable strategy (Figure 4.4) in three fundamental points: *be carbon neutral and revalue waste, drive positive change through all products,* and *positively impact 1 million people*. Regarding products, the company aims to have products with more than one positive attribute connected to social and/or environmental gains. It also aims to reduce waste by reducing, repairing, repurposing and recycling unwanted items in order to reach zero operating waste to landfill.

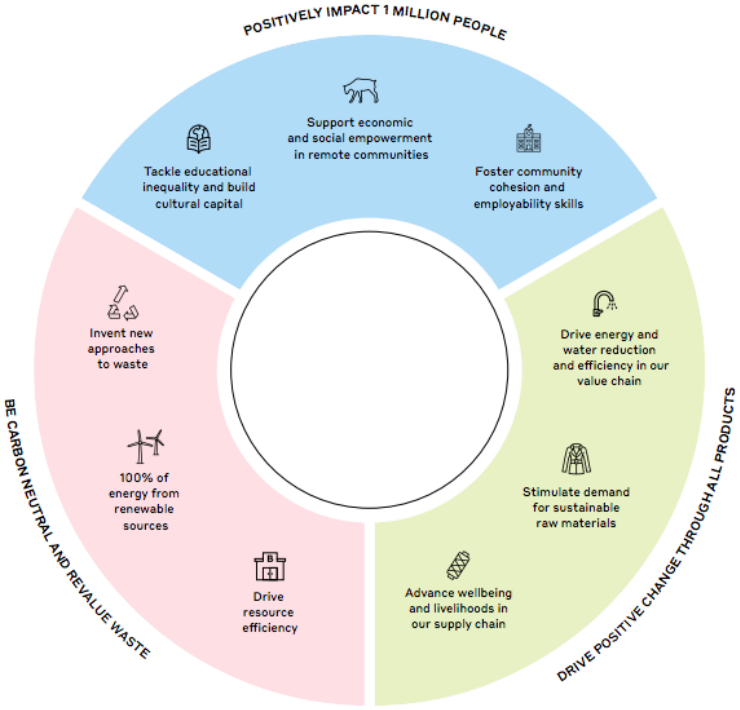

Figure 4.4: Burberry's Sustainability Strategy
Source: Burberry Environmental Social and Governance 2020/2021

4.4.2. CE practices in Burberry's value chain

4.4.2.1. Material sourcing

Burberry works closely with a global network of suppliers to guarantee products with a positive social and environmental impact and that Burberry's high standards are met. Suppliers must adhere to international labor standards and local legislation, as well as Burberry's Responsible Business Principles. Measures such as audits, training, improvement programs and interviews are important to ensure that third-party suppliers meet Burberry's expectations. The first practice, called *diversity and cross-sector linkages,* has been set.

Burberry is investing to optimize its raw material supply. It is currently known for incorporating high-quality, environmentally friendly materials in its collections. In this regard, the following are the most significant objectives (Burberry Environmental Social and Governance 2020/2021):

- Ensure that all materials are 100% traceable by 2025, using certified materials
- Source 100% certified recycled nylon, polyester and organic cotton by 2025
- Source 100% of leather from certified tanneries by 2022

Entering in detail, the main sustainable materials employed by the company are mentioned in Table 4.10.

Materials	Description
Cotton	78% of Burberry's cotton is sustainable (organic or regenerative cotton) and certified. The most important cotton sourced is from BCI.
Cashmere	Thanks to the partnership with Sustainable Fibre Alliance (SFA)[41], the company participated in 2020 in a pilot project with its cashmere scarf supplier, Johnstons of Elgin: they created a fully traceable and SFA certified cashmere fiber.
Leather	It sources 80% of leather from tanneries with environmental, traceability and social compliance certifications.
Viscose	It uses Canopy's Hot Button Report[42], a fiber sourcing research tool, and works with suppliers to acquire only viscose from responsible sources.

Table 4.10: Sustainable materials employed by Burberry
Source: Burberry Environmental Social and Governance 2020/2021

As a result, the company purchases raw materials from vendors who received particular sustainability certifications and deliver environmentally friendly materials. In recent years, Burberry has implemented *green procurement*, a CE practice focused on the selection of suppliers who meet the aforementioned criteria.

As a result of its decision to employ sustainable materials, in 2020 the company was able to create the sustainable Econyl Capsul line: the traditional jacquard parka and car coat were reinvented in a sustainable way utilizing the breakthrough fabric ECONYL. "ReBurberry Edit", a collection built from sustainable materials, was launched the same year. In detail, it was a re-edition of 26 garments and accessories from the P/E'20 collection created with recycled or eco-sustainable manufacturing. Aside from using recycled cotton, econyl, and other recycled materials, the procedures employed to create this collection had a minimal environmental impact, consuming less energy, water, and toxic chemicals.

[41] *''We promote the SFA Cashmere Standard to encourage the adoption of responsible production practices that minimise environmental impact, safeguard herder livelihoods and meet high animal welfare standards''*. Source: https://sustainablefibre.org/

[42] See https://hotbutton.canopyplanet.org/

4.4.2.2. Design

One of the most distinctive characteristics of Burberry design is that strategy, marketing, and responsibility functions collaborate from the beginning of product development. This enables them to better respond to consumer needs while also ensuring that sustainability remains a priority. During the design phase, designers evaluate all of a product's environmental implications, such as choosing technologies that facilitate water recycling or using water-efficient materials. One important ambition of Burberry regards supply chain water conservation and reduction program. The company forbids the use and emission of harmful substances: as a member of the ZDHC Foundation's Board of Directors, it advises luxury peers, suppliers, and specialists on developing creative solutions to ensure successful chemical management in fashion industries. In terms of water management, Burberry implements the "Water Conservation Program," which seeks to reduce the company's water consumption. In fact, they analyze their performances with a specific focus on dyehouses, tanneries, and textile mills, owing to suppliers. Among the KPIs taken into account for the assessment, the company considers:

- Water management, assessed based on best-in-class practices
- Relative water use efficiency
- Potential savings on absolute water use
- Basin water risk as a measure of the specific physical, regulatory and cultural water situation at the site's location

All these projects implemented by Burberry referred to water management and chemicals reduction are related to the *reduction* CE practice.

4.4.2.3. Manufacturing

Burberry is a member of the RE100 initiative, which aims to use 100% renewable electricity by 2022 while also encouraging suppliers to do the same. The company wants to become Net Zero by 2040 and carbon neutral in operational energy use by 2022. It wants to reduce absolute scope 1 and 2 GHG emission by 95%, considering electricity and gas consumptions in stores, offices, manufacturing and distribution sites.

In 2015, Kering, in partnership with Burberry, launched the Clean by Design Programme to reach these goals. This is a cost-effective and environmentally friendly initiative aimed at increasing energy efficiency in textile mills. This program is the result of a collaboration with the Natural Resources Defense Council

(NRDC), the nation's leading environmental advocacy group. The program is based on ten best practices aimed at improving the care with which a textile plant is managed, maintained, and operated, as well as implementing certain technological improvements, primarily in the areas of auxiliary systems (generation, distribution, recovery, and management of heat, steam, water, and compressed air) and process monitoring and control. The initiative resulted in environmental benefits such as a complete phase-out of fossil fuels and a reduction of CO2 emissions by an average of 12% per textile mill (Kering, 2019).

The company has teamed up with the Apparel Impact Institute (Aii) to establish an energy efficiency strategy for Italian manufacturers. Aii is a collaboration of different brands and industries associations that implement sustainability projects for the apparel industry. This promotes environmental programs with demonstrable results that adhere to AI's scientific requirements.

These initiatives refer to the *energy efficiency* practice.

4.4.2.4. Distribution and sales

Sustainable packaging represents another important aspect in order to achieve circularity. The company has signed the New Plastics Economy Global Commitment for the year 2025, with the goal of eliminating harmful plastic and replacing it with 100% reusable and recyclable plastic. Nowadays, Burberry's retail bags and boxes are all reusable, recyclable, and FSC-certified. The oak paper is made up of at least 40% repurposed coffee cups that would otherwise end up in the landfill (66 million cups have been repurposed into Burberry packaging since February 2019). Garments are shipped on recyclable hangers and in 100% recycled polyester garment bags. *Optimized packaging design* has been discovered.

4.4.2.5. Consumption and use

Product labelling was one of the most critical practices discovered during the investigation. The adoption of label contributes in providing customers with information about the Burberry strategy's environmental and social components. Customers may learn how a product meets a variety of externally assured requirements thanks to the new pistachio-colored sustainability labels. They were introduced with the ReBurberry Edit collection and are backed by a completely comprehensive product-focused sustainability program. The amount of organic content or recycled natural fibers used in materials, compliance with carbon emissions standards at manufacturing sites and social activities, such as giving employees a fair wage, are all included in those tags.

Not only p*roduct labelling,* but also *eco labelling* has been identified. The company is trying to source 100% certified leather and recognizes certifications such as Leather Working Group (LWG)[43], Istituto di Certificazione della Qualità per l'Industria Conciaria (ICEC)[44], and International Organization for Standardization (ISO)[45]. All Burberry bags and boxes are certified by the FSC and cashmere fiber is SFA certified.

4.4.3. Collaboration

To drive change, collaboration is fundamental: the company works with peers, sector experts, suppliers, and non-governmental organizations. Burberry believes in an open and collaborative business strategy, and it shares its knowledge and skills to uncover solutions. Its ESG activities are in line with the Paris Climate Agreement[46] and are influenced by the United Nations SDGs.

Suppliers are one of Burberry's most essential collaborators: the company develops tight connections with them, assisting them in adhering to the brand's strategy and mission. They work hand in hand to develop new solutions, such as with Johnstons of Elgin to produce the fully traceable and SFA certified cashmere fiber.

Burberry is also an active member of the ZDHC foundation, where it works in partnership with other brands towards changing the consumption of harmful chemicals along the supply chain. Through this organization, Burberry has implemented the MRSL to help partners in developing processes that have a particular focus on chemical resource management. Partners are monitored on 28 KPIs covering commitment, internal and upstream implementation and ultimately goals achieved (Burberry, 2020).

The company is also one of the core partners of the EMF: through this partnership, Burberry is committed to a business model that keeps clothes in use for as long as possible by using renewable and safe materials.

Another key partnership on the path to climate action is with the NRDC. The aim is to reduce energy and water consumption throughout the supply chain. This is achieved by the launch of the "Clean by Design" project that aims at identifying winning ways to obtain savings targets. In fact, the NRDC helps fashion companies to reduce their environmental impact by being connected with experts who suggest improvements on resource saving (Murray, 2016).

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[43] More on https://www.leatherworkinggroup.com/who-we-are/about-us
[44] Certification Institute in Europe and in the world specialized solely for the leather sector.
[45] Worldwide organization for the definition of technical standards.
[46] See: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Burberry then joins forces with the Aii.

"*From equipping our Italian suppliers to switch to renewable energy to helping our wool producers restore farmland in Australia, we know that it takes targeted action and cross-sector collaboration to make a meaningful systemic impact. This is why we are delighted to support Aii along with our other brand partners - it takes a shared ambition to pursue our collective mission of making fashion supply chains more sustainable*."

Pam Batty

Source: Aii, 2021

The projects initiated with Aii creates continually improving systems from an environmental perspective, maximize stakeholder benefits to increase influence and supply and, finally, increase the level of expertise to establish a market based on best practice from an environmental perspective.

At the end of 2017, Burberry announced a 5-year partnership with Elvis & Kresse [47], a luxury fashion company that develops accessories by re-engineering waste materials. The aim of the alliance is to reduce leather waste. Part of the profits are also used for sustainable purposes, donating them to charitable causes that focus on renewable energy. Burberry's partnership with Elvis & Kresse stays in line with Burberry's new Responsibility plan, which includes a five-year ambition of inventing new techniques to revaluing waste.

Finally, the firm participates in several forums to share its expertise and cooperate with others on more sustainable methods of functioning:

- BCI (Better Cotton Initiative)
- Canopy
- The Fashion Pact, a global alliance created to tackle climate change
- The Textile Exchange
- RE100
- SFA
- Leather Working Group
- Race to Zero

[47] See: https://www.elvisandkresse.com/

4.4.4. Practices in the new product development framework

CE practices for Burberry have been classified according to the company's value chain, and these are summarized in the table below (Table 4.11).

Value chain	Practice	Description
Material sourcing	Diversity and cross-sector linkages	International labor standards and local legislation; Burberry's Responsible Business Principles
	Green procurement	Selection of sustainable raw materials/certified raw materials that reduce environmental impact; organic/recycled/BCI cotton; sustainable leather, viscose and cashmere
Design	Reduction	The company aims to water conservation and reduction programs; Water conservation program
Manufacturing	Energy Efficiency	Renewable electricity; Clean by Design; Net Zero; Sustainability Bond; PUR Project
Distribution and sales	Optimized packaging design	Eco-friendly packaging
Consumption and use	Eco-labelling	Certified materials; ISO; FSC; FSA; LWG
	Product labelling	ReBurberry Edit's labelling

Table 4.11: CE practices implemented by Burberry broken down by the different steps of the value chain

4.5. GUCCI

Gucci is one of the most important Italian fashion houses in the luxury sector. It is part of Kering, a global luxury group that supports the development of some of the most renowned luxury brands: Balenciaga, Saint Laurent, Bottega Veneta and others. Gucci's collections are unsurpassed in terms of quality and attention to detail, and they represent the pinnacle of Italian craftsmanship. Gucci's purpose is to become the global leader in the luxury market, promoting itself as a trustworthy brand that promises to provide the most trendy and sophisticated things to its consumers.

4.5.1. Sustainability

An interview was conducted, and the information gathered was complemented with data from the Gucci 2020/2021 Impact Report.

Gucci's commitment to promoting a more sustainable business model began in 2015, with the launch of the "Culture of Purpose". It is ten-year sustainability strategy aimed at generating positive change for people and the environment, while also attempting to operate in a sustainable, responsible, and accountable manner. Gucci is dedicated to significantly reducing environmental impact across the entire supply chain. By 2025 the company aspire to:

- reduce environmental footprint by 40%
- cut the greenhouse emissions by 50%
- achieve 100% traceability of raw materials
- use 100% renewable energy
- reach environmental footprint by 40%
- create new ways to sustainable procurement, raw materials, and processes. (Gucci Equilibrium, 2020)

4.5.2. CE practices in Gucci's value chain

4.5.2.1. Material sourcing

One of the most important practice that has emerged from the analysis of Gucci is *diversity and cross-sector linkages.* To guarantee that environmental and ethical best practices are integrated across its supply chain, the firm works closely with a network of trustworthy suppliers. All suppliers must adhere to Gucci's Sustainability Principles and Code of Ethics, as well as other laws such as Kering's

Animal Welfare Standards. All company's suppliers are subject to a tight monitoring system, which includes periodic audits by Kering personnel and third-party teams. Gucci also offers training seminars to help suppliers comply with its Sustainability Principles: these workshops disseminate best practices as well as information about Gucci's sustainability approach.

Starting from the first phase of supply chain, in order to improve sustainable actions, material selection is fundamental: cotton, silk, wool, and all other essential materials must be chosen carefully in order to sustain production methods that do not destroy natural ecosystems or local biodiversity, as well as soil health restoration and entire water supply. The main sustainable materials employed are (Gucci Equilibrium, 2020):

- Certified paper (100%) and cardboard
- Certified viscose (76%)
- Organic and recycled cotton (50%)
- Recycled nylon (27%)
- Metal-free leather (26%)
- Organic silk (21%)
- Recycled synthetic fibers (18%)
- Sustainable wool (18%)

Gucci follows the guidelines set by Kering and Canopy. The latter is a non-profit organization that works with companies and retailers to ensure that their supply chains are free of things sourced from ancient or endangered forests. Canopy engages with Kering's cellulosic fiber standard.

Furthermore, Gucci is attempting to increase the use of recycled precious metals in accessories, hardware, and jewelry in order to lessen the environmental effect of mining and extraction connected with the usage of virgin raw materials. Gucci is a member of the Responsible Jewelry Council (RJC)[48], a non-profit organization dedicated to promoting responsible, ethical, social, and environmental standards in the gold, platinum group metals, and diamond supply chains[49]. Since 2015, the firm has used the RJC Chain of Custody certification procedure to certify all gold purchased for jewelry.

[48] It builds trust in the worldwide jewelry sector by ensuring that companies follow ethical business practices.
[49] See: https://www.responsiblejewellery.com/

In this way, a second practice has been identified, called *green procurement*: Gucci sources raw materials that have a reduced environmental impact.

In addition, other two important practices have been identified in this phase, *functional recycling* and *upcycling*. As regards the first one, Gucci Circular Linear promotes material and textile regeneration, reducing waste and decreasing the consumption of raw materials. At the same time, Gucci Off the Grid inaugural collection was made from recycled, organic, bio-based, and sustainably sourced materials. The major material utilized was econyl. To further encourage a virtuous cycle, econyl off-cuts from Gucci Off the Grid manufacturing are recovered and recycled into new econyl, and leather scraps are upcycled as part of our Gucci-Up initiative. Indeed, moving to *upcycling*, Gucci is implementing solutions that reuse raw materials and convert them into higher quality, more functional materials. Through Gucci-Up program the company recovers and upcycles leather and textile offcuts created during manufacturing. The company collaborates with NGOs and women-based projects and from 2018 to 2020 it recovered 27 tons of reusable leather scarps (Gucci Equilibrium, 2020).

Finally, in order to monitor environmental impacts at every stage of the supply chain, Gucci uses the EP&L (Environment Profit & Loss) methodology. It was created by Kering Group and it is a cutting-edge technology for assessing and quantifying the environmental impact of operations. The EP&L tracks carbon emissions, water consumption, air and water pollution, land usage, and waste creation along the supply chain, making the Group's diverse environmental footprint visible, quantitative, and compared[50]. It refers to *LCA* practice. The aim is to create reliable data that can demonstrate the sustainability of products and, at the same time, facilitate decisions on where to act to make continuous improvements.

4.5.2.2. Design

The only CE practice that has been identified in this phase is *reduction*. In 2018, the Gucci Scrap-less initiative was established, in order to drastically decrease the environmental impact of leather manufacturing: the company may process just what it needs for manufacturing by simply cutting the leather hide to size before tanning, decreasing the amount of energy, water, and chemicals necessary to prepare the material. The same advantages were obtained with the introduction of metal or chrome-free tanning. A lot of sustainable goals were achieved, such as the ones related to energy and water reduction.

[50] https://www.kering.com/it/sostenibilita/misurare-il-nostro-impatto/il-nostro-ep-l/cos-e-un-ep-l/

4.5.2.3. Manufacturing

Energy efficiency, which consists of providing vital services with less energy input, is the major practice highlighted at this step of the value chain. One of Gucci's key objectives is to employ 100% renewable energy. In 2020 the company decreased the CO_2 footprint by substituting non-renewable energy from fossil fuels with green energy, resulting in savings of 60.100 tons of CO2. In the same year, the company consumed 93% green energy in its shops, offices, warehouses, and Gucci-owned factories. The company also assists suppliers in that way: today suppliers employ 25% renewable energy, of which 50% in leather manufacturing processes (Gucci Equilibrium, 2020).

4.5.2.4. Distribution and sales

Packaging is mainly associated with this phase and the practice of *optimize packaging design* has been identified. Gucci claims that in order to provide a 360-degree "luxury experience", packaging must be well-designed and contain assurances of raw material sustainability. The new green packaging introduced in 2020 is designed with sustainability in mind:

- the shopping bag handles are black torchon (100% recycled polyester) and knotted to eliminate the use of glues. They are easier to separate and recycle;
- the green color reduces the use of inks;
- the uncoated paper guarantees that it is completely recyclable;
- the shopping bag handles are made of 100% recycled polyester and knotted to eliminate the use of glues, making them easier to separate and recycle.

Gucci's packaging is FSC certified since 2010. Any residual plastic components are recycled, such as hangers for ready-to-wear collections made of recycled polystyrene or rain covers for shopping bags made of recycled polyethylene. The company's target is to eliminate single-use plastic in B2C packaging by 2025 and in B2B packaging by 2030 through Fashion Pact commitment.

Thanks to the collaboration with the RealReal, the company promotes the purchase of used products, implementing in this way the *redistribute and resell* practice. The collaboration prevents Gucci products from ending up in landfills. As part of the agreement, the RealReal launched an e-commerce site dedicated to Gucci's second-hand products, supplied both by users and by the brand itself.

4.5.2.5. Consumption and use

Eco-labelling is the only practice that has been recognized in this phase. Gucci selects materials that are certified. Some examples are the sourced certified viscose that follows the standards developed by Kering and Canopy, or the gold acquired for jewelry are certified via the RJC Chain of Custody certification program.

4.5.3. Collaboration

Since 1999, Gucci is part of the Kering group, which focuses on the development and on the creation of value of its Maison. All these entities are working in order to operate in a more sustainable way. In 2013, Kering founded the Material Innovation Lab (MIL), which supplies the Group's Maison with sustainable fabrics and scraps. It has also created the EP&L methodology and it is a member of the Fashion pact Commitment. Gucci's goal is to conform with Kering's standards by 2025.

The solid partnerships that the company has built with its valued suppliers are crucial. Environmental and ethical best practices are entrenched throughout the company's supply chain, thanks to strong collaboration with them. All suppliers and subcontractors must follow Code of Ethics and the Gucci Sustainability Principles (Gucci, n.d.). Gucci's suppliers also adhere to the MRSL, which includes hazardous substances that may be utilized in production and then discharged into the environment.

Gucci collaborates with Farfetched and together they have created the ''Imagined Futures'', a multi-experience program based on sustainability, innovation and community. The first chapter of this partnership celebrates Gucci's new Off the Grid collection by bringing together utopian ideas of the future from important thought leaders in fashion, culture, and sustainability. Another significant collaboration is that with The North Face. The North Face x Gucci Collection is consistent with both businesses' devotion to environmentally sustainable actions. In this collection, luggage is made of econyl and archival textiles are used in order to give them a new life. The clothing and carrier bags, cartons, and pouches have been thoughtfully designed to minimize environmental effect at every stage of production. All paper and cardboard are sourced from sustainably managed forests, and uncoated paper has been used to guarantee that it is completely recyclable (Eco-sustainable collaboration: Gucci X The North Face, n.d.).

Finally, Gucci has annunciated a partnership with luxury re-sale website The RealReal to create an exclusively app that re-sell only second-hand Gucci pieces.

4.5.4. Practices in the New Product Development framework

CE practices for Gucci have been classified according to the company's value chain, and these are summarized in the table below (Table 4.12).

Value chain step	Practice	Description
Material sourcing	Diversity and cross-sector linkages	Sustainability Principles and Code of Ethics; Kering's Standards.
	Green procurement	Selection of sustainable/certified raw materials that reduce environmental impact (organic cotton/silk, sustainable wool, viscose, recycled materials).
	Upcycling	Gucci Up program.
	Functional recycling	Gucci recovers materials for their original function or for other purposes; Gucci Off the Grid; ECONYL.
	Life Cycle Assessment	EP&L.
Design	Reduction	Gucci Scrap-less initiative; metal or chrome-free tanning.
Manufacturing	Energy Efficiency	Renewable energy and green energy in shops, offices, warehouses, and Gucci-owned factories.
Distribution and sales	Optimized packaging design	Eco-friendly packaging.
	Redistribute and reuse	Second-hand clothes/shoes/bags (the RealReal).
Consumption and use	Eco labelling	FSC, RJC, certified viscose.

Table 4.12: Circular economy practices implemented by Gucci broken down by the different steps of the value chain

4.6. STELLA McCARTNEY

Stella McCartney is a British luxury fashion brand founded in 2001, with 863 shops throughout the world, and a website that serves 100 countries. Since its foundation, it has focused on making high-end items manufactured from sustainable materials. Stella McCartney does not utilize any animal-derived components and is constantly investing in the development of alternative, environmentally friendly materials. The company is always striving to fulfill its objective to becoming an ethical, contemporary, and honest organization: it affirms that it is accountable for the resources consumer as well as for the influence have on people, animals, and environment (Eco Impact Report 2020's Stella McCartney). Its mission is to create the most appealing products with the least environmental impact.

4.6.1. Sustainability

Environmental awareness is the original component of Stella McCartney's concept, distinguishing the brand from rivals who utilize sustainable techniques to response to external requests and societal pressures. The firm has been the first vegetarian luxury brand: it has never utilized leather, fur, or skins. It is working to become more sustainable, trying to reduce environmental impact along all the supply chain, and it is adopting new business models in order to become more fully circular.

Through collaborations, the company is actively establishing itself in the shift for environmental and ethical concerns. The firm promotes circularity not just via the adoption of manufacturing enchantment but also through the attentive management of already marketed products. The brand is constantly supporting the worth of the motherhouse's products, extending the life of its product.

4.6.2. CE practices in Stella McCartney's value chain

4.6.2.1. Material Sourcing

The first practice that has emerged from the analysis is *diversity and cross-sector linkages*. Materials and items are sourced from a carefully selected global network of suppliers, many of whom have been with the company since the beginning. Stella McCartney introduced the Responsible Sourcing Guide for Suppliers in 2019, a manual to the company's sustainability standards and policies, as well as the Stella Sustainability Hub, a tool that gives the company full visibility of supplier performance and alerts it to areas that need improvement. In this regard, assessments are critical for gathering data and issues concerning suppliers, but also determining which suppliers the organization can purchase goods from.

LCA is another major technique that has emerged from the study. Since 2013, the company has been using the Kering-developed EP&L technology to calculate all relevant emissions and resource consumption. In addition, the company has commissioned a peer-reviewed LCA that compares the environmental consequences of obtaining MMCFs from various feedstocks.

In terms of material sourcing, the most important sustainable materials employed by Stella McCartney are listed in Table 4.13.

Material	Description
Cotton	▪ Organic cotton: since 2008, the company has been using certified organic cotton (73%) and it aims to use 100% organic or recycled cotton by 2025. The company exclusively uses organic cotton that has been certified in accordance with the GOTS or the Textile Exchange's OCS. ▪ Recycled cotton: it uses recycled cotton to produce garments like the Infinite Hoodie. This material is made from waste cloths that have been regenerated. These rags undergo a process called the regenerated cycle, where they are processed to make a completely new fabric.
Wool	Wool is used in ready-to-wear and knitwear; it is biodegradable, naturally water repellent, long lasting and FSC certified. The company is working a lot in order to reduce pesticides and to change chemistry of the dyes, with the aim to improve safety and sustainability of material.
Vegetarian leather	Stella McCartney uses innovative animal- and cruelty-free alternatives with very low environmental impact (Stella McCartney's EP&L). A lot of materials have been created by the company as alternative for leather. Altern Nappa is a recycled polyester, waterborne and solvent-free polyurethane and it is used by the company mainly for shoes and bags. Mylo, used for the realization of the Fabella Bag, is an innovative material that looks like leather but is vegan and grown from mycelium. It was realized in 2018 in collaboration with Bolt Threads[51].
Silk	Thanks to the collaboration with Bolt Threads, the company created a synthetic spider silk, called Microsilk, a vegan silk having exceptional qualities like as strong tensile strength, elasticity, durability and softness. It develops cleaner, closed-loop manufacturing methods employing green chemistry.

[51] See: https://boltthreads.com/2017/07/20/stella-mccartney-and-bolt-threads-announce-a-new-partnership-focused-on-sustainable-fashion-and-luxury-materials-development/

Cashmere	Since 2016, the company has been using recycled cashmere. Its knitwear styles are created from certified recycled Re.VersoTM cashmere, which has a seven-fold reduced environmental impact. Cashmere waste is sifted by hand, requiring a skillful touch to distinguish between various fibers. Re.VersoTM is also GRS certified, ensuring that each recycling stage can be traced and validated.
Fur	Its fur contains no animal products: Fur-Free-Fur is a non-cruelty-free ethical option. The firm collaborated with different partners (DuPont and Ecopel) in order to create KOBA, a unique plant-based chemical that assists the company in reducing the amount of virgin polyester used. It contains recycled polyester and can be recycled itself.
Recycled nylon and polyester	The company uses econyl regenerated nylon: it avoided about 10 tones of nylon to landfill. The Fabella Go bags' collection is made of econyl yarn.
Viscose	The company uses only viscose that is free from ancient and endangered forests. It is used in ready-to-wear.

Table 4.13: Sustainable materials employed by Stella McCartney
Sources: Eco Impact Report 2020's Stella McCartney

Recently, the corporation has undertaken initiatives aimed at developing sustainable and recyclable materials. All of these are elements that refer to *green procurement* practice.

4.6.2.2. Design

Stella McCartney creates goods that are designed from the start to have the best possible performance from a circular standpoint. The circular practice that has been identified in this phase is *eco design*. In particular, the main circular lines are:

- Vegan Stan Smith – in 2018, the company collaborated with Adidas to release the first vegan Stan Smith, which was produced using Evrnu's Nucycle yarn.
- Loop trained – it is the world's most sustainable sneaker, which is recyclable, made of environmentally friendly materials, and uses a new locking mechanism to join the upper and sole of the shoe, removing the need for glue.
- COREVA™ - it is the world's first stretch denim that is 100% plant-based, renewable, and biodegradable, replacing typical synthetic and petroleum-based elastomers with natural rubbers to make it fully plastic-free.

- Infinite Hoodie – it is a hoodie constructed with Evrnue's revolutionary upcycling recuperating technologies. The garment is made from 60% NyCycl, a yarn that can be broken down at a molecular level and reassembled indefinitely, and 40% organic cotton from regenerated textile waste (Rossi, 2019). It was realized in 2019 in collaboration with Adidas.

4.6.2.3. Distribution and sales

The company is conscious of the packaging materials it employs, and it is constantly looking for new ways to limit the use of single use/virgin plastic and paper. Stella McCartney only uses FSC-certified or made-from-at-least-50-percent-recycled-material paper in her packaging since 2012. Moreover, Stella McCartney supports Canopy's Pack4Good Initiative and commits to:

- not include fiber produced from ancient or endangered forests in paper-based packaging;
- innovate packaging design in order to reduce material needed;
- use paper-based packaging with high-recycled content (post-consumer waste);
- source fiber from certified forests under the FSC system.

In 2018, the corporation pledged to reduce the quantity of plastic used by signing the EMF's New Plastic Economy Global Commitment. It also claims that all plastic will be recycled, recyclable, or biodegradable by 2025.

All these initiatives can be associated with *optimized packaging design* circular practice.

Redistribute and resell is the second distribution and sale practice revealed by the investigation. The company promotes the buying of used products thanks to a partnership with The RealReal. By giving Stella McCartney products a second life through resale, the cooperation prevents them from ending up in landfills.

4.6.2.4. Consumption and use

The most important activity identified in this phase is *eco-labelling*. The majority of materials sourced are certified:

- wood is FSC certified; viscose is from certified-sustainable forests in Sweden;
- Re.VersoTM cashmere is GRS;
- organic cotton is certified in accordance with GOTS and OCS
- all packaging and papers are either FSC-certified.

4.6.3. Collaborations

The company believes in the power of collaboration and teamwork. Stella McCartney collaborates with local experts, civil society organizations, like-minded brands, and suppliers in order to effect long-term change.

The company's excellent partnerships with its suppliers must be emphasized. It cultivates long-term connections with each vendor, working closely with them to learn about their practices and procedures. The firm picks only suppliers who manufacture responsibly and in accordance with its brand's DNA: if a supplier does not engage and endeavor to meet the company's standards, the company may consider terminating business relationships or, in the case of new suppliers, not even starting the collaboration.

Other important partnerships created by the company in order to become more sustainable are with:

- Canopy – starting from 2014, Canopy has helped the company in verifying that Stella McCartney's supply chain is actually free of ancient and endangered forests. Now, they are collaborating to create forward-thinking conservation solutions in locations like Indonesia and Canada.[52]
- ECONYL – Stella McCartney uses the innovative regenerated nylon fiber created by ECONYL, realized with a particular technology that turn nylon waste into first-grade nylon yarn.
- EMF – Stella McCartney and the EMF co-launched the report ''A New Textile Economy: Redesigning Fashion's Future''. It depicts the fashion industry's ambitious goal, based on a system that ensures that garments, materials, and fibers are kept at their greatest value throughout use and re-enter the market after use, never ending up in the garbage (Ellen MacArthur Foundation, 2017). They also signed the Global Plastics Commitment, which seeks to reduce the use of superfluous plastics, and develop reusable, recyclable, or compostable plastics.
- Bolt Threads – in 2017, together with Bolt Threads, a biotechnology company, the company realized the first garments made with green Microsilk, a very resistant, elastic and soft vegan silk. In 2018, they created also Mylo, a leather-like material made from mycelium.

[52] https://www.stellamccartney.com/it/it/sustainability/fibres-from-forests.html

- Adidas and Evrnu– these collaborations have been crucial for the development of new sustainable products. In 2018, the companies launched the first vegan Stan Smith and in 2019 they launched the first product made with Evrnu's Nucycle yarn, made from liquefied cotton waste.
- Cradle to Cradle Products Innovation Institute[53] - together with the Institute, the company certified Cradle wool knitwear yarn, considering material health, material reutilization, renewable energy and carbon management, water stewardship and social fairness.
- The RealReal – by offering the widest assortment of pre-owned high-end items, it provides fresh life to luxury goods through consignment. Thanks to this collaboration Stella McCartney is transforming the way products are produced, sold, shared and reused.
- DuPont[54] and Ecopel[55] – the company collaborated with these two companies in order to create KOBA, a unique plant-based chemical that helps company to reduce virgin polyester used.

4.6.4. Practices in the New Product Development framework

CE practices for Stella McCartney have been classified according to the company's value chain. They are summarized in the table below (Table 4.14).

Value chain	Practice	Description
Material sourcing	Diversity and cross-sector linkages	Supplier Selection; Responsible Sourcing Guide; Stella Sustainability Hub.
	Green procurement	Selection of sustainable and certified raw materials (organic cotton, wool, synthetic leather, Mylo, Mycrosilk, KOBA, viscose, recycled materials).
	LCA	EP&L.

[53] It is devoted to driving CE innovation via products that benefit people and environment: it establishes the standards from goods that are safe, circular, and created responsibly.
54 See: https://www.dupont.com
[55] Ecopel – "*Thanksfully today, technologies and innovations allow us to have new ways to design amazing and ethical alternatives to fur".* Source: https://www.ecopel.com

Design	Eco Design	Vegan Stan Smith; COREVA™; Infinite Hoodie.
Distribution and sales	Optimized packaging design	Eco-friendly packaging; New Plastic Economy Global Commitment; Canopy's Pack4Good Initiative.
	Redistribution and reuse	The RealReal x Stella McCartney.
Consumption and use	Eco-labelling	FSC; GRS; GOTS; OCS; Cleverclare campaign.

Table 4.14 CE practices implemented by Stella McCartney broken down by the different steps of the value chain

5 Results

The final purpose of the case study research is to design a new framework that connects the fundamental CE practices with the processes of NPD development after collecting all data from the interviewees. The new methodology will include also all value chain stakeholders, allowing for the determination of whether they are facilitators for the transition to a circular business model.

Data was processed utilizing meta-matrices for data analysis in order to meet the study goal, as indicated in section 3.1.6. Initially, evidences on the circular practices and partnerships implemented by the various cases were gathered and organized in a first matrix (Table 5.1). This allowed to determine which practices are most significant for the transition from a linear to a circular business model in the fashion sector, and thus which practices should be included when constructing the final framework. Furthermore, preliminary considerations on the relevance of collaboration for the CE's implementation were made.

The following step in the analysis entails a detailed examination of each practice in order to determine how and why it effects the NPD innovation process. The model developed by Franzò et al. on NPD was adopted to simplify the process. Finally, a meta-matrix (Table 5.3) was constructed, which combined the most essential practices with the stages of NPD.

5.1. Qualitative data analysis

The CE practices and collaborations that have emerged from the six analyzed fashion companies are displayed in the following table (Table 5.1). All of the companies interviewed are categorized into the macro categories of fast fashion and luxury brands in the rows. All circular practices are grouped into the different steps of the value chain in the matrix's columns, according to the model proposed by Kalmykova, i.e. *material sourcing, design, manufacturing, distribution & sales, consumption & use, collection and disposal*.

		Material Sourcing				
		Diversity and Cross - sector linkages	Green Procurement	Life Cycle Assessment	Functional Recycling	Upcycling
Fast fashion brands	**H&M**	(Suppliers)	(Canopy; Textile Exchange; Forum for the Future; Responsible Cashmere Round Table; Responsible Leather Round Table; Renewcell; Stockholm Resilience Centre; Microfiber consortium)	(Third-party verified lifecycle assessment Sustainable Apparel Coalition's Materials)		
	Benetton	(Suppliers; Sustainable Apparel Coalition)	(The Woolmark Company; IWTO)			
	Guess	(Suppliers)	(Canopy; Textile Exchange)			
Luxury brands	**Burberry**	(Suppliers)	(SFA and Johnstons of Elgin; Canopy; Leather Working Group)			
	Stella McCartney	(Suppliers)	(DuPont and Ecopel; Bolt Thread; Canopy; Cradle to Cradle Products Innovation institute)	(Kering)		
	Gucci	(Suppliers; Kering)	(Kering; Canopy)	(Kering)	(Farfetch)	(NGOs and women-based projects)

Design				Manufacturing	Distribution & Sales	
Customization/made to order	Design for Disassembly/Recycling	Eco Design	Reduction	Energy Efficiency	Optimized Packaging Design	Redistribute and Resell
(Customers)	(HKRITA; Ellen MacArthur Foundation)	(HKRITA; Ellen MacArthur Foundation)	(HKRITA; Ellen MacArthur Foundation; ZDHC)	(EP100; RE100)	(Ellen MacArthur Foundation; Fashion Pact; Canopy)	
			(ZDHC)			(Depop)
	(Ellen MacArthur Foundation)	(Ellen MacArthur Foundation)				
			(Ellen MacArthur Foundation; ZDHC; Natural Resources Defence Council; Elvis & Kresse)	(Kering; RE100; Aii)	(Ellen MacArthur Foundation)	
		(Adidas; Evrnue)			(Ellen MacArthur Foundation; Canopy)	(The RealReal)
			(The North Face)		(Kering and the Fashion Pact)	(The RealReal)

	Consumption & Use		Collection and Disposal		
	Eco-labelling	Product labelling	Virtualize	Incentivize Recycling	Logistics/Infrastructure	Take-back and Trade-in System
H&M	(Third-party verified certification)					(I:CO)
Benetton	(Third-party verified certification)					
Guess	(Third-party verified certification)					(I:CO)
Burberry	(Third-party verified certification)					
Stella McCartney	(Third-party verified certification)					
Gucci	(Third-party verified certification)					

Table 5.1: Meta-matrix for qualitative analysis. In the columns, the practices are associated with the steps of value chain. In the rows, the research cases are grouped by unit of analysis. Grey boxes identify practices implemented with collaborations, while the blue ones are implemented without them.

This matrix has proven to be beneficial in identifying trends. Patton, in 1990, argued that *"any common pattern that emerges from a large variation is of particular interest and value in capturing the core experiences and central shared aspects"*. The goal is to see if there is a consistent trend in NPD and CE across different companies, both in general and for specific categories of enterprises in the luxury and fast fashion industries.

Following these considerations, it is feasible to examine each practice that emerged from the six cases, highlighting its significance, impact on the NPD process and potential collaborations.

5.1.1. Common practices

Analyzing the data in Table 5.1, it is possible to identify some practices that are common to most or even all six companies considered in the research. These practices create a pattern among fashion companies, not differentiated by brand type (luxury or fast fashion). For this reason, they will certainly be considered when constructing the final theoretical framework. Practices are discussed in depth in the following paragraphs.

5.1.1.1. Diversity and cross-sector linkages

This practice refers to the establishment of industry standards to encourage cross-sector collaborations through transparency, financial and risk management tools, legislation, infrastructure development, and education.

According to the interviews, this practice is linked to the relationship between fashion companies and their suppliers, as well as the standards that companies use to interact with them. The fashion industry's long-term existence depends on the efforts of product makers, particularly its vendors. Setting standards is critical for motivating suppliers to work in a sustainable manner and ensuring that environmental and social best practices are followed across their supply chain. Companies assist them in working in a more responsible way through code of conduct, sustainability commitments, audits, and training programs. In the vast majority of cases, suppliers must adhere to the firm's principles in order to build trusting and transparent relationships. As a result, it is feasible to emphasize the importance of forming partnerships with suppliers, particularly in terms of circularity. These will enhance the firms' resources and capacity to improve long-term performance (Chen et al, 2017), since they are essential to achieving their long-term goals and transitioning from a linear to a circular model.

Because this practice involves the selection of suppliers and their training, it is assumed that it is related to an early stage of the NPD, affecting the *Idea* phase.

Suppliers with new sustainable materials can lead to the creation of novel items in technology push projects, providing a novel source of idea generation. The practice has therefore an impact on the *preliminary assessment* phase too, because products might be created or not based on the availability of suppliers and their raw materials, as well as the willingness of suppliers to follow the company's standards. In fact, if a supplier does not participate and attempt to achieve the firm's sustainability standards, many organizations may reconsider terminating or not even beginning business relationships with them.

Companies can obtain technical information on the raw materials supplied thanks to the linkages established between suppliers and companies. That is why the practice is associated more to a preliminary technical assessment than to a preliminary market evaluation. Since the target segment is undoubtedly a collection of people interested about sustainable production, the latter takes occur in a later stage. Companies make decisions like these at the beginning of the development process for a new product, and they have a big impact on product quality, cycle time, and costs (Ragatz et al., 1997).

In this case, it has not been emerged substantial differences between fast and luxury brands: all analysed companies have introduced this practice following the same strategy. The same conclusions can be made regarding the type of collaborations created.

5.1.1.2. Green procurement

Green procurement is a strategy for firms to choose and purchase products with a lower environmental impact. The raw materials used in manufacturing have an impact on the ultimate quality of finished goods offered by businesses. To be circular, businesses must produce goods generated from renewable resources.

In terms of *green procurement*, all the companies examined source items with environmental concerns in mind. Table 5.2 lists the six businesses' major materials and the long-term benefits of gathering them, as determined by the analysis.

Material	Sustainable aspects
Cotton ▪ Organic cotton ▪ Recycled cotton ▪ BCI cotton	▪ Less use of energy ▪ Less use of water ▪ Less use of pesticides or chemical fertilizers ▪ Improvement of soil conditions ▪ Reduction of greenhouse gas emissions ▪ Greater biodiversity ▪ Reduction of waste

Wood-based material	▪ Recycled materials ▪ Sustainable sources
Man-made cellulosic fibers	▪ Recycled materials
Wool	▪ Less use of energy ▪ Less use of water ▪ Biodegradable material ▪ Longer life ▪ Less use of pesticides
Cashmere	▪ Recycled material ▪ Improvement of soil conditions ▪ Reduction of greenhouse emissions
Leather	▪ Sustainable source
Linen	▪ Less water ▪ No use of chemicals ▪ More durable
Silk	▪ Less pollution ▪ Natural material/vegan ▪ Long-term sustainability ▪ Less use of chemical
Fur	▪ Recycled material ▪ Less use of energy ▪ Reduction of greenhouse emissions ▪ Improvement of soil conditions ▪ Protection of animals
Recycled material	▪ Recycled materials ▪ Less water consumption ▪ Less chemical usage ▪ Less energy consumption ▪ Reduction of CO_2 ▪ Reduction of waste

Table 5.2 Main materials sourced by suppliers, which identify the *green procurement* practice

Collaborations are necessary in order to source more sustainable materials, according to the report. Non-profit organizations, product makers, and material sustainable solution/material providers are the major ones. Canopy is one of the most common collaborators used by the six cases. Canopy is a non-profit that has worked with over 750 companies across the world to develop policies that eliminate sourcing from Ancient and Endangered Forests and brings game-changing ideas to the mainstream from the edges[56]. Companies today must rely on an innovation model that takes into account not only internal ideas and resources, but also tools and skills from outside. As a result of companies' willingness and duty to obtain certifications from non-competing businesses, fashion firms must progress and innovate from a circular point of view. Often these partners also support research and development, as they make use of already developed solutions or resort to new technological trends.

Regarding NPD's impact, *green procurement* affects only the *preliminary assessment* phase. This is because a feasibility screening is required after a concept has been realized and before moving forward with the product creation. It refers to a preliminary technical assessment as it can provide a technical picture of the realized product. Company's raw material selection ensures the prioritization of the materials' long-term features and attributes for the creation of finished garments. Supply deal with resources availability required to satisfy the demand for the creation of clothing with certain sustainability qualities (Farmer, 1981). This practice is crucial in the macro-phase of idea generation because a product is sustainable if a number of eco-friendly determinants, including the choice of raw materials, are considered at an early stage.

Also in this scenario, no significant distinctions between fast and luxury brands have appeared. The exception is about the creation of collaborations, even if a lot of commonalities exist between the two main groups of analysis.

5.1.1.3. Optimized packaging design

The practice entails the creation of long-term packaging solutions that primarily make use of materials that have reached the end of their useful life. Aside from the fact that the plastic and paper used in this scenario are extremely polluting, packaging allows businesses to directly communicate their sustainability approach to customers. For many consumers, it is becoming as important as the product itself, and its evolution is becoming increasingly significant (Bucci, 2007). To realize packaging in a sustainable way is fundamental in order to reduce waste.

[56]See: https://canopyplanet.org/about-us/our-impact/

All analyzed cases play close attention to this practice: they aim to eliminate harmful components, such as single-use plastics, to reuse and recycle items and to find sustainable materials to innovate and create new ways to package items. In addition, all the analyzed firms offer containers that are FSC certified, so made of materials from responsibly managed forests and recycled materials.

Also in this case, collaborations result of high importance. As it can be observed in Table 5.1, 3 out 6 companies collaborate with the EMF for the New Plastic Economy Global Commitment, 2 out 6 firms partner with Canopy's Pack4Good and Gucci is member of the Fashion Pact. Through these collaborations, companies work in a more sustainable way in order to protect the environment.

Packaging, like products, follows all the different stages of NPD. It can be a source for generation of new ideas and solutions for functionality. The packaging should be designed in such a manner that it reflects the message that the product and the firm want to promote during the concept development phase, and functional elements should be considered. Throughout the development and testing phase, the organization should decide on standardization and alterations that the package might have according on the product it will include. It will then be released alongside the product on the market (Nilsson et al., 2005). The practice of *optimized packaging design* can be associated with both the *concept* phase in the idea generation macro-phase, as it certainly wants to reflect the message of sustainability that the company wants to launch within the market and therefore to the customers. In the same way, it also refers to the realization of the actual sustainable package, which is studied in detail and designed. This practice can also be associated with *development* in the macro phase of product development.

There are no differences in the adoption of this practice between fast and luxury businesses, only in the creation of partnership in order to put it in place. In fact, in this scenario, luxury brands form more alliances in order to achieve more environmentally friendly packaging.

5.1.1.4. Eco-labelling

Eco-labelling is a voluntary protection certification that displays the environmental preference of a product or service within its category. Using certified materials ensures the sustainable characteristics of products. It has been emerged that all six companies source material that are internationally certified. The most common eco-label/certifications used are:

- FSC: it supports ecologically sound, socially good, and commercially successful forest management. On-product FSC labels:

  - All goods are made entirely of materials derived from FSC-certified forests.
  - Combine Products containing materials derived from FSC-certified forests, recycled materials, or other regulated sources.
  - Recycled items may include some post-consumer trash as well as pre-consumer waste.[57]

- BCI: it offers a complete set of production principles and standards for cultivating cotton in a more sustainable manner.[58]
- OCS: it is a voluntary standard that gives businesses a mechanism to verify that a finished product has the correct quantity of an organically cultivated substance.[59]
- GOTS: it establishes worldwide accepted standards for ensuring the organic state of textiles, from raw material harvesting through ecologically and socially responsible manufacture and labeling. In this way, it is possible to provide organic textiles and apparel with a single certification recognized everywhere.[60]
- GRS: it is designed for businesses who manufacture and/or sell products using recycled content. The standard covers the whole supply chain and handles issues such as traceability, environmental considerations, social obligations, and labeling.[61]

From the analysis it has emerged that there are some certifications that are standardized and provided by third parties, like the ones mentioned above, and others that are created by the company in collaboration with partners, such as the collaboration between Burberry and Johnston of Elgin who have created a fully traceable and SFA certified cashmere fiber. In both cases, they are becoming fundamental in the sourcing process.

Eco-labelling affects *preliminary assessment*, *concept* and *commercialization* phases. First, companies select and source materials that are certified, influencing the preliminary phase of idea generation. In this case, unlike *diversity and cross-sector linkages* and *green procurement*, the *preliminary assessment* concerns the market. The label wants to identify a market segment and at the same time give a perspective of

[57] See:https://www.ecolabelindex.com/ecolabel/forest-stewardship-council-fsc-chain-of-custody-certification
[58] See: https://www.ecolabelindex.com/ecolabel/better-cotton-initiative
[59] See: https://www.ecolabelindex.com/ecolabel/ocs
[60] See:https://www.ecolabelindex.com/ecolabel/global-organic-textile-standard
[61] See: https://www.ecolabelindex.com/ecolabel/global-recycle-standard

the product that the customer buys. As regards the *concept* phase, approximately the same reasoning applies. Indeed, the tag identifies the product type as well as the fact that it is targeted at a market concerned with product and process sustainability. Finally, it affects the *commercialization* phase, as it communicates the new message to customers, laying out the whole marketing strategy. Eco-labels encourage customer behavior purchasing an eco-labeled product rather than one that does not have an eco-label (Dočekalová et al., 2011).

As it can be observed, the practice has been implemented following the same strategy by the six companies.

5.1.1.5. Reduction

Reduction refers to design and manufacturing processes that use less materials and eliminate the use of toxic compounds. For example, H&M, in collaboration with the EMF, has reconsidered denim design and manufacture, realizing 100% recyclable jeans, constructed with the Screened Chemistry, a process of selecting safer chemicals while also reducing water and energy used for dying. Gucci has launched the Scrap-less initiative, processing just what it needs for manufacturing by simply cutting the leather hide to size before tanning. In this way, the company can decrease the amount of energy, water, and chemicals necessary to prepare the material.

From the analysis it has emerged that *reduction* practice requires different types of collaborations, such as with EMF, HKITRA, The North face or Elvis & Kresse. They mainly depend on the action implemented by a company.

In terms of the practice's impact on NPD, it has an effect during the *development* phase. This choice is based on the fact that the NPD development step relates to the actual manufacturing of the product, thus all material-saving strategies such as water, energy, and chemical pollution reduction must be implemented at this time.

The practice is presented in all three cases for fast fashion companies, and in Burberry and Gucci for luxury ones, with the creation of different partnerships associated with the projects that have been developed by companies. In this sense, however, just some commonalities have been emerged, such as EMF and ZDHC.

5.1.1.6. Redistribution and resell

Redistribution and resell allows to use a product again, extending its life cycle. Most activities implemented by the analyzed companies refer to the use of external platform for the resell of used cloths: Depop for Benetton and the RealReal for Gucci and Stella McCartney. The RealReal is a physical and online marketplace for

certified luxury consignments, based on CE principles. The RealReal is the leader in luxury resale.

> *"Experty crafted items are designed to last a lifetime – they can change hands countless times and still retain their beauty and value. We bring expertise and enthusiasm to our mission of extending the life of luxury goods and enable more people to own and appreciate them while giving their original owners the opportunity to maximize the value of their investments"*
> The RealReal

To the other side, Guess has implemented an internal program, called GUESS Vintage. The key authentic pieces sold from 1981 to 1999 from all over the world have been made available to customers to encourage reuse and recycling of garments without the use of new raw materials for production. Also, H&M redistributes and resells cloths by itself through the Garment Collecting project: it consists in bringing to the shops all the textile products or used garments of any brands. Then, part of these cloths is re-sold as second-hand. It is possible to notice how collaborations are quite important, but not fundamental, for the implementation of the *redistribution and resell* practice. Indeed, some companies collaborate with external platforms, others develop internal programs.

This practice affects only the *commercialization* phase of the NPD, since these actions take place once the product has been launched on the market and change the end-of-life of products.

As previously said, the difference between luxury and fast fashion companies lies in the type of external collaborations created: the RealReal is a platform created only for luxury items. In addition, for the fast fashion group, 2 out 3 companies have implemented the practice without creation of some collaborations.

5.1.2. Partially common practices

Always taking as reference Table 5.1, there are practices that are implemented by fewer companies, tending to be three or four of the total group. The concept was that if a practice solely belonged to one of the two groups (fast fashion or luxury), it would be unique to that category in the final framework. If, for example, the practice was observed in two luxury companies and one fast fashion company, the activity's relevance was evaluated independently for each company. Even if only one company adopted the practice, if it was deemed important for the transition to a circular business model, it would be evaluated similarly for the entire group. The various practices are discussed below, along with descriptions and potential collaboration opportunities.

5.1.2.1. Eco design

This practice refers to the design process of a product considering its environmental consequences. It analyzes ecological concerns at all phases of the product development process, aiming for products that have the least environmental effect feasible throughout the product life cycle. It has been adopted by H&M, Benetton, Guess and Stella McCartney.

Adopting eco-efficiency techniques is one approach for the manufacturing industry to reduce its environmental impact: *eco design*, in particular, is becoming increasingly important for long-term and improved product development (Knight, P. et al., 2009). In fact, the majority of ecological impacts are caused by the design process. This practice relates to the implementation of new techniques/process/ platform/materials, which can help companies to reduce their environmental footprint. For example, H&M has developed Circulator, a tool that helps designers to think about all stage of the garment development process. Designers can get advice on which materials, components and design tactics are optimal for presenting their products based on the purpose of the garment and they are guided in all design decision by considering frequency, duration, activity, and product access model. On the other hand, thanks to the collaboration with EMF, Guess has participated in the Jeans Redesign projects in order to extend the product's life cycle, using responsibly sourced materials that can be more easily repairable, recyclable and can be reintroduced into the production loop.

In general, it is possible to affirm that the practice of *eco design* requires different types of collaboration with other companies, in order to implement new technologies, test new processes and use new sustainable materials.

The *development* step of the NPD process is influenced by *eco design*. It has an impact on the manufacturing process necessary for the creation of a product. It is critical that the concept of circularity is included from the beginning of product development, so that the product has qualities that make disassembly and recycling of the product at the end of its life cycle easier.

In this case differences are evident between the two group of analysis: all fast fashion companies implement it and only one in luxury sector, Stella McCartney.

5.1.2.2. Product labelling

Product labelling is applied by H&M, Benetton, and Burberry. Its goal is to provide clients with thorough information about contents, raw material origins, and other factors so that they may make informed purchasing decisions. It does not convey any environmental or other preference for specific objects, as opposed to eco-

labelling. For example, Burberry has introduced the new pistachio-colored sustainability labels that tell customers about how a product fulfills a variety of externally guaranteed demanding requirements (quantity of organic content or recycled natural fibers used, compliance with carbon emissions regulations at manufacturing plant, social efforts, etc.). Product labelling has been adopted without any form of collaborations in all cases analyzed.

It can be associated both with the *concept* and *commercialization* phase: information indicates the product categories and market groups that are interested in the sustainability theme; it also communicates the new message to customers, laying out the whole marketing strategy.

5.1.2.3. Energy efficiency

This practice refers to the implementation of services that requires less energy input and consequently lower consumption. *Energy efficiency* has been a driving factor for the manufacturing industry since it has historically been one of the main energy consumers and emitters of CO_2: it accounts for roughly 33% of primary energy consumption and 38% of global CO_2 emissions (Apostolos et al., 2013). Environmental consciousness prompts EU member states to agree on the premise of ''20/20/20 by 2020'':

- 20% decrease in greenhouse emissions
- 20% share of renewable energies
- 20% improvement in energy efficiency by 2020 when compared to 1990 indicators. (Apostolos et al., 2013)

New tools and methods for incorporating *energy efficiency* into process operation have begun to be introduced by businesses. In our case studies, the practice has been implemented by H&M for fast fashion industry and by Burberry and Gucci for luxury one. For example, Burberry in partnership with Kering has launched in 2015 the Clean by Design Programme, aiming to improve water and energy efficiency in textile mills. The program is based on 10 beat practices to improve the care with which a textile plant is managed, maintained, and operated, as well as implementing certain technological improvements, firstly on auxiliary systems (generation, distribution, recovery, and management of heat, steam, water, and compressed air) and process monitoring and control. Both H&M, Gucci and Burberry aim to use 100% renewable energy in their production operations and the ones of their suppliers.

Looking at collaborations, H&M and Burberry are both member of RE100, a global initiative formed by different organization with the aim to reach 100% renewable electricity. As previously mentioned, Burberry has collaborated with Kering, but also with the Aii, created with the aim to *"identify, fund, and scale proven quality solutions to accelerate positive impact in industry"* (Apparel Impact Institute, n.d.). Aii defines "impact" as producing third-party certified and demonstrable improvements in the use of water, energy, and chemicals across the value chain (Apparel Impact Institute, 2021).

The practice affects the *development* phase of the NPD process. It is possible to affirm that it changes the way in which products are produced, introducing new technologies, services, and others, with less energy input.

5.1.2.4. LCA

LCA is a well-structured, rigorous and internationally standardized technique that computes all relevant emissions and resource consumption, as well as the associated environmental and health consequences and resource depletion concerns for any sort of goods or services. The essential premise behind *LCA* is that all environmental impacts associated with a product or service must be examined, from raw materials through waste collection (Klöpffer, 1997). The overall environmental burden in the timeframe "from cradle to grave" is affected by life cycle analysis: the objective is to develop goods, technical solutions and organizations that have the most optimal environmental effect. It is a good basis for CE since it helps introducing CE in 3 steps: firstly, it analyzes advantages or disadvantages of CE on a hypothetical product; secondly, it discovers possible development alternatives along the life cycle; thirdly, it defines the goal along the business strategy (Tòth Szita, 2017).

This practice has been implemented by H&M, Stella McCartney and Gucci. Stella McCartney and Gucci both adopt the EP&L (Environmental Profit & Loss) methodology developed by Kering, since Gucci is a member of the Kering's group and Stella McCartney was part of it till 2019. It is a cutting-edge technology for assessing and quantifying the environmental impact of operations. In detail, the EP&L tracks carbon emissions, water consumption, air and water pollution, land usage, and waste creation along the supply chain, making the Group's diverse environmental footprint visible, quantitative, and compared[62]. To the other side, H&M uses third-party verified lifecycle assessment data and external material benchmarks such as the SAC's Materials: it is composed by a set of different tools that assess the environmental impacts of products and of supply chain in general.

[62] See: https://www.kering.com/it/sostenibilita/misurare-il-nostro-impatto/il-nostro-ep-l/

Collaboration is this case is crucial in order to implement this practice, since it helps to increase the accuracy and analysis of information throughout the supply chain.

LCA influences the *preliminary assessment* phase. As for *green procurement,* it affects the technical viability of the idea and the resources needed: after an idea has been created, it is important to evaluate the practicality before starting production.

5.1.2.5. Take-back and trade in system

From the case study analysis, it is also possible to observe that both H&M and Guess implement *take-back and trade-in system*. Take back systems are programs that collects old items or materials from customers and then reintroduce them into the production cycle.[63] One of the most significant difficulties of CE in fashion is the rising number of post-consumer textiles that wind up in global landfills or are burnt. This signifies a considerable reduction in the reuse and recycling value of items and materials that may be collected and reintroduced into the market (Hawley, 2008). Branded used garment take-back schemes are an activity that is increasingly implemented by fashion retailers in order to facilitate value creation from second-hand clothes, bringing fashion brands into the landscape of used garment collectors (Choi et al., 2015). Fashion retailers often undertake in-store take-back operations through one of three methods: autonomous in-store collection, collaboration with a charity or collaboration with a professional collector/service provider (Hvass, 2019).

In this research, H&M and Guess team up with I:CO for their in-store take-back program. I:CO is an end-to-end solutions provider for the reuse and recycling of clothing, shoes and other textiles. It collects partners' items and then reuse or recycle them ensuring that these resources are reused to the greatest extent possible.

The *take-back and trade-in system* practice refers to the final stage of the NPD process, that of *commercialization*. This is because it is a commercial practice that takes place at the end of the process when the product has already been launched on the market and it is the customers who bring the clothes back to the retailer in order to recycle them. In this way, the process starts again from scratch when the products are recycled, namely from a phase of generating ideas from raw materials.

This practice is not covered by luxury companies.

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[63] Dispose Take-back program. (n.d.). Retrieved from https://www.ceguide.org/Strategies-and-examples/Dispose/Take-back-program

5.1.2.6. Design for disassembly/recycling

This practice is implemented by only two fast fashion companies, GUESS and H&M. *Design for disassembly/recycling* takes into account the necessity to disassemble objects for repairing, refurbishing, or recycling. It can make it easier to fix or update products, extending their useful life. It can also assist to guarantee that the product is recycled and that whole components can be reused (CE practitioner guide).[64] From the interviews, it has emerged that Guess started a project with the EMF, the Jeans Redesign, focused on the production of jeans and aimed to extend the jeans' life cycle: the materials used are more easily repairable and can be dismantled into different components so that they can be reintroduced into the production loop as new raw materials. A clear example are removable buttons. H&M has collaborated with the EMF for the Jeans Redesign too.

As in previous practice, it was noted that collaborations are key in fast fashion companies, since luxury brands do not consider this activity as fundamental for the transition to a circular business model.

The practice affects the *development* step**,** since this part of the process has a great impact on the recyclability of the components. Operators should have a direct control over the main characteristics of the components, such as the type of materials used and the architecture of the product (Prabaharan, 2012). In this way, product samples can be created following the guidelines of the EMF, making the product durable, reusable and recyclable.

5.1.3. Single–case practices

Then there are practices that are implemented by individual companies. They were selected not to be taken into consideration for the creation of a theoretical model since they are specific, executed by unique enterprises, and in most cases not prompted by collaborations. These practices do not represent a pattern in the fashion industry in general. The single – case practices are *customization/made to order* and *incentivize recycling* in H&M case, *upcycling* and *functional recycling* in Gucci, *virtualize* in Benetton, and *logistics/infrastructure* in Guess. In the paragraphs below the descriptions for each one of them is presented.

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[64] Design for disassembly/deconstruction. (n.d.). Retrieved from https://www.ceguide.org/Strategies-and-examples/Design/Design-for-disassembly-deconstruction

5.1.3.1. Customization/Made to order

Customization/made to order refers to a company's activity of taking into account customers' needs and preferences to reduce waste and minimize overproduction. Companies embrace the outsourcing strategy as a result of consumerism, ordering large quantities of products and causing high waste. Nowadays companies are attempting to decrease waste and stocks as part of the circular transformation. It has been a typical approach of traditional luxury brands, but it is more difficult to apply it nowadays with the high demands.

From this analysis, it has been emerged that only H&M implements this practice. The company has launched a new digital platform, H&M Lab, via which it will offer its latest services, products and innovations (it is now only available in Germany): the company can see which products/services have the greatest approval rates and which are particularly well appreciated by clients in this way. The goal is to provide products and services that people will enjoy while also contributing to a more sustainable future. It is therefore clear that customers are the major collaborators for the implementation of that practice.

As it is possible to observe from the analysis, the practice affects the following phases:

- *Idea*: to make sustainable choices more available, the organization must collaborate with customers to understand their requirements, difficulties, and drives associated with the implementation of sustainability.
- *Concept*: it affects for who the new product is intended for.
- *Testing:* it is affected since there are new ways of testing the new sustainable products, like for example the introduction of digital platforms through which companies can test efficiently new products/services and receive feedbacks. It is the only practice that affects this phase of NPD.

5.1.3.2. Incentivized recycling

It is a strategy for rewarding consistent and repeated recycling of recyclable products, such as a deposit refund. It refers to financial incentives that are designed to convince households and garbage producers to reuse and recycle more and it assists to reduce waste creation and can contribute to the funding of waste management initiatives. Incentives may be both incentives and fees. To encourage people to recycle more, rewards are offered to users in the form of vouchers for individuals, coupons for communities, or money to individuals. An effective recycling incentive is also a decrease in trash costs for homeowners who are

prepared to separate more garbage at the source or when local waste recycling objectives are met. It has emerged only in the H&M case, but without any form of collaboration.

This practice has impact on the last phase of the NPD process, *commercialization*, as it changes the final marketing strategy.

5.1.3.3. Logistic and infrastructure

This practice refers to facilities that encourage cost-effective, timesaving, and environmentally friendly post-consumer collection and disposal. These places help and encourage consumer to take their used cloths back to the company. Guess has opened the outdoor Guess Vintage Seeding Suite near its US headquarters to collect used items. No evidence of collaboration has been emerged from the analysis.

This practice has impact on the last phase of the NPD process, *commercialization.* As other practices that affect this phase, it is a commercial practice that takes place at the end of the process when the product has already been launched on the market.

5.1.3.4. Upcycling and functional recycling

Upcycling is based on circular consumption, and the fundamental idea is to revitalize old material by rearranging it and providing new ways to use it while keeping its essence intact as a key value-adding component of the process (Wegener, C., 2016). Gucci has created the Gucci-Up program in order to recover and upcycle leather and textile offcuts created during manufacturing. A similar reasoning can be made for *functional recycling*. The difference between the two practice is that functional recycling makes an object return to the same function or transforms it losing value, while upcycling reuses objects to create a higher quality product. Through Gucci Off the Grid collection, the company recovers and recycles ECONYL off-cuts, which is made entirely of pre and post-consumer waste.

They affect the *preliminary assessment* phase. In order to evaluate the feasibility of the concept, with the introduction of the new sustainable practices, it is important to consider the level of sustainability of a product. It influences the technical viability of the idea and of the needed resources.

5.1.3.5. Virtualize

Virtualize means dematerialization, referring to online purchasing or use of telecommunication in order to reduce the office space and travel for example. It has the potential to reduce resource use and facilitate circular system (Antikainen, M. et al., 2018). Benetton is the only company that has implemented this practice: the company is to turn the points of sale into “digital shops”, which will be done by

increasing omnichannel marketing and developing a new app to aid the sales network. It has launched the Content Factory, a platform for creating and sharing product and collection content such as technical explanations, photos, and videos. Even in this practice, collaborations have not emerged.

It affects the *commercialization* phase. These acts are carried out after the product has been released to the market and change the marketing strategy.

5.1.4. Practices not considered for the final framework

At the end, there are practices in the value chain framework that have not been considered. This is for several reasons:

- because they are not consistent with what is implemented by companies;
- for similarity with other practices and therefore other more specific practices were chosen;
- because they are not related to sustainable and circular concepts, and thus not particularly relevant for the purpose of this thesis;
- because they have a consumer focus rather than a business view.

Practices related to taxes, such as *taxation* and *tax credits and subsidies*, are generally duties that refer to the Green Taxation imposed by the European Commission. The principle is that the polluter pays. From a fiscal point of view, the internalization of environmental costs - i.e. the payment of the damage of the pollution produced by the company that produces it - would lead to correct and effective compensation through pricing policies that avoid the cost being passed on to consumers and tax instruments. (Fant, 2021). All industries in Europe have to pay these taxes. For this reason, it has been chosen not to take these practices into account because they are not specific to the six companies analysed so far.

There are also practices such as *energy production/energy autonomy*, *extraction of bio-chemicals*, *high quality recycling, restoration and design for modularity* that were not taken into account. The basis for this decision is that these activities are most likely carried out by the corporations that supply the fashion industry. These are procedures that are primarily associated with the manufacturing or processing of raw materials.

Industrial symbiosis, product as a service/product service system, sharing, stewardship and separation are the circular practices that were not considered because, although combining interviews and company reports, they were not identified.

Then, *material productivity* and *reproducible and adaptable manufacturing* were not taken into consideration from the beginning of the research analysis. The main reason is that these two practices, among all those listed in the literature, are the ones that have a less significant impact in the field of sustainability.

Socially responsible consumption and *extended producer responsibility* were not mentioned because they have more of a consumer perspective, rather than a company perspective. As the focus of the research is on the practices implemented by the company from idea generation to commercialization, these two practices were not considered as inherent for the construction of the framework.

Finally, other practices not considered are linked to the motivation of more specificity. This means that more specific circular practices were chosen to identify the actions implemented by the companies, even though they might have been equally good. In particular *community involvement* and *re-use* have been replaced respectively by the practices *redistribution and resell* and *take-back and trade-in system*, as in the case of GUESS, because they are more specific in the case of product life extension by involving also external stakeholders.

5.1.5. NPD and CE in the case study research

In the preceding paragraphs, the different CE practices implemented by the various case studies were linked to the NPD phases of Franzò et al. model. The final framework is then built by creating a meta-matrix with the practices applied by various companies flanked by the various steps of the NPD, which are then associated with the macro-phases of idea generation, product development, and commercialization. In Table 5.3 the links are schematized in order to clarify which practice was associated with the different NPD step.

Idea Generation		
Idea	*Preliminary*	*Concept*
Diversity and cross-sector linkages	Diversity and cross-sector linkages	Optimized packaging design
Customization	Green procurement	Product labelling
	Life cycle assessment	Customization
	Functional recycling	Eco-labelling
	Eco-labelling	
	Upcycling	

Product Development		
Development	*Testing*	*Trial*
Optimized packaging design Eco design Reduction Energy efficiency Design for disassembly/recycling	Customization	
Commercialization		
Launch		
Product labelling Eco-labelling Redistribution and resell Virtualize	Logistics/infrastructure Take-back and trade-in system Incentivize recycling	

Table 5.3 CE practices associated with the different steps of NPD

As can be seen, some practices are associated with more than one step of NPD. This is either because companies have implemented them in different situations in product development, or because the practice itself provides important information or resources for more than one NPD step.

5.2. Adoption of CE practices and Collaborations

After having analyzed in detail all CE practices associated with the various phases of the product development process, a more quantitative analysis is conducted to verify the adoption and the impact that practices and collaborations have on the two units of analysis, fast fashion and luxury brands. The analysis starts from a more specific focus on individual companies, and then generalize for the two sectors of the fashion group. The purpose is to investigate if two distinct frameworks for the two sectors were necessary, or if the differences are slight enough that the framework could be used for both.

5.2.1. Impact of circular practices

Starting with a more specific analysis from a company perspective, at a glance it can be seen that the trend of the different companies in the Chart 5.1 is more or less the same. The chart highlights how many circular practices are implemented in each macro-phase of NPD (generalized into idea generation, product development and commercialization) by each single company. It is important to specify that the practices *customization*, *incentivize recycling*, *upcycling*, *functional recycling*, *virtualize*, and *logistic/infrastructure* are not considered as they are present as individual cases across companies, and consequently they will not be considered in the final framework. In terms of all companies, out of the total number of practices, all organizations adopt the most in the first phase of the process, namely *idea generation*, and then gradually reduce or keep the same lower value in the subsequent two phases. As a result, the initial idea is that circular practices have the greatest influence on the beginning phase of the NPD process for all organizations.

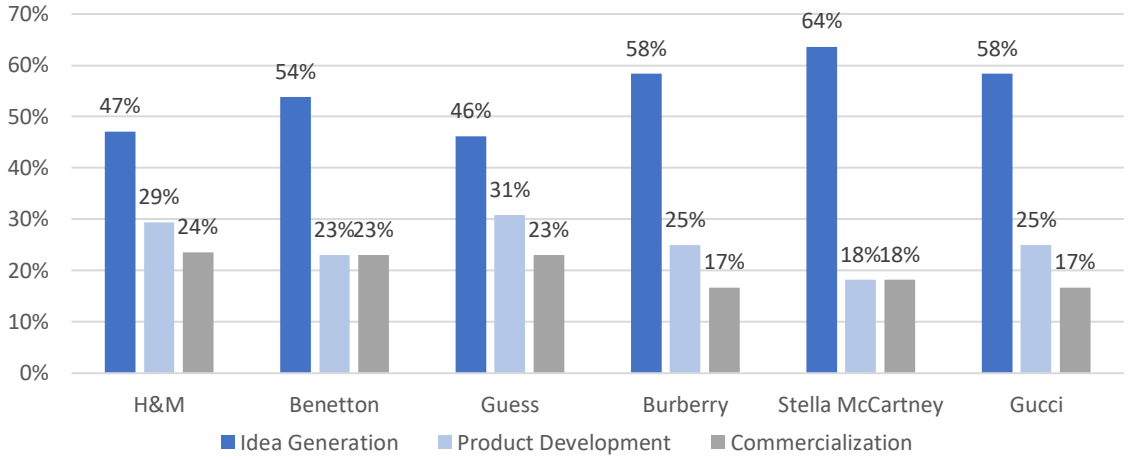

Chart 5.1: Percentage of practices implemented in each macro-phase of NPD for each research case

Remaining within the context of the individual companies, but going into more detail about the individual steps that make up each phase of NPD, the following trends can be highlighted:

- Idea generation phase (Chart 5.2): between the *idea*, *preliminary assessment* and *concept* steps, the general trend is a greater implementation in the second one of these, except for Benetton and Burberry where the impact in the *concept* is the same.
- Product development phase (Chart 5.3): practices are implemented only in the development step for all companies. Testing and trial phases are not impacted by the introduction of CE.

- Commercialization: no analysis has been done as the only step of commercialization is the launch.

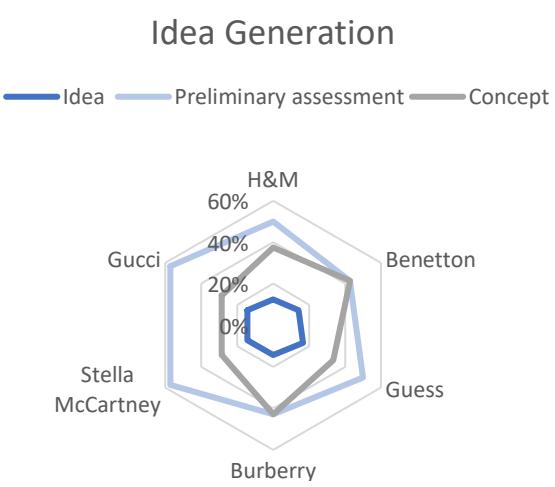

Chart 5.2: Percentage of practices implemented in each step of the idea generation phase

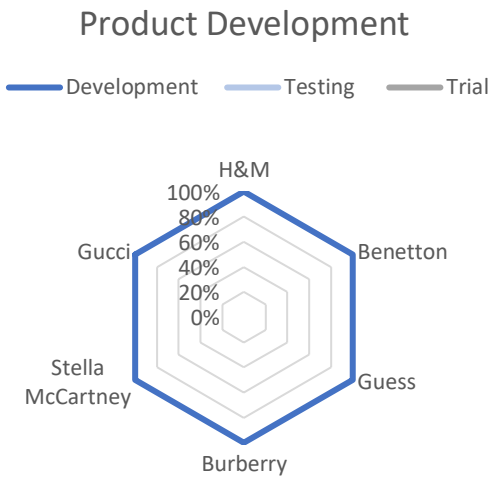

Chart 5.3: Percentage of practices implemented in each step of the product development phase

The analysis is then generalized by moving from individual companies to the two groups of fast fashion and luxury brands. Initially, it is verified if the impact that the practices have in the different steps of NPD is the same. As can be seen from the two following graphs, the trend is similar. Idea generation is the most impacted step, followed by product development and lastly commercialization. The difference that can be seen between the two units of analysis is that luxury companies implement in the first phase of NPD 60% of total practices (Chart 5.5), while fast fashion companies 49% (Chart 5.4). The ratio between the last two phases is more or less the same, except that for luxury companies the impact of NPD is slightly greater than for fast fashion companies (about 11% more).

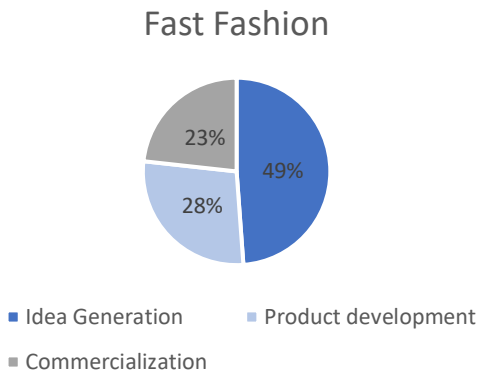

Chart 5.4: Percentage of practices implemented in each step of the NPD in fast fashion companies

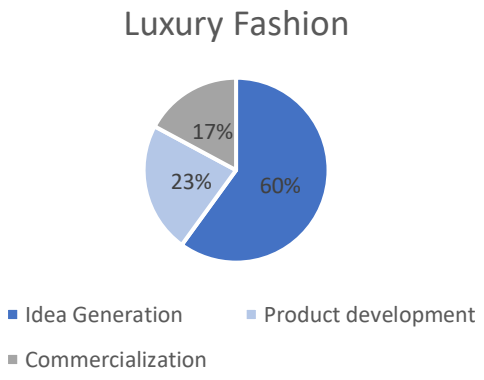

Chart 5.5: Percentage of practices implemented in each step of the NPD in luxury fashion companies

Following the line of investigation of the previous part on the specific companies, it is analyzed how the two generic groups are impacted in the specific steps of the idea generation and product development phases. In particular, in the first phase, it can be seen that for the two units of analysis the trend is almost the same. Indeed, the impact in the *idea* phase is identical, with a value equal to 14% of practices implemented. The value increases in the *preliminary assessment*, with a slightly higher value for luxury companies (52% compared to 48% for fast fashion companies). For the *concept* phase the situation is reversed, with a slightly higher value of 38% for fast fashion companies versus 33% for luxury brands (Chart 5.6).

In the product development phase, the situation is identical for the two analysis units. In fact, both implement 100% of the practices associated with product development in the *development* step (Chart 5.7). In both the trial and testing steps, no practices are implemented.

The commercialization step is not analyzed since, as in the previous specific situation, it is not divided into sub-phases.

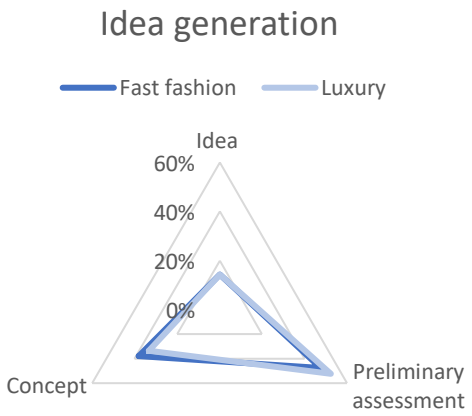

Chart 5.6: Comparison between fast fashion and luxury on the implementation rates of practices in the idea generation's steps

Chart 5.7: Comparison between fast fashion and luxury on the implementation rates of practices in the product development's steps

This specific study shows that there are no significant changes in the ratio of practices implemented in the various stages of NPD between the two units of analysis. As a result, there is no need to think about separating the framework for luxury and fast fashion firms from this first examination.

5.2.2. Collaborations as enabler for CE

From the literature it has emerged how collaborations play a vital role for the implementation of CE. They are considered as a facilitator of greater company performance since they capitalize on resources, capabilities, and processes located in partner firms (Kahn et al., 2006).

A more detail analysis is conducted to understand if collaborators are enabler for the practices implemented by the fashion companies. The study is conducted starting from a focus on each single practice, searching for a predominant trend in the creation of collaboration. Then, a brief note is made on the types of collaborations that are discovered from the analysis. At the end, a more quantitative analysis is performed in order to understand if there are some differences between fast fashion and luxury brands.

Observing Chart 5.8, about 78% of practices applied by the six cases require collaborations and only about 22% practices do not present them. The graph is created considering for each practice the number of companies that implement it; then, a distinction is made considering practices introduced with or without collaborations. Furthermore, if the single-case practices were not included in the final model – *customization*, *encourage recycling*, *upcycling*, *functional recycling*, *virtualize*, and *logistic/infrastructure building* – the percentage of practices implemented through collaboration rises to around 92%. Indeed, the only practice considered that does not present collaboration is *product labelling*. Thus, it is possible to affirm that to facilitate the transition from a linear supply chain to a circular model, stakeholders must collaborate across the value chain (Wood et al., 1991).

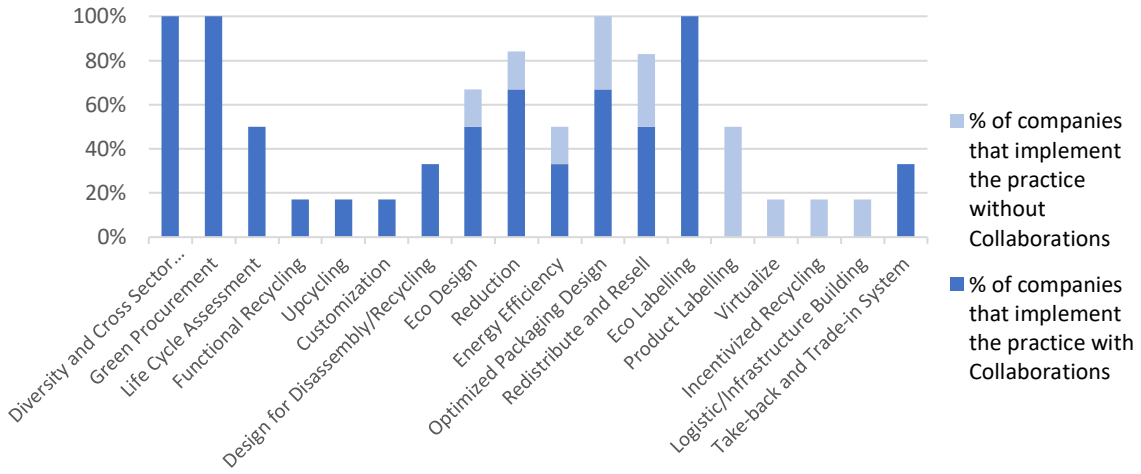

Chart 5.8: Percentage of companies that have decided to implement/not implement specific circular practices

In particular, considering the three main practices implemented by all six cases *diversity and cross-sector linkages, green procurement* and *eco-labelling*, they are all introduced inside six companies through collaborations.

- *Diversity and cross-sector linkages*
  companies work closely with network of trusted suppliers to ensure that environmental and social best practices are embedded throughout their supply chain. This result confirms what Mishra states in his study ''Collaboration as an enabler for Circular Economy: A case study of a developing country'': training suppliers might assist in overcoming the obstacles and hurdles that emerge throughout the outsourcing process of bringing/shipping materials/finished goods, resulting in material savings and resource efficiency.

- *Green procurement*
  the main collaborations are with material/solution provider companies. In fact, nowadays companies rely on an innovation strategy that incorporates not just internal ideas and resources, but also external tools and capabilities. Fashion firms must advance and innovate in a circular manner as a result of their desire and obligation to receive information and knowledge from non-competing companies.

- *Eco-labelling*
  the main type of collaboration that emerges from the analysis is that with third-party verified certification, mainly developed by the Textile Exchange. As states by the literature, fashion companies use in fact green certification in order to source more sustainable materials. They are very important in order to certify the validity of companies' actions.

Then, the cases in which a practice is implemented both with and without collaborations by the companies represent about the 42%, excluding the single-case practices. This happens when companies rely just the internal knowledge.

The main collaborations highlighted in the analysis are summarized in Table 5.4.

Non-profit organizations/alliances	
SAC Textile Exchange Leather Working Group Aii EMF BCI Woolmark Company	Cradle to Cradle Products Innovation Institute IWTO NRDC FSC Canopy
Fashion Company	
Kering Elivs and Kresse	Adidas Johnston of Elgin
International research center/institute	
Stockholm Resilience Centre	HKRITA
Sustainable solution/material provider	
Microfiber Consortium Evrnu Renewcell	Bolt Threads I:CO
Product manufacturer/chemical company	
DuPont	Ecopel
Coalition of global companies	
Fashion Pact RE100	EP100
Online Platform	
The Real Real	Depop

Table 5.4: Main collaborations established by the analyzed companies

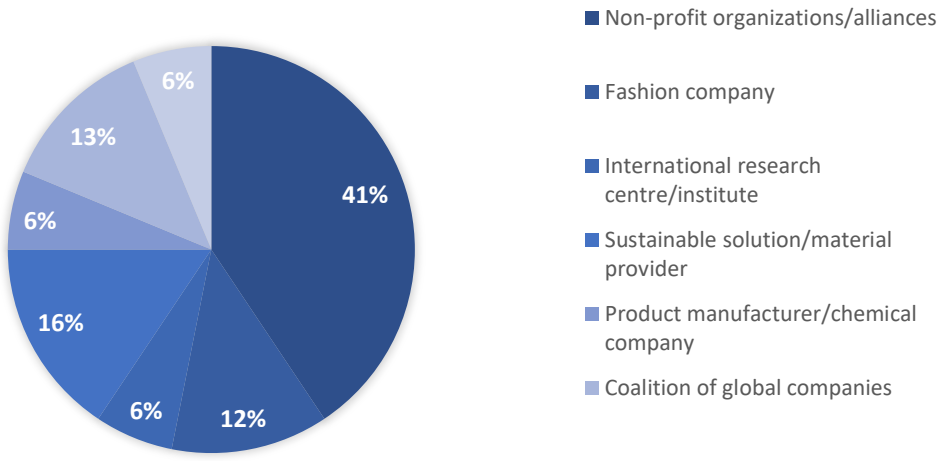

Chart 5.9: Collaboration typologies established by the analyzed companies

From Chart 5.9, it is possible to observe how non-profit organizations represent the 41% of the total type of collaborations that emerged from the interviews. The majority are sustainable organizations with specific aims on CE. In particular, the most influential is the EMF: it aims to develop CE minimizing waste and pollution, circulating products and resources, and rejuvenating environment. It is followed by sustainable solution/material providers, that represent the 16% of total collaborations. It makes sense since sourcing and utilizing sustainable material is crucial in order to operate sustainably and realize final products that reduce the negative environmental impacts. Regarding coalition of global companies, that represents the 13%, they are created in order to reach common goals. Through these coalitions, companies can provide common priorities that assist fashion firms in reducing their environmental impact. Furthermore, fashion companies, that in our case represent the 12% of total collaborations, collaborate with each other in the search for increasingly circular and sustainable solutions. In addition, it is important to underline the case of Gucci and Stella McCartney. Gucci is part of Kering, and Stella McCartney had been part of it since 2019. The luxury group Kering supports and promotes the development of some of the most renowned brands. This type of collaboration is very important for companies, since they share knowledge to reach more sustainable solutions. Less frequent are international research institutes, product manufacturers/chemical company, and online platforms, which each representing only the 6% of the overall collaborations. In particular, the percentage of use of online platforms is so low since this type of collaboration can be useful only for t*ake-back and trade-in system* and r*edistribution and resell* practices.

The latest analysis in this context focuses on the differences between luxury and fast fashion brands (Chart 5.10). In particular, it is important to understand if the two groups present some differences about the external partners integration for CE. From the graph it can be seen how collaborations are fundamental for both groups. In fact, 85% of practices implemented by luxury companies require collaborations as the 75% of fast fashion companies. The remaining part is mainly associated with practices like *product labelling*, which do not show any evident need of collaborations. Going into detail, for luxury companies the practice *energy efficiency* does not present an absolute necessity for cooperation, since 50% of the cases analyzed do not appear to create external collaborations. Regarding fast fashion companies, on the other hand, this situation is determined by practices such as *optimized packaging design* and *redistribution and resell* where only about the 30% of total cases create partnerships.

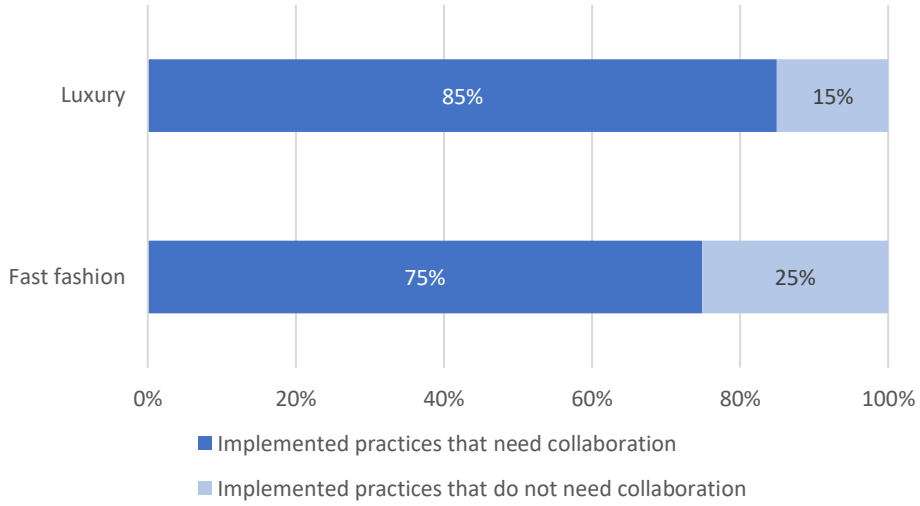

Chart 5.10: Comparison between luxury and fast fashion on the percentage of circular practices that need/do not need collaboration

Indeed, it can be seen that there is no substantial difference between fast fashion and luxury companies, even if they operate in some case in different ways for the creation of collaboration when implementing CE. The matter here is that, in both cases, collaborations represent an enabler for CE.

6 Interpretation of findings

The goal of this multi-case study was to show how fashion companies, divided into fast fashion and luxury brands, adopt various practices to shift their business models from linear to circular, as well as how collaborators may contribute. To achieve the research objective and fill this gap in the literature, a case study design was used to facilitate the collection of data from different companies in the fashion industry. Interviews were conducted and information was collected from company reports in order to conduct a triangulated data analysis (Guion et al., 2011). The combination of an elaborate qualitative analysis and a "quantitative" analysis made it possible to reflect the study participants' views and elaborations on the research topic. This section presents the findings in the context of the research questions, and will therefore be divided into a first review section concerning how circular practices can be associated and implemented in the process of NPD for fashion companies, and a subsequent section concerning the role of collaborations, whether partners can effectively be enablers of circular business models.

6.1. How companies implement the CE in NPD

With the introduction of new technologies and increased market awareness for environmental protection, fashion companies have had to take sustainability, in particular circularity, into account within their value chains and when developing new products (Fung et al., 2021). From this study it can be confirmed that fashion companies implement CE practices within their NPD process. The participants confirmed their transition from a linear to a circular business model over the years, each company in a different way and with different practices. The qualitative analysis, in particular, revealed which practices are most widely used by companies and which are only considered by a portion of the sample. Practices that are common across all units of analysis will undoubtedly be considered in the final research model. Paragraph 5.1.5 shows how all practices for all different cases have been implemented in the same phase of NPD. In the final framework the following practices will be associated with the micro-phases of NPD:

- Idea: *diversity and cross-sectoral linkages*
- Preliminary assessment: *diversity and cross-sectoral linkages, green procurement, eco-labelling*
- Concept: *optimized packaging design, eco-labelling*
- Development: *optimized packaging design*
- Launch: *eco-labelling*

There are also practices that are partially common to the different cases under consideration. From a detailed qualitative study, it was determined whether these practices, if present in only part of the units, were indeed decisive for the transition from a linear to a circular business model, and these will be considered in the final framework. In particular, the following practices were associated with the different steps of the NPD:

- Preliminary assessment: *LCA*
- Concept: *product labelling*
- Development: *eco-design, reduction, energy efficiency, design for disassembly/recycling* (specific for fast-fashion companies)
- Launch: *product-labelling, redistribution and resell, take-back and trade-in system*

The remaining practices were not considered in the final framework. As mentioned in the paragraph 5.1.4, some of these practices could not be qualitatively associated with any of the activities carried out by the different companies, and some were not selected because they were not very specific or could be replaced by other practices more associable to a circular model. Furthermore, some others were not selected a priori, because, already from the literature on the value chain (paragraph 1.1.2), they had a more direct perspective to the consumer than to the company itself.

The qualitative analysis attempted to deduce the necessity to create different frameworks according to the category of the different fashion companies, whether luxury or fast fashion. As can be seen from paragraph 5.2.1, the tendency of companies in general is rather similar. Practically all companies implement most of the total amount of practices in the initial phase of idea generation, with a particular focus on the preliminary assessment step. As for the second phase of product development, all companies focus their transition to a circular business model in the development phase, without implementing any practices in the testing or trial step. The general trend of the two groups of companies concerns an impact in NPD development in the early stages of the process and, as in the company-specific

analysis, also here the preliminary assessment gets the primacy over the other two steps idea and concept. The same applies to product development, where the two groups of companies are only impacted in a roundabout way in the development step. Finally, the commercialization phase is impacted by a smaller portion of circular practices. However, the introduction of the CE can affect the final marketing strategy, with the aim of sensitizing the customer to the sustainable issue and can also influence the end-of-life phase of a product.

From this analysis, it became clear that, in general, it is not necessary to create two different frameworks for the two units. Rather, a single framework is created because both from a qualitative point of view on the impacts of the practices in the NPD, and from a qualitative point of view on the detail of the practices in the different steps, no particular differences were found. The only exceptions are the practice *design for disassembly/recycling* and *take-back and trade-in system*, since the qualitative analysis shows that it is specific to companies belonging to the fast fashion sector and in no way associable to any activity performed by luxury brands (Table 6.1).

		Material sourcing			**Design**		
		Diversity and cross-sector linkages	Green procurement	Life Cycle Assessment	Design for disassembly /recycling	Eco design	Reduction
Idea generation	**Idea**	X					
	Preliminary assessment	X	X	X			
	Concept						
Product development	**Development**				X*	X	X
	Testing						
	Trial						
Commercialization	**Launch**						

**specific to Fast Fashion brands*

Manufacturing	Distribution and sales		Consumption and use		Collection and disposal
Energy efficiency	Optimized packaging design	Redistribute and Resell	Eco-labelling	Product labelling	Take-back and trade-in systems
			X		
	X		X	X	
X	X				
		X	X	X	X*

**specific to Fast Fashion brands*

Table 6.1: Practices implemented in every step of NPD by fashion companies

6.2. Collaboration as enabler for CE

The second part of the framework concerns collaborations, meaning the role they play in fashion firms' transition from a linear to a circular economy. Collaborations across the value chain are crucial for companies to fulfill their goals and specially to gain competitive advantage (Vanathi et al., 2014). In this case, the common achievement between the two entities is to reduce, reuse or recycle materials in order to extend the life cycle of the product. As a result, value chain collaboration must be viewed holistically in terms of circularity, extending beyond the textile sector and involving stakeholders outside of the traditional supply chain, reducing the need for stakeholders to exchange by-products, materials, and information (González-Sánchez et al., 2020). The principle of Open Innovation is also taken into account in this way.

The qualitative analysis tried to find out which practices were dependent on collaboration for the cases. It was emphasized that, for all the practices under review, the intervention of external collaborators was necessary, either to provide information and knowledge or to procure sustainable materials. Exceptions were also highlighted, such as *optimized packaging design*, *eco design*, *reduction*, *energy efficiency* and *redistribution and resell*, where only parts of the companies require the support of collaborators. This partial need for collaboration occurs mainly in fast fashion companies, except for *energy efficiency* where among the two companies implementing that practice, only one needs collaboration. Then there is a single practice, *product labelling*, which in any case under consideration in both luxury and fast fashion brands does not require any kind of collaboration for its implementation.

On the other hand, the more quantitative analysis sought to determine whether the importance of collaborations was at the same level for the two groups of companies. It was found that the difference between the two groups is minimal, with luxury companies having collaborations for 85% of practices, compared to 75% of practices for fast fashion brands. This is mainly due to the practices mentioned above, i.e. those that are partially dependent on external collaborations. In fact, for these practices, the majority of fast fashion brands do not require collaboration, whereas all luxury companies require it. As a result, a unique framework is created, as the difference between the two groups under investigation is minimal and both consider collaborators as CE enablers. However, those practices that certainly need collaboration in the luxury sector and that for fast fashion companies could happen but is not necessary are highlighted, and vice versa (Table 6.2).

		Material sourcing			Design		
		Diversity and cross-sector linkages	Green procurement	Life Cycle Assessment	Design for disassembly /recycling	Eco design	Reduction
Idea generation	**Idea**	X					
	Preliminary assessment	X	X	X			
	Concept						
Product development	**Development**				X*	X	X
	Testing						
	Trial						
Commercialization	**Launch**						

**specific to Fast Fashion brands*

Manufacturing	**Distribution and sales**		**Consumption and use**		**Collection and disposal**
Energy efficiency	Optimized packaging design	Redistribute and Resell	Eco-labelling	Product labelling	Take-back and trade-in systems
			X		
	X			X	
X	X		X		X*
		X	X	X	

**specific to Fast Fashion brands*

Table 6.2: Final framework

- red → need collaboration in both luxury and fast fashion brands
- blue → luxury brands need collaboration, while just part of fast fashion brands needs it
- yellow → fast fashion brands need collaboration, while just part of luxury brands needs it
- green → no need of collaboration

6.3. Discussion

The combination of the theory on circular practices and on collaborations as enablers for the transition from a linear to a circular model leads to the creation of the theoretical framework shown in Table 6.2. This forms the basis for answering the research questions presented at the beginning of the study. Findings highlight:

- The main circular practices that fashion companies implement and how they affect the NPD process. In particular, the NPD changes with the introduction of CE: most of the activities are concentrated at the beginning of the NPD process for both luxury and fast fashion brands.
- Collaborations along the value chain are preferable in order to transition to a circular business model, especially in certain sustainable practices. There are some differences between the two units of analysis, with some activities that require specifically collaborations for one group and not for the other and vice versa.

The study shows that fashion companies are looking for new technologies and innovations in CE in order to change their status of linear business models. This theory is quite consistent for both the two groups of the fashion industry, with some small differences highlighted in Table 6.2. In order to achieve circular business models, companies have to collaborate both with each other and with external stakeholders, such as non-profit organizations, research institutes, suppliers and others. As the theory shows, involving external stakeholders is a source of value creation for the company (Freeman, 1984), thanks to the creation of a network in which values and knowledge are exchanged. In this way, firms exploit the Open Innovation method presented in section 1.2.3.

Nevertheless, it is important to take into account the fact that fashion companies in this transition must be able to overcome barriers. Fashion companies have very complicated supply chains, where they have to try to manage different stakeholders and interconnected processes. Furthermore, the market is still generating such knowledge in terms of product design that designers are completely aware of all the benefits that CE may bring from a sustainable perspective. Customers are often unaccustomed to taking environmental issues into account and focus only on the aesthetics of the product, rather than the damage it can cause to the environment. This emphasizes the necessity of fashion firms today focusing not just on the first phase of the product development process, such as the source of sustainable raw materials, but also on increasing customer awareness of sustainability initiatives. There are also several challenges from a technological point of view, including a lack of capacity and high costs in implementing sustainable recycling practices and

processes. If those barriers are overcome and the business model aligns perfectly with the selection of partners and practices to be implemented, then there is a great possibility to face the change.

7 Conclusion, limitation and avenues for future research

This study focuses on companies transitioning their business model from linear to circular in the fashion industry. In particular, a case study was conducted on companies, including GUESS, H&M, Benetton, Burberry, Gucci and Stella McCartney. They were categorized into fast fashion and luxury brands. Each of these companies was analyzed from a sustainable point of view to understand the extent to which their business models have undergone a transition towards CE.

The literature on the CE in general and in the fashion sector, as well as the presentation of the main circular activities along the companies' value chain, were analyzed to provide a complete theoretical background. The second main topic presented in the literature was the development of new products, with the various existing templates and the selection of the most appropriate model for this study. The concept of collaboration was the meeting point for both topics. It was explained how it can lead to change.

Two main research questions emerged from the literature review. The first gap was highlighted as the relationship between circular practices and the inventive process of NPD. Then the goal was to figure out how partnerships fit into the move to a circular business model, and if they're even essential.

In order to answer these questions, a study methodology has been defined and followed for the different cases that have been selected in the fashion industry. The information was retrieved from interviews, as well as from company reports and research articles. In this way, it was feasible to examine and quantify the success of the businesses, both in terms of the circular practices used in the business model and the partners who helped contributed to their transformation. Two analyses were conducted: a qualitative one in order to define the main practices and collaborations to be included in the final theoretical framework; then a more quantitative analysis to understand if it was necessary to create two separate frameworks for companies in the fast fashion and luxury sectors, considering the adoption of practices and collaborations.

From the combination of the two evaluations, the two research questions were answered. In particular, for the first question *"How and why companies transform their product development process to implement CE?"* the answer was unique for the two units of analysis. The business model is innovated by shifting from linear to circular through the implementation of different practices. These are the most significant in order to make a product circular within the whole process of NPD. As can be seen, the steps of the innovation process are consistent; what differs is how a new product is conceptualized and realized. In detail, at the idea generation phase, the major consideration is no longer customer needs or the introduction of new technologies, but rather sustainability. The idea stems from a desire to create items with circular features, using less raw materials, which are reused or recyclable and hence have a lower environmental impact. Suppliers and their new "creations" become a crucial starting point for the development of new products from this perspective. The criteria for selecting suppliers, the raw material procurement strategy, and the LCA for assessing the environmental impact of a product change are all considered during the preliminary assessment phase. The necessity of evaluating a product's environmental impact affects how corporations choose raw materials. As a consequence, the concept phase has an impact: the ultimate definition of the new product, and thus the message it will communicate to the final consumer, are inextricably related to the circularity aspect. Indeed, most of the companies, both in luxury and fast fashion, implement the practices in the initial phase of the process, in order to give circular characteristics from the beginning. This makes sense because for a product, to be sustainable, it must be conceived as such from the beginning of the production process. However, the results underline that, in order to become more circular and overcome the barriers in the fashion industry, also the product development and commercialization phases are impacted by CE practices. With the introduction of new technologies and production processes, product realization is evolving, all with the goal of decreasing waste and negative environmental implications. Many of the processes that were originally employed are no longer in use or have been modified. Finally, the commercialization phase is critical for explaining the new circular strategy to customers and influencing their behavior. CE changes the way in which companies operates, affecting not only sourcing and production, but also the marketing strategy. In this regard, it's fundamental to educate customers about sustainability.

There is, instead, a little difference between the two units when it came to the second question, *''Are collaborations enablers in the implementation of CE practices within the innovation process?''*. In detail, the answer was affirmative for both, except for a few detailed practices for which some luxury brands needed collaborators and fast fashion brands did not and vice versa. Collaboration is essential in order to share values, technologies, information and knowledge throughout the process of NPD.

Each of the cases analyzed has different partners, but for all of them it was necessary to take them into consideration in order to activate the transition process. Circular practices activated by collaboration are fundamental in order to change the current regime of the fashion industry that is still too polluting but has high potential for growth through research and development. Companies need to re-evaluate their business models both from the point of view of implemented activities and from the point of view of partners and collaborators in order to add value to their performance.

The proposed re-conceptualization of the NPD process through cooperation with the implementation of circular practices has significant managerial consequences. They must reevaluate idealization, product development, and sometimes even promotional methods for all markets, as the issue of circularity is critical not just to reduce the fashion industry's environmental consequences, but also to improve the market share and visibility of fashion enterprises. From the early stages of product development, fashion - related managers should consider all the technologies, raw materials and KPIs to ensure that the product has the necessary characteristics to be deemed a sustainable product. They should also adopt co-development strategies, as research suggests that networking with external stakeholders is critical for applying circular practices throughout the product development and launch process (Chiesa et. al., 2011).

In terms of the literature contribution, this study clarifies the connections between subjects that are frequently discussed independently in the literature, namely CE, NPD and the role that collaboration plays in the implementation of different practices. According to the research findings, it is the latter that is essential in transforming a business model from linear to circular during the NPD process. We extend the literature by developing a model that depicts the fundamental circular practices at each phase, emphasizing the necessity of implementation from the beginning and the active role that collaborators play throughout the innovation process. Partners do, in fact, advocate the usage of the CE through information sharing, supplier education, and stakeholder involvement, as stated by Mishra in 2019. This theory is supported throughout the NPD process, where an effort is made to highlight the relationship between the fashion company and its collaborators in terms of implementing circular practices and the influence they have on improving awareness on the importance of sustainable product development.

7.1. Limitations of the study

The study presents some limitations. The purpose of the following lines is to highlight research limitations and flaws, as well as to remark on possible future research projects.

The type of respondents is the first restriction of this multiple case research. Only in two out of six companies it was possible to interview managers from different areas, in detail from sustainability and product development areas, in order to have a complete view. In all the other cases, interviews were made with only one manager of a single area. In addition, it was not possible to interview anyone from Stella McCartney, and only the Sustainability Report and on-site publications were used to collect data. This has limited the researcher's ability to document all the needed information. Despite this, the sustainability reports made available by the companies allowed to fill the gaps and allow a more exhaustive exploration of the research questions.

In addition, even if it was possible to reach high effort regarding the implementation of CE practices by the six companies analyzed, a limitation is given by the small number of cases analyzed for each single group, fast fashion and luxury company. Three cases for fast fashion and three cases for luxury companies may not provide a statistically significant sample to confirm the framework's general validity. However, they represent a good initial starting point for further investigations.

Finally, data collection procedure used is a more qualitative approach that might be impacted by partial information and personal bias. In addition, qualitative research made more difficult to extend the findings to a broader population with the same degree of certainty.

7.2. Avenues for future research

The new framework provides the base for some potential future researches. In particular, even if it has been discovered that there are no significant differences in the implementation process of CE between fast fashion and luxury companies, it is important to highlight that the investigated companies have relatively similar dimensions. Furthermore, they are well-known/iconic fashion labels that only represent a portion of the business. Taking into account different organizations of various sizes in fashion sector may enable future studies in establishing which elements can have positive or negative impacts on CE adoption, as well as smaller fashion enterprises for whom CE implementation may be more challenging.

Although the study represents a starting point for fashion companies looking to integrate CE principles into their product innovation process, it's crucial to figure out what the primary unique hurdles are that they must overcome in order to become truly circular.

Future studies could also validate the framework in the context of other polluting industries in order to test if the discovered solutions are feasible. Indeed, the fashion industry is not the only sector that requires more responsible and sustainable actions. The agriculture industry, mainly related to food, for example, is among the most polluting industries in the world. It generates about 13-18% of global greenhouse gas emissions, as well as land clearance and burning for agriculture, diminishing the land cover required to maintain the natural carbon cycle. Important actions have been implemented since last years. In the United Nations Climate Change Conference in 2021, over a hundred nations have committed to halting deforestation by 2030. (Omondi, 2021). Other businesses that emit a lot of greenhouse gases and carbon emissions are transportation and energy industries. In order to reduce the worldwide environmental pollution, more researches need to be developed to help companies to create an economy that is more circular.

Finally, future researchers should investigate better the importance of collaborations, not only examining their relevance and function in implementing CE within a company, but also how they finally affect the company's long-term success.

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A Appendix A

In this section, the CE practices implemented by the different case studies are tabled below, together with the collaborations they set in order to perform those activities

A.1. GUESS and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Suppliers
	Preliminary assessment	Diversity and cross-sector linkages	Suppliers
		Eco-labelling	Third party verified certification
		Green procurement	Canopy; Textile Exchange
	Concept	Optimized packaging design	
		Eco-labelling	Third party verified certification
Product Development	Development	Design for disassembly /recycling	EMF
		Eco design	EMF
		Reduction	
		Optimized packaging design	

	Testing	/	
	Trial	/	
Commercialization	Launch	Redistribution and reuse	
		Logistics/infrastructure	
		Take-back and trade-in system	I:CO
		Eco-labelling	Third party verified certification

A.2. H&M and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Suppliers
		Customization	Customers
	Preliminary assessment	Diversity and cross-sector linkages	Suppliers
		Green procurement	Canopy; Textile Exchange; Forum for the Future's MMC Fiber Brand Round Table; Responsible Cashmere Round Table; Responsible Leather Round Table; Renewcell; Stockholm Resilience Center; Microfibre consortium; University Bioextracts

		LCA	Third-party verified lifecycle assessment; SAC's Materials
		Eco-labelling	Third-party verified certification
	Concept	Optimized packaging design	EMF (the New Plastic Economy-Global commitment), Fashion Pact, Pack4Good
		Eco-labelling	Third-party verified certification
		Customization	Customers
		Product-labelling	
Product Development	Development	Design for disassembly /recycling	HKRITA; Ellen MacArthur Foundation
		Eco design	HKRITA; EMF
		Reduction	HKRITA; EMF; Zero Discharge of Hazardous Chemicals (ZDHC
		Optimized packaging design	EMF; Fashion Pact; Pack4Good
		Energy efficiency	EP100 and RE100
	Testing	Customization	Consumer
	Trial	/	
Commercialization	Launch	Redistribution and resell	

		Take-back and trade-in system	I:CO
		Incentivize recycling	
		Product-labelling	
		Eco-labelling	Third-party verified certification

A.3. Benetton and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Suppliers - Sustainable Apparel Coalition
	Preliminary assessment	Diversity and cross-sector linkages	Suppliers - Sustainable Apparel Coalition
		Green procurement	The Woolmark Company; IWTO
		Eco labelling	Third-party verified certification
	Concept	Optimized packaging design	
		Product labelling	
		Eco-labelling	Third-party verified certification
Product Development	Development	Eco design	
		Reduction	ZDHC
		Optimized packaging design	

	Testing	/	
	Trial	/	
Commercialization	Launch	Redistribution and resell	Depop
		Virtualize	
		Product labelling	
		Eco-labelling	Third-party verified certification

A.4. Burberry and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Suppliers
	Preliminary assessment	Diversity and cross-sector linkages	Suppliers
		Green procurement	Sustainable Fibre Alliance (SFA) and Johnstons of Elgin; Canopy; Leather Working Group
		Eco Labelling	Third-party verified certification
	Concept	Optimized packaging design	EMF's New Plastics Economy Global Commitment
		Product labelling	
		Eco-labelling	Third-party verified certification

Product Development	Development		
		Reduction	EMF; ZDHC; NRDC; Elvis & Kresse
		Energy efficiency	RE100; Aii; Kering
		Optimized packaging design	EMF's New Plastics Economy Global Commitment
	Testing	/	
	Trial	/	
Commercialization	Launch	Product labelling	
		Eco-labelling	Third-party verified certification

A.5. Gucci and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Kering; Suppliers
	Preliminary assessment	Diversity and cross-sector linkages	Kering; Suppliers
	Preliminary assessment	Functional recycling	Farfetch
		Eco labelling	Third party verified certification
		Green procurement	Kering; Canopy

		Upcycling	NGOs and women-based projects
		Life Cycle Assessment	Kering
	Concept	Optimized packaging design	The Fashion Pact under Kering
		Eco labelling	Third party verified certification
Product Development	Development	Energy Efficiency	
		Reduction	The North Face
		Optimized packaging design	The Fashion Pact under Kering
	Testing	/	
	Trial	/	
Commercialization	Launch	Eco Labelling	Third party verified certification
		Redistribute and Resell	The RealReal

A.6. Stella McCartney and collaborations categorized by the different NPD process.

NPD		**Practice**	**Collaboration**
Idea Generation	Idea	Diversity and cross-sector linkages	Suppliers
	Preliminary assessment	Diversity and cross-sector linkages	Suppliers
		Green procurement	DuPont and Ecopel; Bolt Thread; Canopy;

			Cradle to Cradle Products Innovation Institute
		Eco labelling	Third-party verified certification
		Life Cycle Assessment	Kering
	Concept	Optimized packaging design	EMF's New Plastic Economy Global Commitment; Canopy's Pack4Good Initiative
		Eco labelling	Third-party verified certification
Product Development	Development	Optimized packaging design	EMF's New Plastic Economy Global Commitment; Canopy's Pack4Good Initiative
		Eco design	Adidas
	Testing	/	
	Trial	/	
Commercialization	Launch	Redistribution and Resell	The RealReal
		Eco Labelling	Third-party verified certification

B Appendix B

Recycled materials used in H&M production.[65]

Recycled material	Description
Recycled cotton	It comes from old garments and textile scraps which are reduced into fibers, spun and transformed into new fabrics. It reduces the use of virgin raw materials.
Recycled wool	It comes from scraps or leftovers created during the production of cloths, or from garments collected in boxes. It saves raw materials and reduces the volume of waste destined for landfills.
Recycled polyester	It is a man-made fiber made from the scraps of petroleum-based products, such as old PET bottles or polyester garments. H&M used 100% recycled polyester in its Spring and Autumn Conscious Collections. This collection results in 75% less water consumption, 90% less chemical usage, 30% less energy consumption, and a 30% reduction in CO2.
Recycled polyamide	It is made from materials such as broken fishing nets and old carpets.
Recycled plastic	It comes from PET bottles and other plastic containers, to create new products as accessories.

[65] Source: H&M's Sustainability Report 2020

Sustainable materials developed and used by H&M.[66]

Material	Description	Advantages
Lyocell	It is a natural and renewable material obtained from vegetable cellulose. H&M uses in particular Tencel Lyocell fibers, sustainably obtained from wood pulp in a closed loop process. It is very similar to cotton.	- Less water for production - Less use of pesticides
Vegea	It is a soft vegan leather substitute manufactured from the byproducts of wine. Plant-based alternatives to totally synthetic oil-derived materials are being developed by H&M. Its manufacturing techniques rely on the use of biomass and vegetable raw resources. In H&M, it's used especially for chain-strap handbags and for some pairs of shoes.	- Recycled material
Renu	It is a high-quality recycled polyester that comes from raw material obtained from used textile products.	- Recycled material
Circulose	It is a fiber made from discarded textiles (recycling cotton, viscose fibers, etc). It can be used to substitute forest raw materials without sacrificing quality. The garment in the Conscious Exclusive collection is constructed of a 50/50 blend of Circulose from recycled jeans and viscose from FSC-certified wood.	- Recycled material
EVO by Fulgar	It is a bio-based yarn derived from castor oil, a renewable source.	- Less water for production - Naturally growth
Desserto	It is a cruelty-free, plant-based alternative to leather, produced from cactus plants.	- Less water for production

[66] Source: H&M's Sustainability Report 2020

ECONYL	It is a regenerated nylon created entirely of waste from the ocean and land. The process begins by salvaging fishing nets, fabric remnants, carpet floors, and industrial plastic. The nylon is next processed and cleaned in order to recover as much as possible. Through a dramatic regeneration and purification process, nylon waste is recycled to its original form. Finally, it is transformed into yarns and polymers for use in the fashion industry.	- Recycled material - Reduction of waste
FLWRDWN	It is a replacement for their present lightweight, thermal insulating outwear, which is constructed of animal feathers or synthetic down. It's a proprietary technique that provides a plant-based, cruelty-free, and resource-saving alternative.	- Natural source - No use of pesticides

C Appendix C

Meta-matrix for qualitative analysis. On the columns, the practices are associated with the steps of the NPD, grouped by macro-phases. In the rows, the research cases are grouped by unit of analysis.

		Idea Generation											
		Idea		Preliminary assessment						Concept			
		Diversity and Cross - sector linkages	Customization	Diversity and Cross - sector linkages	Green Procurement	Life Cycle Assessment	Functional Recycling	Eco-labelling	Upcycling	Optimized Packaging Design	Product labelling	Customization	Eco-labelling
Fast fashion brands	**H&M**	(Suppliers)	(Customers)	(Suppliers)	(Canopy; Textile Exchange; Forum for the Future (Responsible Cashmere Round Table; Responsible Leather Round Table); Renewcell; Stockholm Resilience Centre; Microfiber consortium)	(Third-party verified lifecycle assessment Sustainable Apparel Coalition's Materials)		(Third-party verified certification)		(Ellen MacArthur Foundation; Fashion Pact; Canopy)		(Customers)	(Third-party verified certification)
	Benetton	(Suppliers; Sustainable Apparel Coalition)		(Suppliers; Sustainable Apparel Coalition)	(The Woolmark Company; IWTO)			(Third-party verified certification)					(Third-party verified certification)
	Guess	(Suppliers)		(Suppliers)	(Canopy; Textile Exchange)			(Third-party verified certification)					(Third-party verified certification)
Luxury brands	**Burberry**	(Suppliers)		(Suppliers)	(SFA and Johnstons of Elgin; Canopy; Leather Working Group)			(Third-party verified certification)		(Ellen MacArthur Foundation)			(Third-party verified certification)
	Stella McCartney	(Suppliers)		(Suppliers)	(DuPont and Ecopel; Bolt Thread; Canopy; Cradle to Cradle Products Innovation institute)	(Kering)		(Third-party verified certification)		(Ellen MacArthur Foundation; Canopy)			(Third-party verified certification)
	Gucci	(Suppliers; Kering)		(Suppliers; Kering)	(Kering; Canopy)	(Kering)		(Third-party verified certification)	(NGOs and women-based projects)	(Kering and the Fashion Pact)			(Third-party verified certification)

Product development										Commercialization					
Development				Testing		Launch									
Optimized Design	Packaging	Eco Design	Reduction	Energy Efficiency	Design for Disassembly/Recycling	Customization	/	Product labelling	Eco-labelling	Redistribute and Resell	Virtualize	Logistics/Infrastructure	Take-back and Trade-in System	Incentivize Recycling
(Ellen MacArthur Foundation Fashion Pact; Canopy)		(HKRITA; Ellen MacArthur Foundation)	(HKRITA; Ellen MacArthur Foundation; ZDHC)	(EP100; RE100)	(HKRITA; Ellen MacArthur Foundation)	(Customers)			(Third-party verified certification)				(LCO)	
			(ZDHC)						(Third-party verified certification)	(Depop)				
		(Ellen MacArthur Foundation)			(Ellen MacArthur Foundation)				(Third-party verified certification)				(LCO)	
(Ellen MacArthur Foundation)			(Ellen MacArthur Foundation; ZDHC; Natural Resources Defence Council; Elvis & Kresse)	(Kering; RE100; Aii)					(Third-party verified certification)					
(Ellen MacArthur Foundation; Canopy)		(Adidas; Evrnue)							(Third-party verified certification)	(The RealReal)				
(Kering and the Fashion pact)			(The North Face)						(Third-party verified certification)	(The RealReal)				

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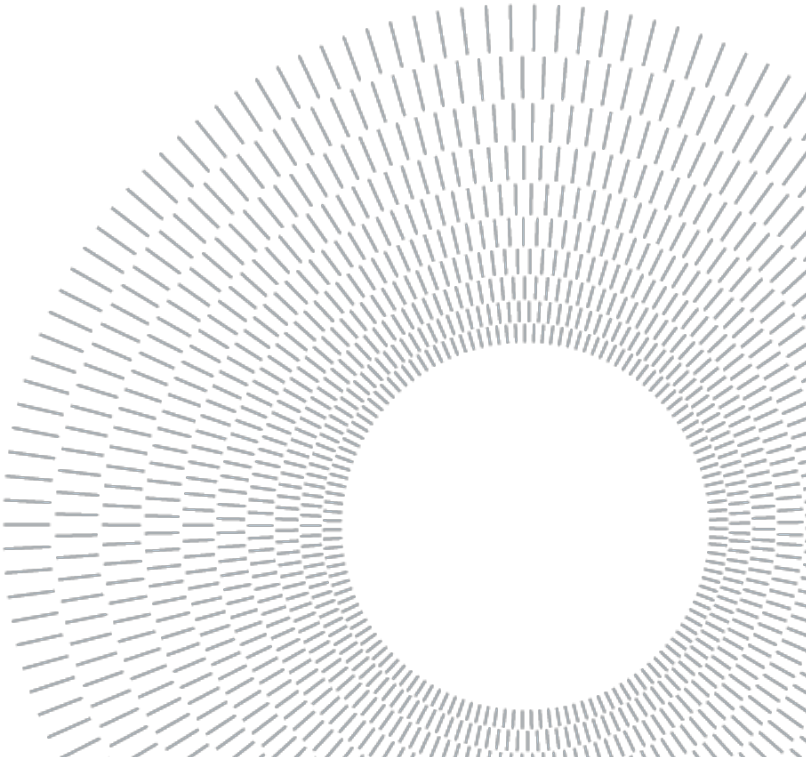

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