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**"WEAVING SUSTAINABILITY: EXPLORING THE CIRCULAR SUPPLY  
CHAIN IN THE TEXTILE AND FASHION INDUSTRY THROUGH CASE  
STUDY ANALYSIS"**

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## ***INTRODUCTION & SUMMARY***

The charm of the fashion industry is undeniable, as it weaves together creativity, style, and expression. Yet, behind the runway's glitz and glamour, lies a striking reality - the fashion industry stands as a formidable contributor to environmental degradation and pollution (Niinimäki et al., 2020). The industry's constant pursuit of inexpensive, disposable clothing has fueled a linear production model characterized by resource-intensive practices (Fletcher, 2016). As fast fashion cycles continue to accelerate, consumers are buying and discarding garments at an unprecedented rate, leading to a surge in production and waste (Niinimäki et al., 2020). At the heart of the textile and fashion (TAF) industry's environmental dilemma is the 'take, make, dispose' paradigm. This linear approach relies heavily on extracting finite resources, such as water, energy, and raw materials, to produce garments that often find their way to landfills after minimal use (Fletcher, 2016). This model perpetuates a culture of disposability, where clothing is viewed as momentary, leading to a significant environmental footprint. The TAF industry consumes an astonishing number of resources, particularly water. For instance, the production of a single cotton t-shirt can demand over 2,700 liters of water (European Parliament, 2020). Additionally, the industry generates vast quantities of waste, from production cut-offs to discarded garments, with much of it ending up in landfills or incinerators, exacerbating environmental problems (Niinimäki et al., 2020). The scale of the TAF industry's impact is best understood through quantification: according to the

Ellen MacArthur Foundation (EMF) (2017), fashion is responsible for approximately 10% of global carbon emissions, surpassing emissions from international flights and maritime shipping combined. These numbers underscore the urgency of addressing the industry's environmental footprint.

Amongst this environmental crisis, circular economy (CE) emerges as a promising solution. CE envisions a regenerative system where products and materials are reused, refurbished, remanufactured, and recycled to minimize waste and extend product lifecycles (Kirchherr et al., 2017). In the context of fashion, CE promotes longevity and the reentry of garments into the market through resale and rental models (Fletcher, 2016). CE offers several advantages for the TAF industry. First, it reduces the demand for virgin resources, thereby lessening the environmental impact of production. Second, it creates opportunities for innovative business models (BMs) that prioritize durability, repairability, and sustainability (Kirchherr et al., 2017). Third, it aligns with consumer demands for eco-conscious choices, fostering brand loyalty.

Effecting a transition to a CE in the TAF industry is a shared attempt. It necessitates collaborative efforts from all supply chain (SC) stakeholders, including manufacturers, retailers, consumers, and policymakers. This collective commitment is the keystone for redesigning processes, rethinking BMs, and promoting circular practices, thus transforming the industry into a force for sustainability rather than destruction (Coscieme et al. 2022). Despite the growing recognition of the need for a CE in TAF industry, the existing literature lacks a comprehensive examination of the entire circular supply chain (CSC), encompassing various BMs for CE. This research aims to bridge this gap by conducting a thorough analysis of case studies. Through this analysis, the intent is to contribute new insights to the existing literature, clearing up how real-world companies are approaching the paradigm shift in the TAF industry. Additionally, this research endeavors to explore potential disparities between theoretical concepts and real-world practices. By combining established theories on CE, circular business models (CBM), and CSC with the actual strategies and actions implemented by TAF industry players, the primary objective is to uncover valuable insights into the challenges and opportunities related to the translation of theoretical concepts into practical applications.

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To achieve these objectives, this thesis is structured as follow: In Chapter 2, a comprehensive overview of the theoretical foundation underpinning the concept of CE is provided. It delves into the intricacies of CBM and explores the dynamics of CSC. This chapter lays the groundwork for the subsequent analysis by establishing a solid theoretical framework. Building on the theoretical foundation introduced in Chapter 2, Chapter 3 adapts these theories to the unique context of the TAF industry. It explores how the principles of CE, CBM and CSC intersect with the specific challenges and dynamics of the TAF sector. Chapter 4 outlines the methodology employed in this research. In Chapter 5, the core empirical findings are presented. This chapter comprises an in-depth analysis of real-world cases of the TAF industry. This study employs a business model canvas (BMC) analysis to investigate how companies are integrating circular practices into their BM, conducting financial and environmental assessments to evaluate the viability and efficacy of each CBM. The final chapter, Chapter 6, synthesized and discusses the results of our empirical analysis.

Through a structured exploration of theoretical foundations, empirical evidence, and critical analysis, this research seeks to offer a comprehensive understanding of the evolving landscape of circularity in the TAF industry. In doing so, the aim is to contribute not only to academic knowledge but also the practical efforts of companies seeking to adopt sustainable and CB practices.



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## THEORETICAL BACKGROUND

### **2.1 Circular Economy**

#### **2.1.1 Introduction to the Circular Economy**

DEFINITIONS: The CE, a concept that has gained significant attention in recent years, presents a transformative approach to resource management and sustainability. Departing from the traditional linear model of "take-make-dispose," the CE was first mentioned by Pearce & Turner (1990) as the idea that everything is an input for something else. Such transition brings economic and social benefits such as job creation, social inclusion, added value for investments, reduced greenhouse gas emissions, and decreased dependence on imported raw materials (Pitoska et. al 2022).

The circular system, opposite to the aforementioned "take-make-dispose", is based on the idea of "cradle-to-cradle", which refers to the concept of designing and producing products in a way that they can be fully recycled or repurposed at the end of their life, mimicking for some extent the nature's cycle (Braungart, 2009). There are several definitions of CE, with some focusing on the reuse of materials rather than using new, virgin resources (Sauvé et al., 2016) and others looking at the broader concept of using waste as an input rather than a loss (Preston, 2012). Some definitions are not only focused on the material resources aspect, but they also include additional elements such as land management, energy efficiency, water conservation, and biodiversity protection (Su et al., 2013). Others view CE from an economic perspective, seeing it as "an essential condition for a resilient industrial system that facilitates new kinds of economic activity, strengthens competitiveness and generates employment" (Bastein et al., 2013). A definition that takes into consideration many disciplines is the one given by the EMF (2013a): the CE is a system that is designed to be restorative or regenerative. It seeks to use renewable energy, eliminate the use of toxic chemicals that could prevent reuse, and strive for zero waste through better design of materials, products, systems, and BMs. Circularity must be

guarantee for all materials and product, which can differentiate between each other's. A distinction between biological and technical materials is agreed upon the literature (EMF, 2013a; Gazzola et. al, 2020), with the former ones being defined as those materials that can be returned to the biosphere as feedstock since they are non-toxic and biodegradable (e.g., forests products), and the latter ones designed to switch cyclically from production to consumption with a minimum loss of quality or value (e.g., plastics, metals, and textile).

THE GOAL OF THE CIRCULAR ECONOMY: is to always keep both types of materials at their highest utility and value through good design, management, and technological innovation, and to facilitate the flow of materials, energy, labor, and information to rebuild natural and social capital (EMF 2013b), while preserving natural resources and minimizing waste generation (Fernandes et al., 2020). Furthermore, in a more recent report the EMF (2017) underlined how the CE principles addressing to challenges like climate change, biodiversity losses, waste and pollution are driven by three main principles:

- **Eliminate waste and pollution:** the CE aims to identify and mitigate the detrimental effects of economic activity on human health and the environment. This includes preventing the release of harmful pollutants, such as greenhouse gases and toxic chemicals, and protecting against land, water, and air pollution. This approach is thoroughly guiding by design principle to make the system more sustainable.
- **Circulate products and materials:** a CE promotes practices that conserve value in the form of energy, labor, and materials. This is achieved by designing products and materials to be long-lasting, easily reused, or repurposed, and able to be recycled. This approach keeps resources circulating within the economy for as long as possible, which creates effective use of natural materials by maximizing the number of uses before they are returned to nature.
- **Regenerate nature:** CE avoids the use of resources that cannot be replenished, such as fossil fuels and instead prioritize preserving or improving renewable resources, such as returning nutrients to soil for regrowth, and utilizing renewable energy sources. This approach maintains the resources and make them sustainable for the future.

### **2.1.3 Characteristics of the Circular Economy**

ADVANTAGES AND BENEFITS: The transition to a CE holds immense potential for creating a competitive advantage in terms of sustainability and economic benefits. Pitoska (2020) highlights that the adoption of CE principles presents a significant opportunity for

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market transformation. The European Commission's Reflection Paper, "Towards a Sustainable Europe by 2030," further supports this notion, indicating that implementing CE practices across sectors and industries could generate a net economic benefit of 1.8 trillion euros by 2030, while also creating over 1 million new jobs in the European Union and playing a crucial role in reducing greenhouse gas emissions (Hellenic Documentation Center, 2019).

One of the key advantages of the CE is its ability to maintain economic profitability while embracing circularity. Jia et al. (2020) emphasize that through circularity, businesses can achieve sustainability without compromising profitability. Sustainable practices within the CE have also been found to generate cost savings. Lucato (2017) highlights the financial benefits that arise from adopting sustainable practices, indicating that companies can realize cost savings by implementing CE principles. The economical profitability is in line with the more generic principle of triple bottom line framework, that underline how performances of a company should be measured by economic, environmental, and social dimensions. The three features, according to Weisenfeld and Hauaerwaas (2018), must be balanced rather than weighting the economic factors as a means for society.

**HESITATION AND CHALLENGES:** Even if CE offers benefits for the society and the economy as an all, companies and consumers are still hesitant to embrace this new approach: the EMF (2013b) lists four reasons for this hesitation: consumer irrationality, conflicting of interests within companies, misaligned profit sharing along the SC, and geographical dispersion; Consumer irrationality stems from the tendency to prioritize the purchase price at the point of sale, overlooking the long-term economic benefits of investing in durable products. Despite not being the central focus of this research, it is worth noting the pivotal role of consumers in the transition from a linear to a CE. The assumption of rational consumer behaviour in classical economic theory has been proven inaccurate, as consumer decisions are influenced by subjective factors such as beliefs, habits, non-economic motivations, and perceptions. Planing (2015) investigated these drivers and emphasized the importance of considering habits, non-functional motives, and perceptions when shifting the value proposition of a performance. He also highlighted the competition faced by such a performance from traditional linear business practices and stressed the need to align the value proposition with human nature. Conflicting interests within companies arise from the short-term focus of corporate strategy, hindering the transition to a usage-based revenue model due to higher capital requirements. The absence of consistent legislation regarding the end-of-life phase of products leads to misaligned profit sharing and low margins for early-stage SC participants. Additionally, the geographical dispersion of value chains across multiple countries weakens the

impact of national initiatives, necessitating international collaboration. Furthermore, the importance of sustainability, as defined in the previous discussions, is amplified by the need to minimize CO<sub>2</sub>e emissions resulting from the transportation of goods worldwide (EMF, 2013b).

**THE NECESSITY OF A COMPREHENSIVE TRANSFORMATION:** Although the core principles and opportunities of a CE show promise, they are not sufficient on their own to bring about the widespread adoption and expansion of this economic model. A comprehensive and coordinated effort that prioritizes a shift towards a long-term, systemic transformation is essential for a CE to become a reality. This requires the participation of multiple stakeholders, including both public and private entities such as corporations, government agencies, citizens, and academic institutions (Coscieme et al. 2022). Government policies have a significant impact on promoting sustainable practices within an economic system (Koval & Weis, 2019; Jones & Calster, 2019; EMF, 2015a). This can be achieved through the encouragement of innovative methods or the enforcement of regulations. Key policy components include the development of necessary skills, strategic asset management, and the establishment of legislation and regulations (EMF, 2015a). Governments and their policies facilitate the exchange of ideas and collaboration between industries, raise public awareness about the CE, and support stakeholders from both the public and private sectors. This support can be provided through various means, including the introduction of regulations and the provision of resources and assistance. In emerging economies, specific government initiatives have been implemented to encourage the transition to more sustainable practices. These initiatives include phasing out fossil fuel vehicles, promoting electric vehicles through tax incentives, establishing platforms for logistics and information exchange, leveraging digital technologies and economies, and implementing the just-in-time concept. Policies play a crucial role in driving changes in consumer behavior and incentivizing sustainable design and production practices. The identified policies within the framework complement and reinforce each other, as well as other transformations within the fashion value chains (EMF, 2015a).

#### **2.1.4 A tool for Circularity**

Value creation through CE has been analyzed from various authors and frameworks; in particular, the ReSOLVE framework, developed by EMF (2015b), is a strategic guide for organizations in adopting CBMs. It encompasses key aspects of CE thinking, represented by the acronym ReSOLVE.

- R for Regenerate emphasizes the need to regenerate natural systems and ensure resource availability for future generations.



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- S for Share highlights the importance of sharing underutilized resources to create more efficient and sustainable systems.
  - O for Optimize focuses on optimizing resource efficiency and minimizing waste.
  - L for Loop underscores the significance of closing material loops and keeping resources in use for as long as possible.
  - V for Virtualize recognizes the potential of digital technologies in creating efficient and sustainable systems.
  - E for Exchange emphasizes the importance of facilitating collaboration and exchange between actors in the CE.

The ReSOLVE framework serves as a valuable tool for organizations seeking to develop and implement CBMs.

## ***2.2 Circular Supply Chain***

### ***2.2.1 Definitions***

To explore how innovative TAF companies can transform their SC with CE principles, understanding the structure and principles of the CSC is essential. This paragraph aims to investigate the CSC's generic framework as a foundation for examining SC collocation and transformation within the industry. According to Munoz-Torres et al. (2018), the implementation of the CE emphasizes the significance of the SC as a vital component. This approach not only enables waste reduction but also facilitates the establishment of self-sustaining systems, where materials are reintegrated into production cycles (Genovese et al., 2017). Various forms have been used to define CSC: reverse SC, close-loop chain or open-loop chain, and green SC (Gonzalez-Sanchez et al., 2020; Batista et al., 2019).

- **Reverse Supply Chain:** The concept of reverse SC management has emerged as an application of CE principles to SC management. It involves various activities related to product design, operations, and end-of-life management, aimed at maximizing value creation throughout the entire lifecycle. This is achieved through the recovery of post-use products, either by the original manufacturer or a third party. Reverse SCs can be classified as open-loop or closed-loop systems (Genovese et al., 2017; French & LaForge, 2006). However, it is important to note that while product recovery at the end of its useful life is environmentally beneficial, it also incurs energy costs and generates pollution during transportation and subsequent treatment (Taghikhah, 2019).

- **Closed-loop vs. Open-loop Chain:** Open-loop SCs involve the reuse of materials or products by parties with other purposes than the original producers. In contrast, closed loop SCs involve the practice of taking back products from customers and returning them to the original manufacturer for value recovery through either complete or partial reuse of the product (French & LaForge, 2006). Closed loop SCs, which encompass activities such as remanufacturing, reuse, repair, refurbishment, and recycling, require significant resource investment and the establishment of a collection system to facilitate product return at the end of its life cycle (De Angelis et al., 2017). Open-loop chains involve materials from multiple producers, whereas closed-loop chains focus on a specific manufacturer (Masi et al., 2018).
- **Green Supply Chain:** Green SCs foster environmental cooperation between suppliers and customers, resulting in benefits for both environmental and economic performance (Masi et al., 2017). Unlike traditional SCs, green SC management incorporates environmentally friendly practices throughout various stages, including product design, raw material selection and procurement, production, distribution, and after-sales services (Kazancoglu et al., 2018). Two approaches can be adopted when implementing green SC practices: monitoring and collaboration. In the monitoring approach, the purchasing company establishes standards for evaluating suppliers and their products. Conversely, the collaborative approach involves buyers actively engaging in improving the environmental performance of suppliers, with a focus on long-term objectives (Chu et al., 2017).

In the literature, these terms are often used interchangeably, but it is crucial to recognize the significant distinctions between them. The concept of a CSC goes beyond closed SCs and green SCs. It introduces two key differences. Firstly, it broadens the scope of actors involved in the chain by encompassing sectors beyond the original one. Secondly, it transforms the relationships among these actors. Customers have the ability to return products or their waste to any actor within the value chain of the production system, regardless of industry sector boundaries (Farooque et al., 2019).

### **2.2.2 The butterfly diagram**

Within the context of this thesis, the "butterfly diagram" proposed by EMF (2013a) is presented in Figure 1, serving as a fitting representation of the key characteristics discussed earlier. The diagram highlights the significance of the inner circle in closed loop solutions, with emphasis on the relationship between circle tightness and substantial savings in labor, energy,

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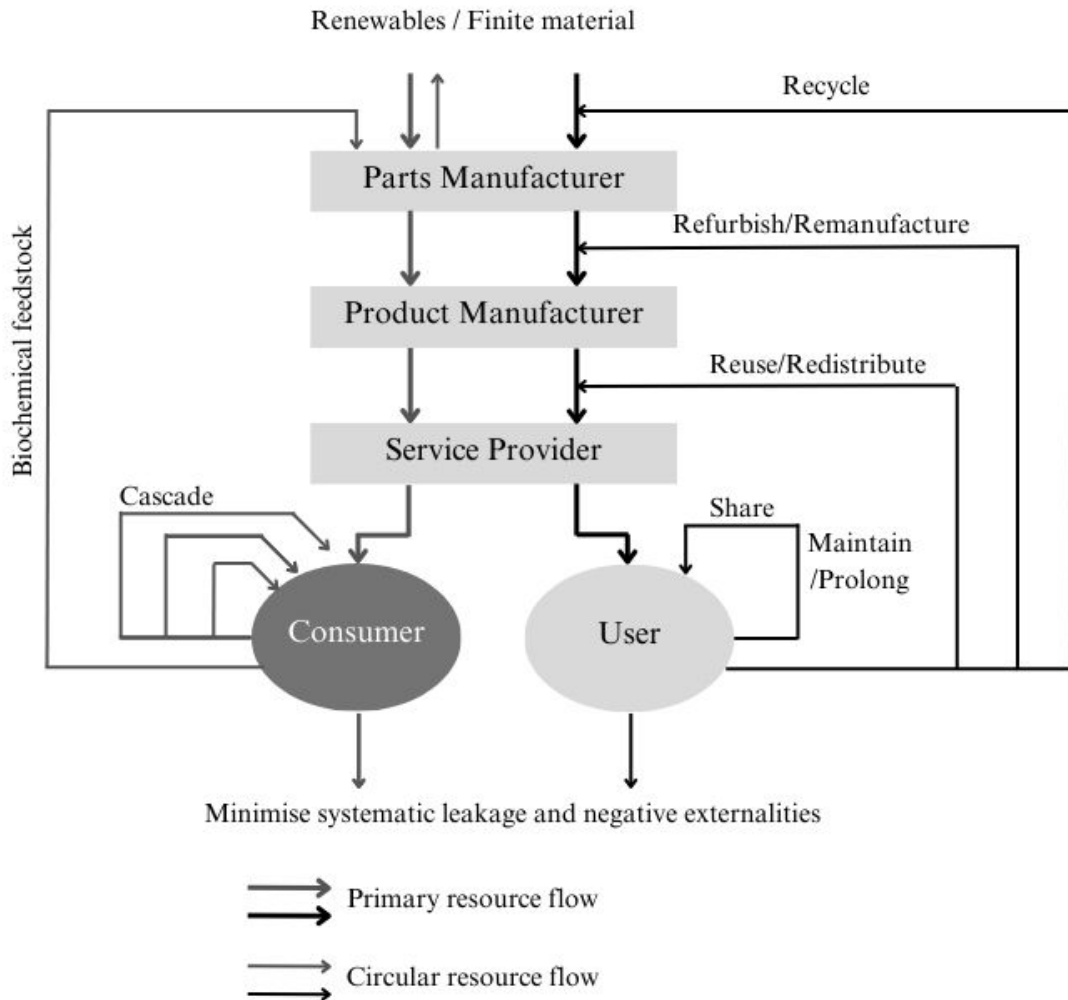
capital, and associated externalities. This inner circle demonstrates the positive environmental and economic implications of substituting virgin materials with looped ones, particularly when the cost of linear processes exceeds that of circular processes. Additionally, prolonging the lifespan of products by engaging in longer cycles brings about further advantages, both within consecutive circles across various blocks of the SC and through increased product utilization (e.g., multiple sales of vintage clothing). While open loop solutions offer opportunities for cascading products, components, or materials, these cycles are not of relevance to this thesis and the specific context of the TAF industry.

The butterfly framework presents a clear separation between the biological and technical material, and according to Lüdeke-Freund et al. (2018), closing the corresponding flows requires the development of different cycles. Again, even if the biological solutions are of vital importance for the TAF industry, the aim of the thesis is to understand the right part of the framework, and the related BMs of each cycle. The four cycles can be described as follow:

- **Cycle I:** Repair and maintenance activities are conducted to extend a product's lifespan by inspecting and servicing it, aiming to restore or sustain its functionality (Bocken et al., 2016). These tasks can be undertaken by the manufacturer, professional service providers, or even by consumers in their homes or self-help workshops.
- **Cycle II:** Reuse and redistribution involve utilizing a product for its original purpose without significant modifications or enhancements. Typically, ownership transitions from the initial user to a secondhand user in commercial settings. These operations, involving return and redistribution, yield substantial economic gains and ecological benefits due to favorable input-output ratios (Esain et al., 2016).
- **Cycle III:** Refurbishment and remanufacturing entail more comprehensive overhauls of products, often necessitating the replacement of failing or soon-to-be-failing parts (King et al., 2006). Refurbished products generally do not reach the same quality level as remanufactured ones, as remanufacturing involves wholesale restoration and component replacement to meet the performance specifications of the original equipment manufacturer (Diallo et al., 2017).
- **Cycle IV:** When refurbishment and remanufacturing are no longer feasible, recycling becomes a viable option. This process involves the separation, collection, and processing of synthetic and mineral materials, which are then utilized in the production of new goods. The recycled material may exhibit lower quality and functionality

(downcycling) or, in some cases, even higher quality and functionality (upcycling) compared to the original material (EMF, 2015b).

Figure 1: Butterfly Diagram with Resource Flow



Source: EMF (2013a); Farooque et al, 2019) with personal elaboration of the author

Furthermore, as depicted in the diagram, CSC consist of two resource flows: primary resource flow and circular resource flow. The primary resource flow refers to the forward flow of goods in both linear and closed loop SCs. On the other hand, circular resource flows encompass the flows of goods, materials, and energy that are recycled, reused, repaired, remanufactured, refurbished, recovered, or retained. In practical implementation, CSC management - defined as the integration of circular thinking into the management of the SC and its ecosystem, hence restoring technical materials and regenerating biological materials towards zero waste - strive to achieve zero waste by introducing system-wide innovations that recover value from what

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was previously regarded as "waste" (Farooque et al., 2019). It is important to acknowledge that all the cycles mentioned above involve a demand for used or waste materials, which necessitates appropriate logistics and could result in the development of new markets for secondary resources or the expansion of existing ones. In their most sophisticated form, the resulting resource flows and partnerships can lead to symbiotic relationships that enable multiple resource utilization, cascading and biorefining, continuous recycling, or the emergence of industrial symbiosis networks based on spatial proximity. (Chertow, 2000; EMF 2015b).

## **2.3 Circular Business Models**

### **2.3.1 Definitions**

A BM broadly describes how a business proposes, creates, delivers, and captures value for its customers and wider group of stakeholders (Magretta, 2002). A CBM can be defined as one that acts within closed material loops (Mentink, 2014) or one that combines the creation of economic value with the narrowing, slowing, or closing of resource loops (Bocken et al., 2016; Lewandowski, 2016). CBMs are the means to realize circular goals such as longer use, reuse, or recycling, supporting the transition to a CE (EEA, 2021a). They assist in the implementation of the 9R strategies for increasing circularity of the economy introduced by Potting et al. (2017), as they are based on smarter product use and manufacture (refuse, rethink, and reduce), extended lifespans of products (reuse, repair, refurbish, remanufacture, and repurpose), and useful application of materials (recycle and recover).

A BM incorporating the principles of the CE implies "creating value by exploiting value retained in used products to generate new offerings" (Linder and Williander, 2017). In a circular model, the focus shifts from a single transaction between actors to multiple transactions within closed-loop cycles (Coscieme et al., 2022). Circularity primarily revolves around resources rather than outputs. Resources can be recovered, recycled, reused, upcycled, or downcycled depending on their physical properties, available technologies, and consumer demand for these transformations (Singh et al., 2019). However, the initial step in any circular model is reducing resource consumption (Provin et al., 2021) as the fundamental goal of circularity is to preserve natural resources and minimize waste generation (Fernandes et al., 2020). Implementing circularity solutions requires an inter-organizational effort focused on innovation, collaborations with stakeholders, and consumer education (Dragomir & Dumitru, 2022).

Frishammar & Parida (2019) CBMs as "*business models that create, capture and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby*

*realizing environmental, social, and economic benefits."* The rise of the CE has shown that traditional and linear BMs are not adequate to meet the needs of this new paradigm. As a result, new BMs based on the principles of the CE have emerged. These models, known as CBM, aim to improve resource efficiency by extending the useful life of products and closing material loops. Nußholz (2017) also provides a definition of CBM, stating that it involves creating, capturing, and delivering value through a value creation logic designed to extend the useful life of products and parts, for example, through long-life design, repair, and remanufacturing. The ultimate goal is to create a closed-loop system where resources are kept in use for as long as possible, reducing waste and the need for virgin materials. Linder and Williander (2017) further elaborate on the conceptual logic of CBM, which involves utilizing the economic value retained in products after their initial use in the production of new offerings. This means that the value of a product is not lost once it has been used but rather can be repurposed and integrated into new products, creating a circular and sustainable system.

CBMs challenge traditional concepts of purely financial value creation by emphasizing sustainable practices such as closing material loops and minimizing waste (Lewandowski, 2016). While SCs span multiple organizations and their material flows, BMs tend to focus on individual organizations and their value creation strategies. CBMs demonstrate how companies can create value by implementing CE approaches such as eco-design and cleaner production (Lüdeke-Freund et al., 2016). These approaches transform major business activities such as resource management, production, and marketing. However, the development of CBMs must be case-specific to effectively translate CE principles into BMs (Lewandowski, 2016; Planing, 2015). The ultimate goal of CBMs is to create value through resource efficiency and waste reduction, considering the input, transformation, and output of the BM. This can lead to symbiotic relationships and the creation of new markets for secondary resources. CBMs also have the potential to extend customer experiences and responsibility while reducing negative ecological and social impacts and creating additional revenues from CE products (Chertow, 2000).

### **2.3.2 Types of Circular Business Models**

Lüdeke-Freund et al. (2019) conducted a comprehensive literature review on CBMs and identified four key dimensions in the creation of economic value for a company. These dimensions include value propositions, value delivery, value creation, and value capture. Value propositions refer to the benefits provided to customers through products, services, or product-service systems. Value delivery encompasses the actors and processes involved in delivering

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value propositions to customers. Value creation involves the actors and activities that contribute to the creation of value, including production processes. Lastly, value capture refers to how companies earn revenue from the value created. Based on the analysis of these dimensions, Lüdeke-Freund et al. (2019) identified different characteristics of the CBMs, which are presented in Table [1] and serve as useful references for the analysis of real cases. These CBMs correspond to the six technical and biological cycles explained and presented by the EMF in 2015(b) – only the four “technical” are presented.

- **Repair and maintenance models:** These models focus on providing customer-centric services that extend the usability and functionality of products, reducing the need for new products and associated costs. They contribute to long-term customer relationships, enhanced reputation, reduced waste handling costs, and fewer social externalities.
- **Reuse and redistribution models:** These models facilitate access to used products through evaluation, enhancement, and marketplace creation. They offer customers lower prices and prolonged access to familiar products. Value is created through substitution for new products, cost savings for manufacturers, and new revenue sources. Value delivery processes enabling relationships between market actors are crucial.
- **Refurbishment and remanufacturing models:** These models combine repair, reuse, and specific business design options to obtain used products and components. Benefits include reselling, improved reputation, reduced costs, and lower carbon emissions. They compete with new product sales and contribute to a CE through extended product experience and reduced environmental impacts.
- **Recycling models:** These models involve downcycling and upcycling materials. They offer green inputs, lower prices, and substitution of virgin materials. Challenges in scaling up include product complexity and sorting issues. Efficient collection systems, sorting innovations, and collaboration within the value chain are crucial. Policies supporting sustainable materials and increased transparency can further promote recycling models.

Hence, the transition toward circularity in the fashion industry requires the implementation of various CBMs and the adoption of innovative approaches. These models and approaches encompass the entire value chain, from design and production to consumption and end-of-life management. Collaboration among different stakeholders, including manufacturers, consumers, policymakers, and researchers, is crucial to overcome the challenges associated with circularity and to create a more sustainable and resilient fashion industry. Table 1 represents the morphological box of CBM design options:

Table 1: Morphological box of CBM design option

BM Dimensions		CEBM design options derived from reviewing 26 CEBMs (the number of CEBMs that mention the respective design option is indicated in parentheses) <sup>(a)</sup>											
Value proposition	Products	Repaired, refurbished, remanufactured, or recycled products (3)	Reusable or recyclable products (3)	Products based on recycled waste (3)	Long-lasting products (3)	Used products, components, materials, or waste as production inputs (5)	Reusable or recyclable production inputs (1)	n.s. (9) <sup>(b)</sup>					
	Services	Facilitating collaboration (3)	Take-back management (4)	Customer education (3)	Waste handling, processing (3)	Product-/service-based functions (2)	Maintenance, repair, control (4)	Product-/service-based results (1)	Upgrading (2)	Auxiliary services (2)	n.s. (11)		
Value delivery	Target customers	Quality-conscious customers (1)	Cost-conscious customers (1)	Green customers (2)	B2B customers (4)	B2C suppliers (1)	B2B suppliers (2)	C2C suppliers (1)	n.s. (17)				
	Value delivery processes	Connecting suppliers and customers (5)	Providing access to a product's functionality (2)	Providing (product-based) services and results (2)	Providing used products, components, materials, or waste (4)	Taking back used products, components, materials, or waste (4)	Sharing products, components, materials, or waste (2)	n.s. (11)					
Value creation	Partners and stakeholders	Suppliers (1)	Manufacturers (5)	Retailers (2)	Service providers (2)	Public institutions (2)	Collectors of products, components, materials, waste (2)	Others (e.g., researchers) (1)	n.s. (17)				
	Value creation processes	Maintaining or repairing products, components (6)	Refurbishing or remanufacturing products, components (5)	Recycling of products, components, materials, waste (3)	Upgrading or upgrading of products, components, materials, waste (3)	Reselling products, components, materials, waste (3)	Taking back or recapturing products, components, materials, waste (7)	Winning back base materials (4)	Using used products, components, materials, waste as input (8)	Matching over- and under-capacities (4)	Designing products, components, materials (4)	n.s. (1)	
Value capture	Revenues	Additional product revenues (3)			Payments per unit of service (5)			Payments for functions or results (1)			Price premiums (6)		n.s. (12)
	Costs	Labor (1)	Repair, maintenance, control (3)	Waste handling, processing (7)	Manufacturing (1)	Resource inputs (13)	Transportation, logistics (1)	Supply risks (1)	n.s. (11)				

Source: Lüdeke-Freund et al. (2019)



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### 2.3.3 Business Model Canva

Most companies' BMs are both linear and circular to some extent, since they have been applying CE principles (even if not deliberately), such as virtualization of products and processes, and looping some resources, making the main conceptual frameworks of BMs apply as well to the CE to some extent. One of the most used and explored BM framework is the so-called Business Model Canvas (BMC), which consists of nine building blocks that together define the main characteristics of the BM adopted by a certain company (Osterwalder & Pigneur, 2010). The nine blocks are:

1. **Customer Segments:** The different groups of people or organizations a company aims to serve with its products or services.
2. **Value Proposition:** The unique value that a company provides to its customers, addressing their needs and solving their problems. Value proposition is the core component in the circular proposition of BMC, where the value is offered through a product, that must have the specific features of CE, product related service, which is the alternative for the buy and own solution, and the services, which may be virtual ones (De Jong et al., 2015).
3. **Channels:** The ways a company reaches and communicates with its customers to deliver its value proposition. The most common circular solution is the shift towards virtual channels for both the value proposed (i.e., Spotify value proposition is virtual) and to sell the value via virtual channels (i.e., shopping online) (EMF, 2015b).
4. **Customer Relationships:** The types of relationships a company establishes and maintains with its customers. To be more sustainable relationships should be built and maintained for longer time, trying to eliminate waste (Van Renswoude et al., 2015)
5. **Revenue Streams:** The different ways a company generates revenue from its value proposition, through sales, subscriptions, advertising, etc. The circular propositions are several, usually associated with the PSS or collection back of products, components, or material.
6. **Key Resources:** The essential assets a company needs to create, deliver, and capture value, such as physical, intellectual, human, and financial resources. Resources can be found through circular sourcing, hence materials or products obtained through closed loop, as well as through better-performing material or digitalization (Planing, 2015; EMF 2015a).
7. **Key Activities:** The critical actions a company must perform to deliver its value proposition, such as production, marketing, distribution, etc. The key activities which

directly or indirectly lead to creating, offering, and delivering the value propositions, may apply the CE principles in several ways. Some are oriented on increasing performance, product design, technology exchange, and the other on remanufacturing, recycling or even lobbying (Lewandowsky, 2016).

8. **Key Partnerships:** The collaborations and alliances a company needs to leverage its key resources, minimize its risks, and optimize its activities. Cooperative networks allow businesses to gain expertise, support, and supplies (Scott, 2017). Sheu (2014) argues that collaborative relationships allow the green SC to perform better, in support of the “butterfly diagram” developed by the EMF (2013a) that shows the key role of manufactures and recycling companies in the CE.
9. **Cost Structure:** The expenses a company incurs to create, deliver, and capture value, including fixed and variable costs, economies of scale, etc.

In his research, Lewandowsky (2016) suggested a modified solution to improve circular features in the BMC. The proposed solution involves the addition of two blocks: a take-back system block, which deals with the reverse flow in the SC and requires different logistics partners and channels compared to the forward flow, and adoption factors block, which encompasses both internal and external factors that impact the circularity of a BM. Internal factors refer to intangible capabilities within the company, such as team motivation and organizational culture, while external factors relate to technological, political, sociocultural, and economic issues (Roos et al., 2014). Table 2 represents the Circular BMC proposed by the author:

Table 2: Circular Business Model Canvas

<b>Partners</b> <ul style="list-style-type: none"> <li>• Cooperative networks</li> <li>• Types of collaboration</li> </ul>	<b>Activities</b> <ul style="list-style-type: none"> <li>• Optimising performance</li> <li>• Product Design</li> <li>• Lobbying</li> <li>• Remanufacturing, recycling</li> <li>• Technology exchange</li> </ul>	<b>Value Proposition</b> <ul style="list-style-type: none"> <li>• PSS</li> <li>• Circular Product</li> <li>• Virtual service</li> <li>• Incentives for customers in Take-Back System</li> </ul>	<b>Customer Relations</b> <ul style="list-style-type: none"> <li>• Produce on order</li> <li>• Customer vote (design)</li> <li>• Social-marketing strategies and relationships with community partners in Recycling 2.0</li> </ul>	<b>Customer Segments</b> <ul style="list-style-type: none"> <li>• Customer types</li> </ul>
	<b>Key Resources</b> <ul style="list-style-type: none"> <li>• Better-performing materials</li> <li>• Regeneration and restoring of natural capital</li> <li>• Virtualization of materials</li> <li>• Retrieved Resources (products, components, materials)</li> </ul>		<b>Channels</b> <ul style="list-style-type: none"> <li>• Virtualization</li> </ul>	
<b>Cost Structure</b> <ul style="list-style-type: none"> <li>• Evaluation criteria</li> <li>• Value of incentives for customers</li> <li>• Guidelines to account the costs of material flow</li> </ul>		<b>Revenue Streams</b> <ul style="list-style-type: none"> <li>• Input-based</li> <li>• Availability-based</li> <li>• Usage-based</li> <li>• Performance-based</li> <li>• Value of retrieved resources</li> </ul>		
<b>Adoption Factors</b> <ul style="list-style-type: none"> <li>• Organizational capabilities</li> <li>• PEST factors</li> </ul>				

Source: Lewandowski (2016)

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## **CIRCULARITY IN THE TEXTILE AND FASHION INDUSTRY**

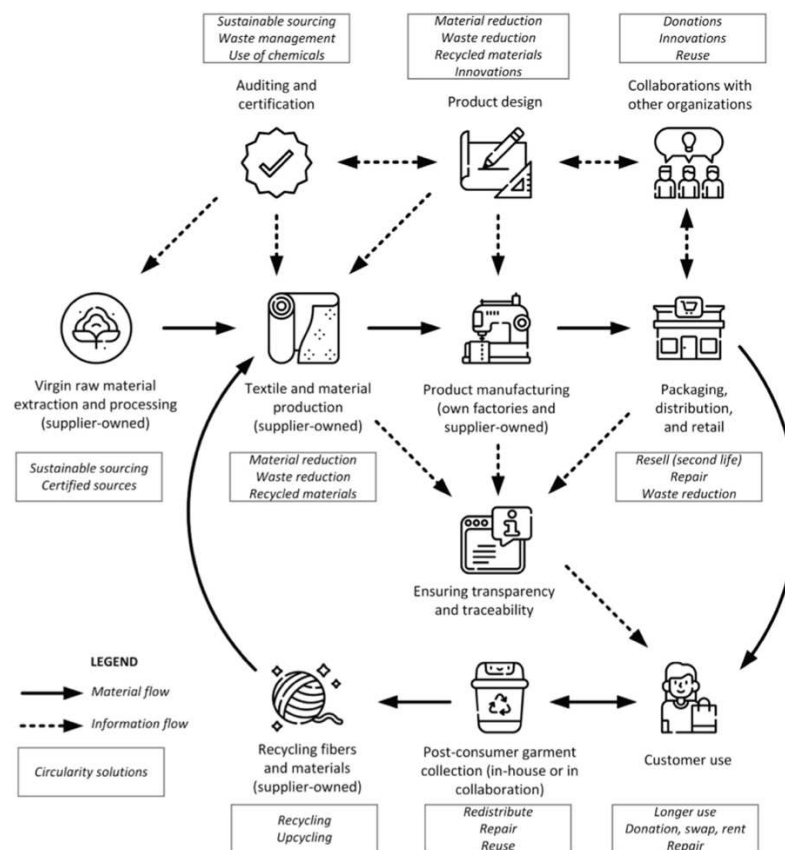
### ***3.1 The Textile and Fashion industry's Circular Supply Chain***

According to Dragomir & Dumitru (2022), the implementation of CE practices is of utmost importance in minimizing the negative environmental impact caused by the TAF industry. It is crucial for multiple organizations positioned at different stages of the SC to collaborate and coordinate, as highlighted by Allen et al. (2021), in order to adopt circular solutions within the industry. Adherence to the principles discussed in the preceding chapter is essential for the effective functioning of the CSC. Although the concept of CSC for the TAF industry is relatively recent, it has already been extensively examined in numerous studies. Dragomir & Dumitru (2022) propose a comprehensive model in figure [2] that encompasses both material and information flows, providing a concise overview of each stage of the SC and drawing upon various theories related to transforming the TAF industry into a circular system. However, it is important to note that in this chapter, only selected stages will be thoroughly analyzed, primarily because many of the intermediate steps, such as product manufacturing and design processes, are typically managed by the final detailer.

In the fashion industry, the primary resource utilized is virgin fiber, but the CE model advocates for the incorporation of recycled fibers as an upstream source. To ensure the origin of virgin fibers, independent certification processes can be implemented, and suppliers of virgin fibers and materials may undergo audits, some of which are conducted or commissioned by retailers. The transfer of fibers typically occurs between textile and garment manufacturers, which are typically separate entities from the retail chain. Control over key business processes, such as designing, packaging, distribution, and retail, is exercised within fashion companies.

Collaboration between large fashion retailers and non-governmental organizations (NGOs), as well as governmental agencies, plays a significant role in reducing resource consumption. The downstream segment of the value chain involves customer use, product reuse, and textile recovery. Once post-consumer garments and accessories are collected, the recovery phase can commence. This, according to Oh & Jeong (2014), is the main part for the circularity of the process. Fibers and materials undergo reprocessing and are integrated into similar manufacturing processes or even different industries. Traceability of fibers and materials is crucial for all stakeholders in the value chain to assess the reusability and recyclability of textile resources. This traceability serves as both an input and an output of the circular models. To enhance transparency for customers and recycling agents throughout the product's lifecycle, detailed labeling and disclosures on websites are provided. Sustainability reports, which serve as a source of data for this research, are also part of the transparency output within the value chain.

Figure 2: Circular Supply Chain for the Textile and Fashion Industry



Source: Dragomir & Dumitru (2022)

Considering the aforementioned cycles proposed by EMF (2013a) and Lüdeke-Freund (2019), an effective approach for comprehending the propositions and characteristics of CBM within each stage of the CSC for the TAF industry is to organize the steps into these cycles. This categorization allows for a more systematic analysis of the CBMs and their respective stages within the different cycles. By examining the TAF industry through this lens, valuable insights can be gained into the various CBMs applied and their specific attributes at each stage of the CSC.

- Repair and maintenance models are essential components of the CE framework, encompassing various stages from product manufacturing to retailers and customer use. These models are specifically designed to prolong the lifespan and enhance the usability of products, aligning with the objective of sustainable consumption. By adopting repair and maintenance models, stakeholders actively contribute to the conservation of resources and promote a more sustainable approach to utilizing products. Furthermore, the downstream segment of the CSC involves activities like reusing and redistributing products, often facilitated through consumer-to-consumer (C2C) markets. According to Oh and Jeong (2014), repairers are engaged in competition with product manufacturers, even though certain manufacturers like Patagonia also function as repairers when they prioritize environmental preservation. Reuse and redistribution models exhibit numerous similarities to the previously mentioned models. In this particular context, CBMs that prioritize access-based approaches like product sharing or rentals are highly relevant.
- Refurbishment and remanufacturing models necessitate extensive industrial knowledge and technologically advanced processes. Remanufacturing entails the complete disassembly of used products, followed by the sub-assembly of approved parts and the subsequent assembly of remanufactured products. In certain cases, remanufacturing involves incorporating technological upgrades, resulting in products that are equivalent in quality to new ones. This practice directly competes with yarn manufacturers, as stated by Oh and Jeong (2014).
- Finally, recycling models encompass the final stage of the CE, establishing a link between textile and yarn production in the fashion industry and other industries through processes like downcycling.

Effective information flows are integral to all cycles within the CE framework. These diverse approaches, taken together, significantly contribute to achieving circularity in the

fashion industry and enable the sustainable management of resources. The efficiency of post-consumer garment collection is particularly crucial in involving product re-manufacturers in the overall process, and it will be analyzed in the later on this thesis.

The following paragraphs offer an elaborate elucidation of CBMs tailored specifically for the TAF industry, considering the cycles of the CSC. By considering the various stages within the CSC, this analysis provides a comprehensive exploration of how CBMs can be effectively applied in the TAF industry. Please note that any focus on refurbishment and remanufacturing processes will not be done due to missing theories and practical cases. Finally, it is essential to underline that within the context of CE principles, BMs in the TAF industry will be classified into two main categories: those focused on production and those centered around retail. It is important to note, however, that these categories are not mutually exclusive, as the circularity of the models creates interdependencies and connections throughout the SC.

## **3.2 Circular Business Model for retail**

### **3.2.1 Consumer types**

To gain a comprehensive understanding of the various circular solutions for retailing fashion garments, it is essential to consider the impact of these models on consumers and, in turn, how consumers will influence the success and adoption of these models. Consumer acceptance of the CE within the TAF is influenced by a range of factors, including cultural background, age, and other variables. However, tracking attitudes towards circular or eco-friendly products on a comprehensive scale is beyond the scope of this thesis, as it poses challenges for both companies and scholars. Nevertheless, several studies (Gazzola et al., 2020; BRS, 2018; Musova et al., 2021) have observed positive trends among younger generations, particularly Generation Z, who exhibit awareness of climate change and a willingness to adopt sustainable consumption practices in the fashion market.

While price remains a significant consideration for buyers, as highlighted by Rothenberg & Matthews (2017), it is important to recognize that consumer decisions are influenced by multiple motives, as outlined in the research conducted by the EMF (2017). As consumers become increasingly sensitive to sustainability concerns, fashion brands are compelled to enhance transparency regarding their products. This transparency encompasses providing information on material costs, mark-ups, labor expenses, transportation fees, and duties (Gazzola et al., 2020). By incorporating social responsibility into their value proposition,

fashion brands can improve their reputation and cater to consumers' growing demand for sustainable practices. The relationship between individuals and clothing is complex, with diverse meanings attributed to both wearing and purchasing garments. The research identifies various motives that drive people's engagement with clothing, including practical factors such as functionality, comfort, and the need for replacement, emotional factors such as self-expression, retail therapy, and the pursuit of uniqueness, as well as social factors related to status demonstration, social pressure, and the desire for memorable experiences (Armstrong et al., 2016). In contrast to the linear system that offers a single solution of selling new clothes, the circular approach provides multiple options that are tailored to specific markets and address the unique needs of different businesses.

Shaw & Koumbis (2017) proposed a classification of consumers based on their distinct characteristics and needs, which can be linked to different types of circular models. The identified consumer segments include the "Bargain" segment, characterized by actively seeking promotions, second-hand options, and online deals for affordable fashion. The "Stand-out" segment comprises individuals who prioritize unique and individualistic styles, often exploring independent boutiques, street markets, and engaging in do-it-yourself clothing. The "Fitting-in" segment seeks to align personal style with the fashion preferences of chosen social groups, aiming to blend in and conform. The "Avoid" segment primarily engages in fashion retail for replacement and practical reasons, focusing on functional needs rather than trends or style. The "Celebrity" segment is driven by fashion trends, avidly following and imitating celebrity styles, queuing for special collections, and consuming fashion magazines. Finally, the "Environmental" segment prioritizes ethical fashion practices, displaying a concern for sustainability, avoiding fast fashion, and supporting small labels that align with their values.

By understanding the characteristics and needs of these consumer segments, businesses can tailor their CBMs to effectively meet the specific requirements and preferences of each group. This alignment between consumer types and circular models is summarized in table 3 based on the research conducted by the EMF (2017):

Table 3: Consumers type and their Circular Business Model

<i>Consumer Segment</i>	<i>Rental Sub</i>	<i>Short-term Rental</i>	<i>High Durability Clothes</i>	<i>Resale/Second-hand</i>
<i>Bargain</i>	NO	YES	YES	YES
<i>Stand-out</i>	YES	YES	YES	YES
<i>Fitting-in</i>	NO	NO	YES	YES
<i>Avoid</i>	NO	YES	YES	YES
<i>Celebrity</i>	YES	NO	NO	NO
<i>Environment</i>	YES	YES	YES	YES

Source: EMF (2017)

Note: "YES" indicates a strong fit between the consumer segment and the circular model, while "NO" indicates a weak fit.

### 3.2.3 Longevity and Resale Models

As previously mentioned, the fashion industry operates at a fast pace, constantly introducing new trends and styles, and its effects on the environment and society are profound. However, the current fast fashion models prioritize affordability, frequent collection updates, and a decline in garment quality and durability, raising concerns about the sustainability of the industry. Extensive analysis of TAF market has revealed that more than 70% of the fashion sector's climate impact can be attributed to upstream activities, while the remaining 30% is associated with downstream processes such as transportation, packaging, retail, use, and end-of-use (Global Fashion Agenda, 2020). It is within the downstream segment that longevity and resale models play a significant role. Moreover, there is a concerning trend in the current state of clothing utilization that deserves attention. While clothing utilization rates are relatively higher in many low-income countries, other regions exhibit significantly lower rates. Globally, there has been a 36% decrease in clothing utilization compared to 15 years ago. For example, in the United States, clothes are worn for only about a quarter of the global average. Astonishingly, consumers worldwide discard approximately €420 billion worth of clothing annually that could have been further utilized (EMF, 2017). Disturbingly, certain garments are estimated to be discarded after just seven to ten wears. These alarming statistics emphasize the urgent need for a paradigm shift towards a more sustainable and responsible approach to clothing consumption. It is worth noting that clothing users themselves have already



recognized this issue, as evidenced by German and Chinese citizens admitting to owning more clothes than necessary (WRAP, 2017). *The Benefits of Longevity*: Given these challenges, it is imperative to explore innovative and alternative approaches to address the issues within the fashion market. One such approach involves advocating for the promotion of longevity in clothing usage. This concept focuses on extending the lifespan of garments and reducing their disposal rates. By encouraging consumers to prolong the usage of their clothing items, it becomes possible to mitigate the environmental impact associated with excessive production, waste generation, and resource consumption, all while maintaining profitability and economic viability. Research has demonstrated that by extending the average lifespan of clothing by nine months, there can be a significant reduction of approximately 30% in annual CO<sub>2</sub> emissions, water usage, and waste generation (WRAP, 2017). Furthermore, studies indicate that doubling the average number of times garments are worn can lead to a 44% decrease in CO<sub>2</sub> emissions (EMF, 2017). These findings underscore the potential of fostering clothing longevity as a crucial solution.

**HIGH DURABILITY CLOTHES:** According to Coscieme et al. (2022), CBMs centered around longevity and durability aim to extend the overall quality and lifespan of garments by promoting extended and repeated use. These models encompass various strategies to enhance both the tangible aspects, such as textile quality, and intangible aspects, such as the emotional durability of garments (referring to people's lasting attachment to their clothes and the longevity of fashion trends) (WRAP, 2017). By extending the usability and functionality of products, particularly fashion items that are prone to trends, it becomes feasible to minimize the necessity of purchasing new products or transitioning between them (Lüdeke-Freund et al., 2019). Improving product quality also has an impact on brand image, leading to increased customer satisfaction and brand attachment, as exemplified by brands like Patagonia. By fostering loyalty and commitment to their products, brands can strengthen their market position and ultimately achieve long-term profitability. Testing for quality, adhering to durability and recyclability standards, educating customers on garment care, and helping them recognize high-quality products during the purchasing phase are crucial elements. Transparency and providing consumers with information about the durability of clothing items are key drivers of demand for durable products. Furthermore, shifting from material expenses to labor expenses, thereby generating supplementary income for workers, is widely recognized as one of the significant outcomes of a circular (or performance) economy (Stahel, 2016). Additionally, a greater emphasis on quality labels and warranties is recommended (EMF, 2017). Eco-labels, whether

issued by companies themselves or certified by third parties, encourage consumers to contribute by paying a premium and endorsing claim about the sustainability of different materials. When sustainable consumption encompasses product use and disposal, it introduces consumers to new responsibilities that go beyond their traditional roles (Stål and Jansson, 2017). Most of the proposed solutions for enhancing garment longevity and durability involve redesigning processes and reevaluating the value attributed to clothing, favoring quality and durability over low prices. The design stage is crucial in implementing BMs that prioritize longevity and durability (Yriberri et al., 2023). Approaches can include designing for emotional attachment and trust, reliability and durability, ease of maintenance and repair, as well as disassembly and reassembly, among others (Bocken et al., 2016). Although more durable products may come with higher costs, these expenses can be justified by raising consumer awareness of the future savings gained from avoiding frequent purchases, providing after-sale maintenance and repair services, and facilitating the development of secondhand markets for the products. Furthermore, it is noteworthy that certain segments of the fashion market already exhibit a demand for durable clothing. Garments such as socks, jeans, underwear, and coats play a vital role in durability-focused choices. Brands like Patagonia and Levi's have successfully tapped into this market by offering high-quality products while effectively managing their SCs (EMF, 2017).

**REPAIR AND MAINTENANCE:** As mentioned earlier, the implementation of repair systems plays a vital role in extending the usage of garments. Within this context, various approaches can be observed regarding repair and maintenance services: Firstly, manufacturers can provide repair and maintenance services either through warranties or as additional services (EMF, 2017). Secondly, external service providers, independent of the manufacturers, have the opportunity to offer standalone repair and maintenance services. Examples of such services include shoe repair and clothing mending, enabling the prolongation of product lifespan, and generating value in the process (Accenture, 2014; Clinton and Whisnant, 2014). These BMs, whether integrated into product sales or offered independently, share a common objective of delivering exceptional product experiences and engaging customers in value co-creation. This is evident from customers bringing in damaged products and adhering to service schedules (Accenture, 2014; Clinton and Whisnant, 2014). Furthermore, the literature on repair and maintenance BMs emphasizes their potential to generate additional value, such as fostering long-term customer relationships, enhancing reputation, extending product experiences, reducing waste handling costs, and mitigating social externalities (Lüdeke-Freund et al., 2019). In addition to manufacturers and external service providers, brands like Patagonia contribute to the ecosystem by offering repair and maintenance services, coupled with product guarantees,

as part of their offerings. While customers have the option to undertake repairs themselves, several barriers exist that hinder self-repair, including time constraints, lack of expertise, and the potential for higher costs compared to purchasing new items (Coscieme et al., 2022).

**EMOTIONAL ATTACHMENT AND FLEXIBILITY:** Encouraging consumers to dress an item more often requires fostering emotional attachment and ensuring flexibility in clothing. Emotional attachment can be achieved through various means, such as involving consumers in the making process, maintenance, or redesign of their garments (EMF, 2017). This connection strengthens the bond between consumers and their clothing items, increasing the likelihood of prolonged use. Furthermore, flexibility in clothing is linked to future upgrades enabled by evolving technologies. By incorporating technological advancements, clothing items can adapt to changing needs and preferences, ensuring their longevity, and reducing the need for frequent purchases. To enhance our comprehension of the defining features of BMs that contribute to longevity, with a focus on quality as the primary objective and repairment services as supplementary solutions, table 4, inspired by the one put forth by Lüdeke-Freund et al. (2019) previously presented, serves to concisely outline the operational and structural aspects of these BMs.

Table 4: Circular Business Model characteristics for Longevity

<i>BM dimensions</i>		<i>Circular Options</i>		
<i>Value Proposition</i>	<b>Products</b>	Reusable or recyclable products		Long lasting products
	<b>Services</b>	Facilitating collaboration	Customer education	Maintenance, repair, and control
	<b>Target Customers</b>	Quality-conscious customers	Green customers	B2B customers
<i>Value Delivery</i>	<b>Value Delivery Processes</b>	Providing (product-based) services and results		

<b>Value Creation</b>	<b>Partners and Stakeholders</b>	Suppliers and Manufacturers	Retailers	Service-provides	Others such as R&D or external collaboration
	<b>Value Creation Processes</b>	Maintaining or repairing products, components		Designing products, components, and materials	
<b>Value Capture</b>	<b>Revenues</b>	Payments for functions or results		Price premiums	
	<b>Costs</b>	Labour	Repair, maintenance, and control	Manufacturing	Resource inputs

Source: Lüdeke-Freund et al. (2019) with personal elaboration of the author

### 3.2.3 Resale

In 2021 resold clothing fetched around \$15bn, up from less than \$1bn in 2013. A further \$21bn was spent on garments from charity and thrift shops. The total spent on second-hand garb, some \$36bn, is slightly bigger than the \$30bn spent on “fast fashion” in shops such as Zara or h& m. By 2025, according to Global Data, a research firm, the value of resold and thrifted clothing will climb to \$77bn as resale revenues triple to \$47bn annually and charity-shop revenues climb to \$30bn. Combined revenues will dwarf those from fast fashion which are expected to grow to just \$40bn (The Economist, 2021).

Resale activities have gained traction as a thriving BM, offering access to used products, evaluating their market value, and creating a dynamic marketplace (Esain et al. 2016). After undergoing minor improvements like cleaning and repairing minor defects, the products gain added value, enhancing their attractiveness to potential buyers. Clothing manufacturers have recognized the potential and started offering reuse and redistribution services through their own platforms (e.g., H&M) (Hvass, 2014). This strategic move allows manufacturers to tap into the growing demand for sustainable alternatives and foster a CE. Resale activities involve various processes, such as evaluating, enhancing, and shipping products, which can also be conducted through a consumer-to-consumer (C2C) approach. Successful online marketplaces like Vinted or eBay have revolutionized the way secondhand products are bought and sold, fostering a sense

of community and trust among buyers and sellers. One of the key value propositions for customers engaging in resale activities is the opportunity to access products at lower prices, resulting in significant cost savings (Lüdeke-Freund et al., 2019). Additionally, resale activities offer prolonged access to familiar products that may no longer be available through traditional retail channels. By embracing the resale model, manufacturers can reduce their reliance on raw materials, minimize waste generation, and contribute to a more sustainable industry (Lüdeke-Freund et al., 2019). Central to the resale BM is the requirement for used products to flow back to the service provider, either directly or through an intermediary, ensuring a continuous supply of inventory for resale (this step will be further analyzed later in this thesis) (Coscieme et al., 2022). This aspect aligns with the concept of a CE, where resources are kept in circulation. Collection strategies presents several challenges, which will be discussed further in this chapter. Driven by frugality and cost-consciousness, second-hand stores have become popular shopping destinations, with fashion being a major motivator for consumers (Philip et al., 2020). Quality standards and functional, beautiful products are seen as necessary rather than winning characteristics, debunking the misconception that second-hand goods are inherently inferior (Poldner et al., 2022).

The growth of the resale market has outpaced traditional markets significantly, driven by consumers' increasing openness to second-hand products and their recognition of the value and sustainability benefits (Coscieme et al., 2022). Online platforms, accounting for a substantial portion of the resale market, have gained widespread acceptance due to their convenience and accessibility (Circular Fibres Initiative analysis based on Euromonitor International Apparel & Footwear 2016 Edition). From a business perspective, the resale market presents an attractive proposition due to its low costs and high-margin potential (Poldner et al., 2022). Brands that establish their own resale channels can improve brand perception, increase the perceived quality of their items, and capture additional value (Poldner, 2022). Studies estimate that clothing reuse replaces approximately 60% of new purchases, contributing to reduced consumption and resource conservation (Farfetch, 2020; Farrant et al., 2010). Rental and resale BMs are recognized as having the biggest impact on driving sustainable change in the fashion industry, enabling extended product lifecycles, and reducing the need for continuous production (Colosante & D'Adamo, 2021). Engaging in resale not only offers an economically rational option but also enhances brand exposure and image (Poldner et al., 2022). Brands that actively participate in the resale market can shape consumer perceptions, positioning themselves as leaders in sustainability and responsible consumption (Poldner et al., 2022). By

embracing clothing reuse and resale, brands and consumers alike can actively contribute to a more sustainable and responsible fashion industry. Table 5 resume the main characteristics of CBM for Resale activities:

Table 5: Circular Business Model characteristics for Resale

Source: Lüdeke-Freund et al. (2019) with personal elaboration of the author

	<b>BM dimensions</b>	<b>Circular Options</b>			
<b>Value Proposition</b>	<b>Products</b>	Used products, components, or waste as production inputs			
	<b>Services</b>	Take back management		Customer education	
<b>Value Delivery</b>	<b>Target Customers</b>	Cost-conscious customers (quality for some)	Green customers	B2C suppliers	C2C suppliers
	<b>Value Delivery Processes</b>	Connecting suppliers and customers	Providing used products, components, or material	Taking back used products, or components	
<b>Value Creation</b>	<b>Partners and Stakeholders</b>	Manufacturers	Retailers	Service providers	Collector of products, or components
	<b>Value Creation Processes</b>	Maintaining or repairing products or components	Reselling products or components	Taking back or recapturing products components, and waste	Matching over- and under-capacity
<b>Value Capture</b>	<b>Revenues</b>	Additional products revenues		Price premium (for some vintage)	
	<b>Costs</b>	Labour	Repair, maintenance, and control		Transportation and logistics

### **3.2.4 Access Models**

The current imperative within the textile industry, as well as other business-to-consumer sectors, revolves around the urgent need to effectively operationalize the concepts of sustainability and sustainable development. This strategic implementation is vital not only to amplify the value of the core product offering but also to prevent any potential depreciation of its worth (Stål and Jansson, 2017). Mont et al. (2006) suggests that access- or use-based BMs represent one of the most viable solutions for Product-Service Systems (PSS). Such models involve the retention of product ownership by the provider while granting customers access to the products through leasing, sharing, or pooling, thus fostering sustainability in the process (Tukker, 2004). The adoption of access based CBM is of paramount importance in revolutionizing the acquisition and utilization of clothing, transitioning towards a paradigm that emphasizes usage and subsequent return (Coscieme et al., 2022). Colosante et al. (2021) argue that, as for rental models, resale BMs hold great potential for effectively addressing the sustainability challenges prevalent in the fashion industry. This perspective is aligned with Intlekofer et al.'s (2010) proposition that PSS models exhibit particularly pronounced effectiveness for products characterized by high emission levels during the production phase rather than during usage. Given the substantial utilization of water, chemicals, and energy in the production of fibers and clothing, the fashion industry emerges as an ideal candidate for the implementation of PSS models aimed at extending the lifespan of products (Stål and Jansson, 2017). Furthermore, the escalating pace of fashion cycles and the widespread embrace of planned obsolescence necessitate the exploration of alternative mechanisms for value appropriation that are independent of material throughput. In this regard, the viability of use-PSSs becomes increasingly apparent (Armstrong et al., 2015).

However, the adoption of such BMs poses challenges with regard to consumer comprehension of the underlying value proposition. Throughout the various phases of consumption, consumers encounter a multitude of difficulties. Use-PSSs do not confer product ownership, which encompasses intangible values such as personal identity, control, and convenience (Tukker, 2015). Additionally, the shared nature of products raises concerns surrounding issues of intimacy and hygiene (Armstrong et al., 2015a; Catulli, 2012). Moreover, the task of returning products presents challenges for both consumers and sellers due to the existing complexities within take-back systems and logistics (EMF, 2017). Furthermore, Bodenheimer et al. (2022) argue that consumers may encounter difficulties in comparing prices between ownership-based and access-based products. On the other hand,

consumer motivations include the desire to save money for special occasions, engage in guilt-free style experimentation, and demonstrate a commitment to sustainability (Bodenheimer et al., 2022). In fact, sustainability emerges as a significant driver, surpassing mere cost-saving considerations, as indicated by Bodenheimer's analysis of a German online company specializing in the rental of "regular" clothing. It is worth noting that the existing literature on this subject presents divergent viewpoints, with some authors (Papista and Krystallis, 2013; Patala et al., 2016) asserting that green products must not only exhibit superior sustainability compared to their conventional counterparts but also match or surpass them in terms of core aspects. Companies that adopt these innovative BMs have the opportunity to cultivate closer relationships with consumers, gaining a more profound understanding of their needs and fostering brand loyalty in the process (Tukker, 2015). Moreover, reducing stock requirements can serve as a motivating factor for brands. In the context of fashion-rental models, recommended strategies include establishing partnerships with designers and luxury brands, leveraging dead stock from previous seasons, investing in impactful marketing campaigns, and developing robust infrastructure to facilitate collaboration with textile services (Bodenheimer et al., 2022). Within the realm of access models, as defined by EMF (2017), various approaches are gaining traction in the fashion industry, such as rental subscription models and short-term rentals. Rental subscription models have emerged as a transformative approach in the fashion industry, allowing customers to pay a monthly fee to access a fixed number of garments on loan at any given time. This model aligns perfectly with the prevailing trend of online shopping, where the emotional aspects of physical retail experiences have diminished in value, particularly among younger generations. By adopting subscription models, brands can reap several benefits, including increased exposure and the opportunity to gather valuable customer feedback through feedback loops. Moreover, the consistent revenue streams generated by these models, akin to platforms like Spotify and Netflix, empower brands to enhance their offerings by gaining deeper insights into their products and the needs of their consumers. Luxury and personalized brands have already embraced this model, with Stitch Fix's monthly styling boxes serving as a notable example, thereby paving the way for non-luxury brands, and underscoring the untapped potential of rental subscriptions, despite their limited market presence.

In addition to rental subscriptions, short-term rental models play a significant role in the fashion industry, catering to the demand for specific occasions and providing access to high-end or formal clothing without the need for long-term ownership. A prime example is Rent the Runway, a prominent player in the market, which achieved an impressive \$800 million retail value in 2014 by offering luxury and formal clothing rentals. Similarly, high



street shops have recognized the opportunity presented by short-term fashion solutions and capitalized on the demand for rentals targeting special occasions, particularly in the US market. The success of companies like Houdini Sportswear, which offers short-term rentals of specific sportswear items at a fraction of their retail price, further attests to the viability of short-term rental models beyond the luxury context. Moreover, the scope of rental models extends beyond clothing alone, encompassing workwear or hospital/restaurant linen rentals, rentals of single-occasion clothing such as wedding or dinner dresses, rentals of baby clothes including reusable diapers, and even everyday wardrobe sharing facilitated through leasing arrangements. Ultimately, while rental models for high-end and event-based items are more likely to yield profitability, scaling rental models to encompass everyday clothing would significantly contribute to the advancement of circularity and sustainability within the fashion sector (Bodenheimer et al., 2022).

Table 6 outlines the key characteristics of access BMs in the fashion industry.

Table 6: Circular Business Model characteristics for Access Models

<i>BM dimensions</i>		<i>Circular Options</i>			
<i>Value Proposition</i>	<b>Products</b>	Long lasting products	Luxury products		Workwear attire
	<b>Services</b>	Take back management	Product-/Service based functions		Customer education
<i>Value Delivery</i>	<b>Target Customers</b>	Cost-conscious customers	Green customers	Quality-conscious customers	B2C customers
	<b>Value Delivery Processes</b>	Connecting suppliers and customers	Providing used products, components, or material	Providing product related services	Taking back used products, or components
<i>Value Creation</i>	<b>Partners and Stakeholders</b>	Retailers	Service providers (e.g., logistics)		Collector of products, or components
	<b>Value Creation Processes</b>	Maintaining or repairing products or components	Cycling products over several consumers	Taking back or recapturing products components, and waste	Adding additional value to the same product over time

<b>Value Capture</b>	<b>Revenues</b>	Additional products revenues		Payments for services and functions	
	<b>Costs</b>	Labour	Repair, maintenance, and control	Supply risks	Transportation and logistics

Source Lüdeke-Freund et al. (2019) with personal elaboration of the author

### 3.3 Circular Business Model for production

#### 3.3.1 Recycling Models

**THE CURRENT SITUATION:** While extending the lifespan of garments cited previously in this chapter is considered a positive and essential step, it fails to fully address the issue of escalating textile waste caused by overproduction and increased consumption mentioned earlier. In European countries, the UK, and the United States, fashion consumers discard between 11 and 30 kilograms of textiles per person each year (EEA, 2021; Dahlbo et al., 2017; Allwood et al., 2015). Shockingly, one out of every five garments end up as waste, never being sold or used (GFA, 2020). Textiles make up approximately 22% of mixed waste worldwide (Nørup et al., 2019), with an annual production of 92 million metric tons of textile waste (GFA, 2020). Additionally, project a 62% increase in global waste by 2030 is projected, accompanied by a loss of approximately \$500 billion due to the lack of recycling practices. Given the situation, recycling plays a crucial role in the sustainability transitions of the fashion industry (Sandin and Peters, 2018), and, to some extent, material-level recycling will always be necessary (Bocken et al., 2016). Various authors (Navone et al., 2020; Sanchis-Sebastià et al., 2021; Sandin and Peters, 2018) highlight recycling as one of the most promising approaches to combat textile waste. However, despite the growing waste problem and awareness, the low level of recycling persists, due to inadequate collection and sorting systems, design and manufacturing processes that hinder recyclability (e.g., textile blends), and existing technical and economic barriers (to be analyzed later in this paragraph). Global statistics from EMF (2017) reveal that in 2015, the overall recycle rate for post-consumer textiles was a mere 15%, with less than 1% being recycled into similar quality products.

**RECYCLING BUSINESS MODELS:** CBMs centered around recycling transform products that are no longer suitable for their original purposes into raw materials ready to be re-

manufactured (Coscieme et al., 2022). This process helps reduce the reliance on virgin materials in the industry, thereby lowering the environmental impact associated with disposing of materials at the end of their life cycle. In European countries, the UK, and the United States, the disposal of textiles by fashion consumers ranges from 11 to 30 kilograms per person annually (EEA, 2021b; Dahlbo et al., 2017; Allwood et al., 2006). Surprisingly, one in every five garments is wasted, never being sold, or utilized (GFA, 2020). Textiles account for approximately 22% of global mixed waste (Nørup et al., 2019), with an annual production of 92 million metric tons of textile waste (GFA, 2020). Furthermore, Schmutz et al. (2022) project a 62% increase in global waste by 2030, leading to a loss of approximately \$500 billion due to insufficient recycling practices.

While extending the lifespan of garments, as discussed earlier, is considered a positive and crucial step, it fails to fully address the escalating textile waste issue resulting from overproduction and increased consumption. Thus, recycling assumes a critical role in the sustainability transitions of the fashion industry (Sandin and Peters, 2018), with material-level recycling remaining necessary to some degree (Bocken et al., 2016). Several authors (Navone et al., 2020; Sanchis-Sebastià et al., 2021; Sandin and Peters, 2018) emphasize recycling as one of the most promising approaches to tackle textile waste. However, despite the growing waste problem and increasing awareness, the recycling rate remains low due to inadequate collection and sorting systems, design and manufacturing processes that impede recyclability (e.g., textile blends), and existing technical and economic barriers (to be further discussed in subsequent paragraphs). Global statistics from EMF (2017) reveal that in 2015, the overall recycling rate for post-consumer textiles was a mere 15%, with less than 1% being recycled into similar quality products. CBMs revolving around recycling transform discarded products into raw materials that can be re-manufactured (Coscieme et al., 2022). In this context of corporate sustainability, CBMs based on recycling can offer environmentally friendly inputs in the case of processing firms, such as material recycling companies, or green products for manufacturers who utilize these eco-friendly inputs (Lüdeke-Freund et al., 2019). Manufacturers leveraging recycled materials can attract environmentally conscious customers, especially through marketing campaigns that emphasize the sustainable content of their products as an integral part of their design (Coscieme et al., 2022). This concept holds true given the increasing consumer sensitivity towards environmentally aware brands, although it also raises concerns about potential greenwashing practices (i.e., when businesses provide misleading information about the environmental performance of their products and technologies) (Laufer, 2014).

Furthermore, these CBMs offer a more comprehensive value proposition by facilitating the reuse and reprocessing of products and materials that would otherwise be discarded and incinerated by consumers and businesses alike. Recycling BMs require significant labor, skills, and technical knowledge to establish an effective infrastructure (Singh et al., 2019). To enhance the recycling process, knowledge hubs play a central role, particularly in fostering innovation in technologies and eco-design. Design strategies like designing for disassembly and utilizing sustainable material combinations can greatly improve the recyclability of garments (Coscieme et al., 2022). Various recycling processes have room for improvement, as indicated by Eppinger (2022) based on a case study analysis, and the industry has observed growth in recycling activities. Mechanical recycling, in particular, shows potential for further enhancement and is less susceptible to impurities. Conversely, Niinimäki et al. (2020) argue that chemical recycling is more effective, increasing fiber recycling by 60% compared to mechanical methods. Furthermore, recycling can eventually operate at the molecular or atomic level, reverting to the smallest particles or original material form, which is already being explored in certain industrial processes (Fraunhofer, 2014). Recycling can be classified into two categories: open loop (downcycling) and closed loop (upcycling) (Eppinger, 2022). Open-loop recycling converts used materials into lower-value materials, such as transforming clothing into stuffing. In contrast, closed-loop recycling achieves higher-quality materials and improved functionality, for instance, converting polyethylene terephthalate bottles or ocean plastics into clothing and carpets (Braungart and McDonough, 2013). According to Wang (2006), the inputs for the processes, hence the textile waste, can be categorized into three types: industrial waste, pre-consumer waste, and post-consumer waste. Industrial waste comprises scraps and remnants generated during manufacturing processes, which are typically suitable for recycling due to their known fiber composition and processing chemicals. Pre-consumer waste includes unsold stock and returns from both physical and online sales, often consisting of multi-fiber compositions and various attachments. Post-consumer waste consists of worn garments and household textiles discarded by consumers (Wang, 2006). When it comes to recycling, industrial waste is the most used.

These CBMs connect the downstream and upstream ends of SCs, necessitating comprehensive reverse logistics that connect users, raw material suppliers, and parts manufacturers (Lüdeke-Freund et al., 2019). However, ensuring a consistent SC remains challenging for both pre- and post-consumer waste (Ponnambalam et al., 2023). While there is growing pressure for companies to adopt recycling practices, developing countries face additional challenges, including limited technical knowledge, difficulties in obtaining

stakeholder consensus, absence of recycling standards, affordability of fast fashion products, restrictions on waste imports, shortage of skilled labor, low raw material prices, and the costs associated with necessary investments (Kazancoglu et al., 2022; Sinha et al., 2022; Juanga-Labayen et al., 2022; Hvass, 2014; Ribul et al., 2021). These barriers disproportionately affect developing countries (Ponnambalam et al., 2023). The high cost of recycling processes makes them commercially infeasible (de Aguiar Huho, 2021). Furthermore, post-consumer recycling technologies face challenges in delivering quality products that align with consumer demand (de Ahuiar Huho, 2021). Critical barriers in the textile recycling sector include system costs, inefficiencies in textile separation, lack of support structures for collection, and production of recyclable clothing, which can contribute to lower input and product prices. However, in the case of upcycling, it is possible to charge a normal or even premium price (Kraaijenhagen et al., 2016). Table 7 outlines the key characteristics of recycling BMs in the fashion industry:

Table 7: Circular Business Model characteristics for Recycling

	<i>BM dimensions</i>	<i>Circular Options</i>		
<i>Value Proposition</i>	<b>Products</b>	Product based on recycled waste	Reusable or recyclable production inputs	
	<b>Services</b>	Take back management	Waste handling, processing	Customer education
<i>Value Delivery</i>	<b>Target Customers</b>	Green consumers	B2B customers	
	<b>Value Delivery Processes</b>	Connecting suppliers and customers	Taking back used products, components, materials, or waste	Providing used products, components, or material
<i>Value Creation</i>	<b>Partners and Stakeholders</b>	Manufacturers	Collectors of products, components, materials, or waste	
	<b>Value Creation Processes</b>	Recycling of products, components, material, or waste	Upcycling of products, components, materials, and waste	Taking back or recapturing products components, and waste
				Winning back base materials

<b>Value Capture</b>	<b>Revenues</b>	Additional products revenues		Premium prices	
	<b>Costs</b>	Labour	Waste handling, processing	Resource inputs	Transportation and logistics

Source: Lüdeke-Freund et al. (2019) with personal elaboration of the author

### 3.3.2 Collecting and Sorting processes

The collection and sorting of textile waste play a vital role in maintaining the efficiency of the SC within the fashion industry. These processes are instrumental in capturing the inherent value of materials at different stages, thereby promoting effective resource utilization and sustainable practices (EMF, 2017). Through meticulous collection and sorting, the industry can enhance its circularity and minimize waste, leading to a more sustainable and environmentally responsible approach to textile production and consumption (EMF, 2017)

**COLLECTION:** The initial phase in achieving circularity within the textile industry involves the collection of textile waste, as emphasized by EMF (2017). However, the current state of textile waste collection exhibits significant disparities in both collection rates and approaches, varying across different countries and regions. While some nations, such as the UK, have implemented municipal collection schemes, the effectiveness and scope of these schemes differ at the local level. In contrast, several countries heavily rely on informal collection systems, lacking formalized processes and failing to differentiate between textiles destined for recycling or reuse. Consequently, the landscape of textile collection for recycling purposes often suffers from fragmentation, limited scalability, and inadequate location-specific collection systems. The collection of used textiles can follow either a brand-selective approach, where companies retrieve only the garments they originally sold, or an unselective approach, where companies accept all textiles for collection (Coscieme et al., 2022). Selective garment collections are typically carried out by companies that have integrated take-back systems into their BMs, which may include free mail returns (e.g., Patagonia), in-store collection of used garments (e.g., H&M), donation incentives, and the repurchase of used garments for resale on their online platforms (Eppinger, 2022). Various BMs exist for textile waste collection, with some collectors incorporating sorting capabilities, while others collaborate with sorting businesses. Conversely, unselective collection of used textiles often takes place through curbside collection or textile-waste containers managed by waste-management companies or

charities. These collected textiles are then sorted, often involving the participation of social workers and volunteers, and subsequently sold on the global market (Coscieme et al., 2022). Municipalities, as emphasized by EMF (2017) and in line with emerging policies, play a pivotal role in facilitating textile collection, implementing measures such as home pick-up systems and appropriate collection containers, to effectively scale up these operations. Policy makers play a crucial role in driving actions related to textile waste management, as highlighted in the previous chapter. An excellent illustration is the Directive (EU) 2018/851 of May 30, 2018 (EU, 2018), which amends Directive 2008/98/EC on waste and mandates EU countries to establish separate collection systems for textiles by 2025. Italy, for instance, has already taken steps in this direction with Legislative Decree No. 116/2020, making it mandatory for citizens to sort textile waste. These policy measures aim to enhance the effective management and sustainability of the textile industry's waste streams. (EU, 2018; Italy, 2020).

**SORTING:** Textile recycling faces significant challenges in the sorting process (Chen et al., 2021). The lack of unified standards and policies, coupled with the need for more efficient procedures, necessitates the development of sorting techniques. Certain companies primarily focus on segregating garments that can be resold from those suitable for recycling. In contrast, others, as described by Eppinger (2022), implement multi-level sorting methods. This includes manual fabric sorting, where operators remove non-textile components and categorize garments based on quality. Garments with stains or holes are processed for recycling, while those in better condition are directed to second-hand markets. According to EMF (2017), various technologies, such as RFID tags, can aid in tracking and sorting garments (Chen et al., 2021). Furthermore, automated optical solutions proposed by WRAP (2014) play a crucial role in the sorting industry and the overall recycling process. These technologies enable the identification and sorting of textiles. However, chemical processes pose significant challenges for sorting at other levels, such as yarn and fiber. After mechanical removal of non-textile materials and chemical washing, the fibers may undergo blending using temperature-based heating solutions or dissolvable methods. Technological advancements are also vital for the economic sustainability of the industry. Eppinger (2022) highlights that logistics costs, environmental policies, and slim profit margins act as barriers for companies, leaving resale as the only profitable secondary business to pursue. The theory behind this model lacks completeness as it primarily focuses on technological advancements and procedures rather than the BM and its features. In chapter 5, a practical example of a company exclusively sorting textile waste will be examined to identify the characteristics of the BM for the TAF industry. However, it is worth noting that collectors

and sorters often work in collaboration or as a single entity. For instance, Sysav, a sorting company in Sweden, functions as both a collector and a sorter while also rewarding those who contribute waste. Sysav is an intriguing case study as it operates on an economy of scale, collecting and sorting various types of materials, and sharing knowledge and processes tailored to the specific needs of each waste type between the different business units (Sysav, 2021).

Notice that the creation of the table with the characteristics for this type of CBM is missing due to limited information.



## METHODOLOGY

This chapter outlines the approach used to conduct a quantitative research study focusing on CBM in TAF industry within the context of a CSC. This research follows the illustration scenario for a case study presented by Sigglekow (2007), which emphasizes understanding theoretical argumentation through real case scenarios. To select companies for inclusion in the study, the research relies on the availability of information, such as reports, data from companies' websites, news articles, and the ORBIS database, which provides financial information. These sources are chosen based on their reliability in assessing the BMs in the TAF industry. The research employs several tools in a sequential order to process the necessary data. Firstly, the BMC developed by Lewandowsky (2016) is used to assess the characteristics of the identified companies. This framework provides a comprehensive overview of the key components of a CBM, enabling a detailed analysis of its structure and operations. Additionally, the ReSOLVE framework (EMF, 2015) is utilized to evaluate the extent to which the identified BMs align with circular principles. This systematic approach helps assess the circularity of the BMs by considering the six factors presented in the second chapter (Regeneration, Share, Optimize, Loop, Virtualize and Exchange). Moreover, an environmental assessment is conducted based on performance indicators provided by Yribbery (2023) and described in table 8. This assessment involves comparing the company's environmental impact, including emissions and water consumption, with industry standards. By doing so, the research evaluates the environmental performance of the CBMs under study. Finally, financial feasibility is assessed using the ORBIS database, which provides relevant financial information for the selected companies. This step involves comparing the financial data

of the companies with industry medians, based on the SIC code of the described company, to understand their financial standing and assess the feasibility of transitioning to a CBM.

*Table 8: Environmental performance indicator*

<b>Indicator</b>	<b>Way to Measure It</b>	<b>Description</b>
<b>Efficiency</b>	Indicator of circular material use rate	It measures the percentage of recycled raw material used in total material consumption.
	% of renewable energy	It is measured by the yearly consumption of renewable energy over the total yearly consumption of energy, all multiplied by 100.
<b>Ecological Footprint</b>	Footprint indicator	It is measured by the emission of greenhouse effect gas multiplied by global warming potential over 100 years for the gas used.

*Source: Yriberry (2023) with personal elaboration of the author*

The collected data is analyzed to identify shifts in profitability and centrality within the new CSC resulting from the adoption of a more circular approach. The analysis focuses on comparing the performance of the identified BMs across the various steps of the CSC, aiming to understand the impact of circular strategies on profits and SC dynamics.

The research acknowledges certain limitations. One limitation lies in the availability of information, as it relies on publicly accessible reports, websites, and news articles. This might result in limited data availability for some companies, potentially affecting the overall comprehensiveness of the study. Moreover, biases may arise due to the subjective interpretation of data and reliance on secondary sources. It is important to consider these limitations when interpreting the findings and generalizing them to the broader TAF industry.

## CASE STUDIES

### **5.1 Access Models**

Companies adopting access-based models as opposed to ownership come in various forms, ranging from short-term rentals tailored for special occasions and sportswear, to more recent developments in long-term rentals (EMF, 2017). Table 9 provides an overview of companies employing the latter approach, offering a synthesis of their operations and the available dataset for each entity. The selection process for the companies under scrutiny was primarily predicated on the availability of both financial and environmental data. While the former hinges on the ORBIS platform rather than corporate discretion, it is disconcerting to note the substantial number of these enterprises that refrain from divulging sustainability reports, or furnish minimal data on their websites, such as Armoire. Furthermore, the chosen company - Rent the Runway - does operate not only as an access model but also as repair and maintenance and re-sale of used garments, hence showing characteristics presented in the previous chapter for all the different CBMs presented. Ultimately, the comparison was directed towards two pioneering entrants into the market—namely, Rent the Runway, which remains operational, and YCloset, which has since exited. This comparative analysis augments the overarching objective of this study, namely, to discern effective strategies for cultivating a CE within the TAF industry, particularly within the B2C segment.

Table 9: List of companies considered for access model analysis.

<i>Name</i>	<i>Brief Description</i>	<i>Financial Data</i>	<i>Sustainable reports</i>	<i>Website</i>
<i>Armoire</i>	Clothing rental subscription service that focuses on providing a rotating wardrobe of high-end and designer clothing for women.	No	Yes, partial	<a href="https://www.armoire.style/">https://www.armoire.style/</a>
<i>By Rotation</i>	It allows users to rent out their own wardrobe items to others or rent items from another user	No	No	<a href="https://byrotation.com/">https://byrotation.com/</a>
<i>Moss Bros</i>	It offers solutions for special occasions, focusing on high-quality suit rentals tailored for men's needs, particularly for significant events like weddings.	Yes	Yes*	<a href="https://www.mossbroshire.co.uk/">https://www.mossbroshire.co.uk/</a>
<i>Nuuly</i>	Operated by URBN, it allows customers to rent a variety of clothing items, including clothing, accessories, and even some vintage pieces, for a monthly fee.	No**	Yes	<a href="https://www.nuuly.com/">https://www.nuuly.com/</a>
<i>Onloan</i>	It focuses is on providing a sustainable way for women to access a rotating wardrobe of high-quality designer items without the	No	No	<a href="https://onloan.co/">https://onloan.co/</a>

	need for constant purchasing			
<i>Rent the Runway</i>	This service offers customers access to designer clothing, accessories, and apparel through a fashion subscription and rental model, allowing them to borrow these items as needed.	Yes	Yes	<a href="https://www.renttherunway.com/">https://www.renttherunway.com/</a>
<i>The Devout</i>	It provides a monthly subscription service enabling customers to select and mix five items from a virtual wardrobe, all-inclusive with delivery, laundry, and accidental damage coverage.	Yes	No	<a href="https://www.thedevout.com/">https://www.thedevout.com/</a>
<i>Tulerie</i>	It is a fashion rental platform that facilitates borrowing and lending of designer clothing and accessories with a peer-to-peer approach.	No	No	<a href="https://tulerie.com">https://tulerie.com</a>
<i>Vince Unfold</i>	It is a subscription rental service that gives members access to endless styles for one flat monthly fee of \$175	No	No	<a href="https://www.vinceunfold.com/">https://www.vinceunfold.com/</a>
<i>YCloset***</i>	It offered a service that allowed	Yes, partial	No	No website available

customers to rent  
designer clothing and  
accessories for a  
specific period of  
time.

*Source: Personal elaboration of the author*

\* The report is on the website, but it does not present enough information for an adapt analysis

\*\* Only parent company available

\*\*\* The company does not operate anymore

## **5.2 Access Model: YCloset**

YCloset, legally known as Beijing Next Dress Technology Co., Ltd, was a prominent Chinese garment sharing platform that was established in Beijing in 2015. They offered a service that allowed customers to rent designer clothing and accessories for a specific period, providing an alternative to traditional retail shopping. Evidencing its market disruption, the company has secured substantial investments from diverse stakeholders over the course of its existence. Notably, the e-commerce titan Alibaba Group Holding Ltd made a substantial injection of over 50 million euros through two distinct investment phases. As indicated by news reports at the time (Bittau 2021, Zhang 2017), the company had a promising market outlook, with high aspirations to dominate the Chinese sector and serve as a global exemplar for emerging access-based models. However, in August 2021, YCloset unexpectedly announced its closure, expressing regret for the millions of subscribers affected.

Given the limited available information, this analysis must adhere to stringent conditions. The cessation of the YCloset website and reliance on news articles and research papers for insights into its BM further constrains the study. Nevertheless, it remains crucial to discern the disparities between profitable and successful enterprises (such as Rent the Runway, which will be examined in the subsequent section) and unsuccessful ventures. It is important to acknowledge that this analysis may be somewhat incomplete due to data gaps, including the absence of environmental impacts and specifics regarding processes and operations.

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### **5.2.1 Business Model Canva**

**KEY PARTNERS:** YCloset has established partnerships with renowned luxury brands such as Prada, Kenzo, Armani Jeans, and Michael Kors, enabling the company to offer a wide range of high-end fashion options to its customers. Additionally, collaborations with premium brand Peace Bird, designers including Sleek, Finders, and D-two, as well as fast fashion brands like Zara and Topshop have further enriched their inventory (Liu et al., 2022).

**KEY ACTIVITIES:** The core activities of YCloset revolve around managing their extensive clothing inventory, which includes daily dresses, special occasion attire, and traditional Chinese clothing. The company operates cleaning operations, ensuring that the rented garments were well-maintained and ready for use. They also handle logistics and delivery operations, ensuring timely and efficient service. YCloset has invested in building an integrated operation center for washing and distributing clothing, optimizing their operational efficiency (Liu et al., 2022; Zhang & Liou, 2021). Additionally, the company has developed sophisticated clothing collocation recommendation systems to assist customers in selecting suitable outfits.

**KEY RESOURCES:** The key resources of YCloset include their three large dry-cleaning facilities, which play a crucial role in maintaining the quality and cleanliness of the rental clothing and their inventory. They also own warehouse and maintenance facilities, allowing them to efficiently store and manage their extensive inventory. The company utilizes RFID technology, enabling automated tracking of product information, including product type, washing method, and washing processes. This technology helps reduce human costs and streamline operations (Liu et al., 2022; Zhang & Liou, 2021).

**VALUE PROPOSITION:** YCloset had established an enticing value proposition for its customers during its operational period. The organization implemented a subscription-based service that granted customers the opportunity to indulge in unlimited clothing rentals for a monthly fee of approximately €65, with a maximum of three items per order. This innovative subscription model granted customers access to a diverse range of clothing options suitable for various occasions, including everyday wear, special events,

and even traditional Chinese attire. By offering a cost-effective approach to fashion, YCloset garnered a substantial customer base, achieving a remarkable milestone of one million users within its inaugural year (Bittau, 2021; Zhang, 2017). Moreover, YCloset extended a unique feature to its customers, allowing them to purchase any garment they desired with a price based on their level of utilization. This buy-option provided an added convenience for those who found themselves particularly fond of a rented item and wished to keep it permanently in their wardrobe. In addition to its customer-centric approach, YCloset had envisioned providing designers and brands with an innovative platform to showcase their products. While specific details on the implementation of this feature are unavailable, the organization aimed to offer designers and brands the opportunity to allow customers to test and experience their products before committing to a purchase (Zhang 2017). Regrettably, YCloset has since ceased operations, and the extent to which this envisioned service materialized remains uncertain.

**CUSTOMER SEGMENTS:** The primary target customer segment for YCloset was individuals, more specifically female workers in first- and second-tier cities (cities with more than 3 million inhabitants), with daily wear needs in China (Zhang and Liou 2021). The company focused on fulfilling the clothing requirements of customers who needed regular outfits for their daily activities. They capitalized on the Chinese market's limited demand for occasional wear, as many events in China did not have specific dress codes (Zhang, 2017).

**CUSTOMER RELATIONSHIPS:** YCloset cultivated customer connections by integrating social media features into their platform, enabling customers to share captivating snapshots of their style endeavors and actively engage with the company's offerings. In addition, the company streamlined the online ordering process by leveraging their WeChat mini program, app, and website, ensuring effortless accessibility for their clients. By extending customer support through these digital channels, they effectively enhanced the overall customer experience, as emphasized by Liu et al. (2022). Nevertheless, as highlighted by Bittau (2021), the company encountered difficulties in maintaining the necessary level of transparency anticipated by customers. These patrons, as indicated by Armstrong et al. (2015a) and Catulli (2012), expressed concerns regarding



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hygiene-related aspects and sought precise details regarding return and reimbursement policies. Additionally, YCloset enacted alterations to their subscription offerings without adequately notifying their users. An element contributing to the downfall of China's clothing rental platform "YCLOSET," as expounded by Bittau (2022), was its imprudent configuration of the user payment system and the presence of arbitrary charges (such as "unjustified deductions," "automatic membership renewal," "challenges in post-sale refunds"). These factors led to a substantial attrition of platform users. The failure instance of "YCLOSET" finds reinforcement in the validation that users' apprehensions about financial risks do indeed impede the eventual adoption of second-hand clothing-sharing behavior.

**CHANNELS:** YCloset utilized a combination of channels to reach and engage their customers effectively. They leveraged their presence on the WeChat mini program, their dedicated app, and their website to provide customers with easy access to their rental services. These digital channels served as the only platforms for customers to explore and place online orders for rental clothing items (Bittau, 2021; Liu et al., 2022).

**REVENUE STREAMS:** The primary revenue stream for YCloset came from the monthly subscription fees, which accounted for 75% of their overall revenue. The remaining revenue was generated through customers' purchases of clothing items from the community. (Liu et al. 2022).

**COST STRUCTURE:** YCloset incurred several significant costs in their operations. Logistics costs, including delivery expenses, were estimated to be less than 20% of the subscription fees due to the dense population in Chinese cities. However, inventory management costs, including procuring, storing, and maintaining a vast range of clothing items, constituted a significant portion of their expenses. Operating and maintaining large-scale dry-cleaning facilities also contributed to the company's cost structure (Zhang, 2017)

**TAKE-BACK SYSTEM:** YCloset's position in the fashion sector was inextricably linked to its pivotal take-back mechanism, a cornerstone embodying the company's commitment to sustainable fashion consumption. This orchestrated reversal within YCloset's SC required specialized logistics partners and channels distinct from the forward process. The company took on the internal responsibility of managing the retrieval and upkeep of the leased apparel. A focal point in this approach was the substantial investment in the nation's three largest dry-cleaning facilities, previously mentioned. Warehousing and maintenance infrastructure, coupled with RFID technology, streamlined the intricate management of the vast inventory in the reverse channel. The automated tracing of product information via RFID significantly elevated the efficiency of the take-back processes (Zhang, 2017; Liu et al., 2022). This reverse trajectory held pivotal importance within YCloset's overall value proposition. The subscription model that enabled customers to rent garments was complemented by the distinctive option to purchase cherished items. The take-back system expanded this value by ensuring the seamless reintegration of returned apparel into the inventory, facilitating subsequent rental and purchase opportunities (Zhang, 2017). In summation, YCloset's take-back strategy constituted a fundamental component of its innovative BM. Through adept management of the reverse course, the company sustained its provision of a sustainable and economically viable approach to fashion, in harmony with its customer-centric principles. In doing so, YCloset made strides toward curtailing fashion waste in the industry.

**ADOPTION FACTORS:** As previously mentioned, the influential role of adoption factors in molding the circularity of a BM remains unquestionable, encompassing both internal and external components. While internal factors encapsulate intangible proficiencies like team motivation and organizational culture (Roos et al., 2014), a thorough exploration of YCloset's internal adoption factors is impeded due to the scarcity of accessible data concerning the company's organizational framework, policies, and ethical stances. Shifting our focus to external dynamics, it's noteworthy that Chinese consumers, particularly the youth demographic, exhibit distinct inclinations, as validated by their prioritization of fashion leadership, cost awareness, and active engagement with social media platforms. This predominant inclination, which favors style and economic

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considerations over quality and environmental consciousness, presents a substantial external determinant that influences the CBM of YCloset. Moreover, China has established itself among the pioneering emerging economies committed to sustainable objectives, aligning its strategies with global commitments from entities like the EU, UK, and US (Bleischwitz et al., 2022). Some scholars even posit that China holds the potential to drive a worldwide shift towards environmental responsibility, potentially instigating a new wave of eco-innovation that extends to other emerging economies (Mathews & Tan, 2016). The evaluation of China's CE policies has highlighted noteworthy accomplishments in tackling environmental challenges, including curbing pollution, conserving biodiversity, and reducing greenhouse gas emissions (Li et al., 2020; Ali et al., 2018; Wang et al., 2021). Nevertheless, despite these achievements, certain deficiencies endure in the form of implementation gaps and coordination hurdles. These obstacles manifest in the dichotomy between the propagation of innovative practices in limited provinces and niche markets, as opposed to the broader transformation of mass markets. Additionally, challenges in coordination arise among local governing bodies, provinces, and industrial sectors, impacting the cohesive execution of circular endeavors (Bleischwitz et al., 2022). In essence, YCloset navigates an external terrain molded by a dynamic interplay of factors. While the company adapts to prevailing fashion trends and financially conscious consumer preferences, it operates within the broader context of China's evolving environmental policies and the associated difficulties in translating overarching commitments into practical actions across diverse domains. The convergence of these external influences significantly shapes YCloset's adoption of circular methodologies within its rental clothing BM.

Table 10 outlines the key attributes of YCloset's BM.

Table 10 Business Model Canva - Sysav

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>• Luxury brands (Prada, Armani Jeans etc.).</li> <li>• Collaboration with everyday garments brands such as Zara.</li> </ul>	<p><b>Key Activities</b></p> <ul style="list-style-type: none"> <li>• Managing of clothing inventory.</li> <li>• Operation of dry-cleaning facilities and maintenance of garments.</li> <li>• Logistics and delivery.</li> <li>• Development of a recommendation system.</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>• Subscription-based service offering unlimited clothing rental.</li> <li>• Access to diverse clothing options.</li> <li>• Buy-option for customers.</li> <li>• Showcase platform for designers and brands.</li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>• Social-media integration.</li> <li>• Streamlined online ordering via WeChat, app, and Website.</li> <li>• Customer support through digital channels.</li> </ul>	<p><b>Customer segment</b></p> <ul style="list-style-type: none"> <li>• Female workers in first- and second-tier Chinese cities.</li> </ul>
<p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>• Large dry-cleaning facilities.</li> <li>• Warehouses.</li> <li>• RFID technology.</li> <li>• Large inventory.</li> </ul>	<p><b>Channels</b></p> <ul style="list-style-type: none"> <li>• WeChat mini program.</li> <li>• App.</li> <li>• Website.</li> </ul>	<p><b>Take-Back Systems</b></p> <ul style="list-style-type: none"> <li>• Reverse logistics internally managed.</li> <li>• Maintenance of garments.</li> </ul>		
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>• Significant costs in logistics and inventory management.</li> <li>• Large scale dry-cleaning facilities operations and maintenance.</li> </ul>		<p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>• Monthly subscription fees.</li> <li>• Revenue from customer purchases of clothing items.</li> </ul>		
<p><b>Adoption Factors</b></p> <ul style="list-style-type: none"> <li>• Internal factors: no data available.</li> <li>• External factors: consumers' preferences and inclination, Chinese's policies on CE with the challenges attached for the translation.</li> </ul>				

Source: Personal elaboration of the author

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### **5.3 Access Model: Rent the Runway**

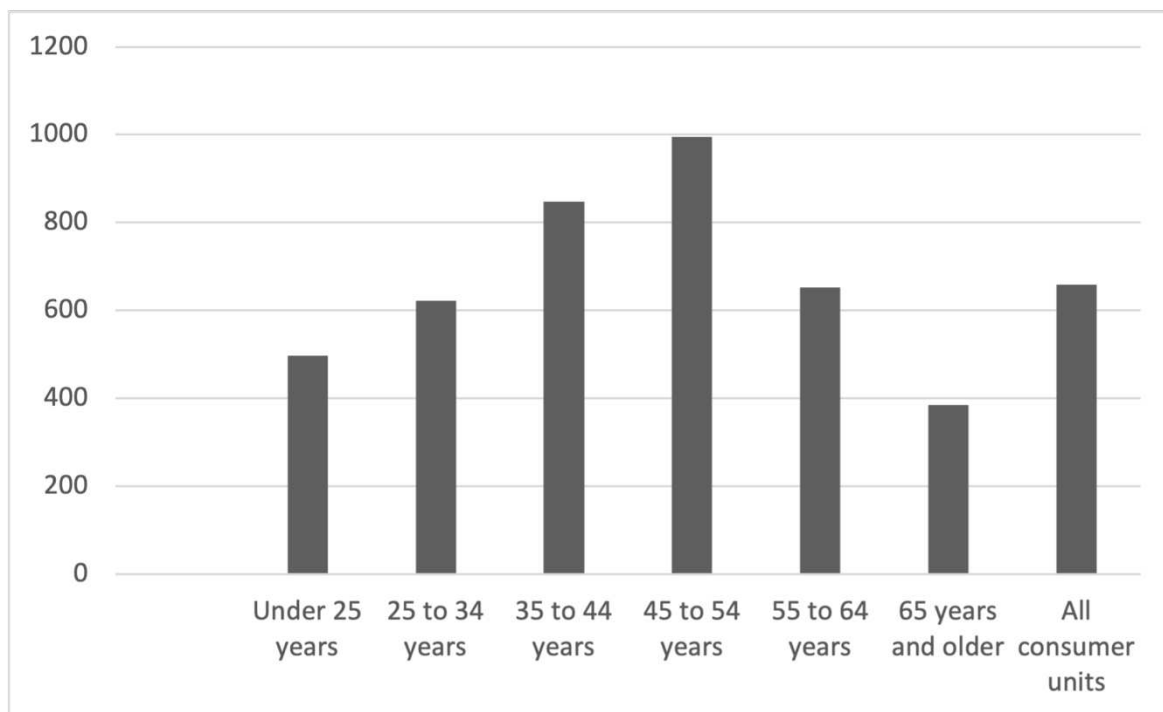
Rent the Runway (RTR) is a pioneering company in the realm of fashion rental services, focusing on providing access to high-quality designer apparel and accessories for consumers while minimizing the traditional buy-and-own model's environmental impact. Founded on the principles of sustainability and convenience, Rent the Runway has reshaped the way people engage with fashion. Unlike the conventional practice of purchasing clothing that often leads to unused items and excessive waste, RTR offers a platform where individuals can rent garments for special occasions or everyday wear, promoting a circular fashion economy, and reducing textile waste (EMF, 2017).

Since its inception 2009, RTR has grown into a prominent player in the fashion industry. Its innovative BM has gained traction and popularity among consumers who seek both style and sustainability. The company has collaborated with renowned designers and brands to curate a diverse collection of fashion items available for rental, catering to various preferences and occasions. Operating with a commitment to sustainability, RTR has implemented efficient logistics and cleaning processes to ensure rented items maintain their quality while reducing the environmental impact associated with clothing production. By encouraging customers to rent rather than buy, the company contributes to the reduction of fashion's carbon footprint and encourages a shift towards more mindful consumption patterns.

#### **5.3.1 Business Model Canva**

**CUSTOMER SEGMENT:** RTR primarily targets American women between the ages of 25 and 45 who have an affinity for high-end designer fashion across various occasions, as stated on their annual reports (Rent the Runway, 2022). Furthermore, according to the data presented in the chart below, RTR's intended clients consists of women willing to invest more than the average US female individual on clothing (Smith, 2022). For instance, the lowest-cost option for renting five garments per month translates to an annual expenditure of approximately \$1200, which surpasses the higher end of the expenditure spectrum in the table. This observation suggests that RTR predominantly operates in urban areas characterized by higher income levels, thus offering greater

opportunities to engage with customers who seek celebrity-style fashion choices (EMF, 2017).



Source: Smith, 2022

Figure 3: Average annual consumer expenditure on women's annual apparel in the US in 2021, by age (in U.S. dollars)

Lastly, it's worth noting that around 2019, RTR briefly experimented with renting children's clothing. However, based on current information available on their website, it appears that this concept didn't gain significant traction (Del Valle, 2019; Liu et al., 2022).

**VALUE PROPOSITION:** The value proposition of RTR is built upon two main propositions: short-term and long-term rentals, with the addition of a buy-back opportunity. The company offers customers the flexibility to choose between renting for a short duration or for an extended period, catering to different occasions and needs. This includes a subscription plan that provides options ranging from 5 to 20 items per month (characteristics for each plan in table 11), with corresponding pricing tiers. Clients can opt for plans that suit their usage frequency and desired wardrobe size, with the convenience of 1 to 4 shipments per month based on their chosen plan. These plans encompass two main categories: the Core Closet, which offers rental items with a value

of up to \$350, and the Complete Closet, catering to a more comprehensive range of items valued up to \$3000.

*Table 11: Characteristics for each plan of Rent the Runaway*

<b>Items (per month)</b>	5	10	15	20
<b>Price (per month)</b>	\$94	\$144	\$193	\$235
<b>Items for each shipment</b>	5	5	5	5
<b>Shipments (per month)</b>	1	2	3	4
<b>Product access</b>	Core Closet	Complete Closet	Complete Closet	Complete Closet

*Source: RTR website*

Across all subscription plans, RTR provides several consistent benefits to customers. These include free shipping with a swift delivery time frame of 1 to 3 days, the liberty to retain rented items for as long as desired, the option to pause or cancel subscriptions at any time, and access to a 1:1 styling service. Furthermore, RTR offers to the subscribers' discounts for one-time rentals, along with discounted prices for purchasing rented clothes. The provision of detailed customer reviews further enhances the shopping experience and aids decision-making, particularly for long-term subscribers, as the system tailors' recommendations based on user preferences and style history.

In addition to the subscription-based model, RTR offers a one-time rental option, designed for special occasions such as weddings and parties. This feature allows customers to rent items for 4 to 8 days, receiving them in advance. Although immediate purchase is not available due to possible prior bookings, the buy option is accessible on the website for available items. Notably, late returns incur a charge of \$50 per day, incentivizing timely returns and maintaining availability for other customers.

The company's commitment to customer satisfaction is also evident in its approach to damages. RTR covers small damages like wine stains, relieving customers of minor concerns. However, in cases of significant damages or lost pieces, customers are required

to pay the current "to buy" price. This policy strikes a balance between accommodating normal wear and tear and ensuring accountability for substantial damage.

Finally, the RTR website's extensive repository of reviews and recommendations reinforce customer confidence in their selections, particularly valuable for long-term users seeking a curated experience. Moreover, RTR's commitment to sustainability and convenience is exemplified through its smart cleaning service, which not only relieves customers from the burden of cleaning but also assures hygiene and the condition of the clothing (Rent the Runway, n.d.).

**CHANNELS:** RTR employs a multi-channel approach to reach and serve its customer base. The primary channel for its operations is its website, functioning not only as the initial point of contact for new customers but also as the central platform for shopping and client support. In 2013, RTR expanded its digital presence by launching a smartphone application, allowing customers to rent clothing and access a unique feature. This feature enables users to capture a photo of their desired dress, whether found while shopping or spotted on a friend, and employ photo matching technology to identify an identical or similar style within RTR's inventory (PR Newswire, 2013). Prior to the onset of the COVID-19 pandemic, RTR maintained a network of five brick-and-mortar stores. However, these physical retail outlets have since been shuttered due to the pandemic's impact. Notably, the company acknowledged that the presence of these physical stores garnered mixed reactions among its clientele, with certain customers expressing negative sentiments towards this particular aspect of the company's strategy. Finally, it is important to notice that, according to the company's financial statement (Rent the Runway, 2022), eighty percent of the customer base has actively recommended the service to a minimum of five individuals, thereby contributing to the company's organic growth and serving as a crucial marketing channel.

**CUSTOMER RELATIONSHIPS:** RTR places considerable emphasis on customer satisfaction, recognizing its pivotal role as a B2B company with a substantial reliance on customer subscriptions for profitability. This customer-centric approach is fortified by deeply engaged clients, exemplified by the substantial influx of 33.1 million customer reviews submitted up to January 2023 (Rent the Runway, 2022). These reviews not only



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serve as a testament to the customers' active involvement but also underline their utilization of the amassed community feedback to make informed decisions and feel confident in their choices. This robust engagement has yielded substantial benefits in terms of virality and word-of-mouth marketing. Moreover, the community's attachment to the brand is evident in the fact that 75% of customers showcased themselves wearing RTR attire on social media, a statistic gleaned from the March 2023 Subscriber Survey (Rent the Runway, 2022). This customer-centric strategy isn't merely an abstract concept but a tangible driver of revenue for the company. The revenue stream derived from these customer relationships constitutes an essential cornerstone for the overall well-being of RTR.

In addition to these paths of interaction, the company's website is equipped with an integrated chat function that connects users with operators upon signing in. This feature offers customers a convenient means to address specific concerns or navigate through any issues encountered during their interactions with the platform. However, it's worth noting that the absence of a direct phone number for customer support is a distinctive feature of RTR's customer relationship framework (Rent the Runway, 2023a).

**COST STRUCTURE:** RTR's cost structure is composed of several key categories that reflect the operational and strategic aspects of the company's BM. The following data has been obtained from the annual report of the company (Rent the Runway, 2022):

- Fulfilment costs incorporate expenses tied to efficient order processing, including labour payroll, third-party shipping fees, packaging materials, cleaning, and logistical expenses. Remarkably, both fulfilment and general administrative costs have consistently risen, jointly constituting half of the total expenses in 2023.
- Technology Expenses encompass costs related to the company's tech infrastructure, spanning payroll for tech roles, professional services, and expenditures linked to third-party software and licenses.
- Marketing Expenditures fuel brand visibility efforts, covering online/mobile marketing, SEO, email campaigns, agency fees, consumer research, and other marketing-related outlays. Notably, advertising expenses have varied over time, with 2023 at \$30.7 million, 2022 at \$20.6 million, and 2021 at \$4.2 million.

- General and Administrative Costs encompass payroll, customer service, occupancy, professional services, credit card fees, and administrative expenses.
- Rental Product Depreciation and Revenue Share accounts for rental product depreciation, write-offs, and revenue-sharing arrangements with brand partners.

REVENUE STREAMS: The BM of RTR encompasses two main revenue streams. The following data has been obtained from the annual report of the company (Rent the Runway, 2022):

- The primary source of revenue for RTR revolves around the rental of dresses. This can occur either through individual rentals or as part of subscription packages (86% of total revenue in 2022). While individual dress rentals experience seasonality, with peaks during festive occasions like Christmas and Eid when dressing up is more prevalent, the subscription model generates a consistent cash flow throughout the year.
- Dress Sales: Another revenue avenue for RTR is the sale of previously rented dresses. At this stage, any sales made constitute pure profit, as the rental charges would have already covered the initial purchase and operational expenses several times over. This aspect represents a final monetization opportunity for dresses that have served their rental purpose.

KEY RESOURCES: RTR strategically utilizes a range of key resources to underpin its BM. Central to this approach is their Proprietary Inventory Data System, which seamlessly integrates with on-site search and discovery features. By doing so, RTR enhances the customer experience, allowing for more intuitive and efficient product searches. The company's migration to Cloud Infrastructure further strengthens its operational capabilities. This technological shift not only enhances scalability, performance, and reliability but also aligns with RTR's growth trajectory and steadfast commitment to elevating customer experience (Rent the Runway, 2021). An innovative At-Home Pick-Up Program, covering a substantial portion of their subscriber base, concurrently improves customer satisfaction and loyalty while optimizing transportation expenses. The strategic partnerships RTR fosters with renowned designer brands enable the direct sourcing of products, thereby diversifying their selection and providing

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subscribers access to a wide array of options (Rent the Runway, 2022). This distinctive approach is fortified by a comprehensive Data Collection and Analysis system that gathers valuable insights on customers and products, enabling personalized experiences and informed decision-making regarding demand patterns and product lifecycle optimization. Further enhancing their operations, RTR operates on a proprietary Operating System that unifies software and hardware, serving as the cornerstone of their customer-facing e-commerce, rental reverse logistics, and merchandising control (Galbraith, 2013). This dedication to innovation extends to the integration of advanced Garment Care Equipment, assuring high-quality processing at scale. Supported by strategically located Fulfilment Centers with advanced storage solutions and efficient processing capabilities, RTR's resourceful infrastructure enables the seamless execution of their customer-centric BM.

**KEY ACTIVITIES:** RTR engages in a series of key activities that underpin the enhancement of its operational framework. Signifying a fundamental shift, RTR's concerted efforts to Improve Customer Experience stem from foundational work undertaken in 2022. This includes the enrichment of search experiences, migration to cloud infrastructure for enhanced scalability, and the expansion of the at-home pick-up program, all of which are testament to the company's dedication to customer-centric enhancements (Rent the Runway, 2022). The company's proactive approach is also reflected in its Designer Brand Partnerships. By actively cultivating and sustaining relationships with renowned designer brands, RTR secures the ability to acquire products directly. This strategy ensures the availability of a diversified and expansive selection for its subscribers. A central tenet of RTR's operations is Data Analysis and Utilization. The vast corpus of collected data serves as a foundational resource for optimizing customer personalization, predicting demand patterns, and strategically managing product lifecycles (Rent the Runway 2021). A strong commitment to technological advancement is evidenced through consistent Technology Development. The proprietary operating system, a cornerstone of RTR's unique BM, is subject to continuous refinement and development. It seamlessly integrates software, hardware, and logistics to support the company's operations comprehensively. RTR's meticulous attention extends to Garment Care and Processing. The implementation of rigorous garment care protocols,

automation, and storage solutions within its fulfilment centres ensures the meticulous processing of rental items. Complementing these activities is adept Transportation Management. Through strategic collaboration with a diverse array of last-mile service providers, RTR adeptly manages the intricate logistics of transportation and returns, notably through the at-home pick-up program (Supply Chain Dive, 2022). These interlocking activities collectively underpin RTR's commitment to delivering a seamless and unparalleled customer experience within the fashion subscription industry.

**KEY PARTNERS:** Rent the Runway (RTR) thrives on a network of strategic partnerships that form the foundation of its operational excellence. Central to this network are its collaborations with Designer Brands, a pivotal alliance enabling direct sourcing of products from these brands. This partnership fuels RTR's commitment to offering an expansive array of styles directly to its subscribers, thereby reinforcing the company's value proposition. Moreover, RTR's seamless logistical prowess is made possible through its collaboration with Logistics Partners, encompassing both national and regional last-mile service providers. This strategic synergy ensures the efficient management of transportation and returns logistics, a critical aspect of RTR's BM. Complementing this, Technology Providers contribute to RTR's innovation by furnishing the company with third-party software solutions. These solutions are seamlessly integrated into the proprietary operating system, optimizing crucial business operations. This collaboration underscores RTR's technological prowess and its commitment to delivering a seamless customer experience (Rent the Runway, 2022). Collectively, these partnerships represent the strategic underpinnings that fortify RTR's ability to operate at the forefront of the fashion subscription industry.

**TAKE-BACK SYSTEM:** The take-back system implemented by RTR aligns with the fundamental principles proposed in the preceding chapters. This model not only extends the lifespan of each garment within its lifecycle but also augments the frequency of their utilization. Integral to the effectiveness of this system are the cleaning procedures and consumer education, pivotal components that enable its functionality, but the pivotal resources and activities underpinning the efficacy of the take-back system are logistics and their associated inventory processes. Of noteworthy consideration is the

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transportation aspect, identified as one of the predominant contributors to the environmental impact, with street transport being the prevalent mode according to the company's website. RTR offers two possibilities to consumers for returning garments: they can opt to personally visit the nearest centre, such as UPS, for package returns, or they can avail the convenience of a personalized domicile pick-up service. In the year 2022, as documented in the company's financial report, RTR made advancements in its at-home pick-up services, extending coverage to approximately 60% of its subscriber base. Effectively managing these operational activities assumes central importance while aiming to maximize efficiency. This aligns with the principles outlined by the EMF in 2017, underlining the imperative of reducing pollution within the process. With RTR's extensive subscriber base exceeding hundreds of thousands, it possesses the capacity to exert notable impact on the entirety of the industry.

ADOPTION FACTORS: RTR's ESG (Environmental, Social, and Governance) Impact Strategy centers on fostering an inclusive and safe internal environment. This commitment reflects in offering growth opportunities to employees, driven by core values that guide ambitious goals such as reducing carbon emissions to achieve net-zero emissions by 2040, minimizing waste, promoting diversity in the workforce, and enhancing diversity in fashion using their platform (Rent the Runway, 2023b).

Externally, in the United States, various factors encourage companies like RTR to adopt more sustainable practices. Most notably, consumers are increasingly aware of environmental issues and climate change. Surveys by institutions like the Pew Research Center (2015) show a growing number of Americans making eco-friendly choices in their purchases. Additionally, government policies and regulations push companies to cut their carbon footprint. Furthermore, the influence of investors focusing on sustainability, who consider Environmental, Social, and Governance (ESG) factor their investment decisions (UN PRI, 2023), can greatly affect a company's funding and reputation.

In table 12 the BMC of RTR is represented.

Table 12: Business Model Canva - Rent the Runway

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>• Designer Brands for direct sourcing.</li> <li>• Logistics Partners for transportation and returns.</li> <li>• Technology Providers for software solutions.</li> </ul>	<p><b>Key Activities</b></p> <ul style="list-style-type: none"> <li>• Enhancing Customer Experience.</li> <li>• Designer Brand Partnerships.</li> <li>• Data Analysis and Utilization.</li> <li>• Technology Development.</li> <li>• Garment Care and Processing.</li> <li>• Transportation Management.</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>• Top brand at affordable prices.</li> <li>• Buy-back option.</li> <li>• Benefits for subscribers.</li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>• Strong emphasis on customer satisfaction and engagement.</li> <li>• Positive word-of-mouth marketing with subscribers sharing experiences.</li> <li>• Community attachment and confidence in brand.</li> </ul>	<p><b>Customer segment</b></p> <ul style="list-style-type: none"> <li>• American women aged 25 to 45 with an affinity for high-end designer fashion.</li> <li>• Clients with above average income levels.</li> </ul>
<p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>• Proprietary Inventory Data System.</li> <li>• Cloud Infrastructure.</li> <li>• At-Home Pick-Up Program.</li> <li>• Designer Brand Partnerships.</li> <li>• Data Collection and Analysis system.</li> <li>• Proprietary Operating System.</li> <li>• Garment Care Equipment.</li> <li>• Strategically located Fulfillment Centers.</li> </ul>			<p><b>Channels</b></p> <ul style="list-style-type: none"> <li>• Website as primary platform for shopping and support.</li> <li>• Smartphone application with photo matching feature.</li> </ul> <p><b>Take-Back Systems</b></p> <ul style="list-style-type: none"> <li>• Cleaning procedures, consumer education, logistics, and inventory processes.</li> <li>• Two return options: in-person centers or at-home pick-up.</li> </ul>	
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>• Fulfillment costs: Order processing, shipping fees, packaging, cleaning, logistics.</li> <li>• Technology expenses: Tech infrastructure, software, licenses.</li> <li>• General and administrative costs: Payroll, customer service, occupancy, administrative expenses.</li> <li>• Rental product depreciation and revenue share.</li> </ul>		<p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>• Rental of dresses: Individual rentals and subscription packages (86% of total revenue).</li> <li>• Dress sales: Sale of previously rented dresses.</li> </ul>		
<p><b>Adoption Factors</b></p> <ul style="list-style-type: none"> <li>• Internal factors: ESG Impact Strategy for internal environment; Goals: Net-zero emissions by 2040, waste reduction, diversity promotion.</li> <li>• External factors: Consumer awareness and concern for environmental issues; regulatory pressures and government initiatives for sustainability; incentives for eco-friendly practices</li> </ul>				

Source: Personal elaboration of the author

### 5.3.2 Environmental assessment

Similar to the previous assessment conducted for RTS, the ReSOLVE framework (EMF, 2015b) is now applicable to evaluate the effectiveness of specific components within the BMC [Table 13]. This approach enables a thorough exploration of the environmental implications. This method serves a dual function by serving as both a circularity evaluation and a pragmatic analysis of the actual environmental impact. The results depicted in the table validate the alignment of RTR's BM with the principles outlined by EMF.

Table 13: ReSOLVE framework for Rent the Runway

<b>BM Components</b>	<b>Regenerate</b>	<b>Share</b>	<b>Optimize</b>	<b>Loop</b>	<b>Virtualize</b>	<b>Exchange</b>
<i>Partners</i>						
<i>Activities</i>	X	X	X	X	X	
<i>Resources</i>	X	X	X	X		
<i>Value Proposition</i>	X	X	X	X	X	X
<i>Customer Segment</i>	X			X		X
<i>Customer Relationships</i>		X	X		X	X
<i>Channels</i>					X	X
<i>Take-back system</i>	X			X	X	
<i>Adoption Factors</i>	X	X	X	X	X	X

Source: personal elaboration of the author

\*Note that the inclusion of X signifies the application of CE principles to the specific component of the BM.

Once more utilizing the performance metrics presented by Yribbery (2023), the evaluation of RTR's BM in relation to its environmental performance becomes feasible. Given that the company has exclusively disclosed data from the year 2022, with a commitment on their website's ESG section to offer complete transparency from 2023 onward in their environmental reports, the subsequent table is formulated not with a temporal emphasis but rather with a comparative perspective. The selection of the two additional firms, Esprit, and Onward Holding Co., for comparison is grounded in their comparable operating revenues, which aligns with the scale of RTR's operations. This selection allows for a concise environmental comparison with similar companies that operate as traditional players in the fashion market. The information on table 14 was sourced in the companies' respective environmental reports (Rent the Runway 2022; Esprit 2022; Onward Holdings Co., Ltd. 2022):

*Table 14: Environmental performance indicator for Rent the Runway*

<b>Indicator</b>		<b>RTN</b>	<b>ESPRIT</b>	<b>HONWARD HOLDING</b>
<b>Efficiency</b>	Indicator of circular material use rate	n.a.	n.a.	n.a.
	% of renewable energy	n.a.	n.a.	n.a.
<b>Ecological Footprint</b>	Scope 1	546 tCO2e	1323 tCO2e	1552 tCO2e
	Scope 2	970 tCO2e	2806 tCO2e	8895 tCO2e

*Source: (Rent the Runway 2022; Esprit 2022; Onward Holdings Co., Ltd. 2022):*

Again, note that:

- Scope 1 pertains to emissions associated with the internal activities utilizing diesel, gasoline, refrigerants, and natural gases.
- Scope 2 pertains to emissions linked to the procured electricity.

The provided table, despite its omission of crucial elements such as the specifics concerning the electricity sources utilized and the nature of products rented by RTR, leads to an incomplete understanding of the precise proportion of circular products within their reported figures. Nonetheless, a discernible trend emerges wherein fashion companies, comparable in terms of revenue yet divergent in their BMs that offer alternative services



for analogous products, exhibit varying environmental impacts. Notably, RTR stands out by emitting a lower level of pollutants. However, interpreting these findings requires a cautious approach, particularly considering RTR's lesser involvement in the production process. Moreover, RTR asserts in their Carbon Offset Overview that beginning from 2022, the company has actively engaged in procuring certified carbon offsets, effectively offsetting 100% of their emitted emissions.

As for RTS, RTR presents a discrete section focused on environmental savings within their Life Cycle Assessment Highlights report for the year 2022, represented in table 15:

*Table 15: Savings in 2022 of Rent the Runway*

<b>Water</b>	<b>Global Warming Potential</b>	<b>Eutrophication</b>	<b>Energy</b>	<b>Land use</b>
253.622.589 liters	20048 tons	n.a.	98.600.000 KwH	n.a.

*Source: Rent the Runway, 2022 with personal elaboration by the author*

Even though the data possess limited individual significance, the comparisons between RTR and linear players indicates that RTR effectively harnesses its resources and adeptly addresses inefficiencies within its operational procedures. Additionally, it is noteworthy that RTR has established robust policies concerning animal welfare, underscored by its commitment to responsible sourcing practices. For instance, the company has implemented a prohibition on the use of animal fur and angora, as well as exotic skins including, but not restricted to, materials derived from alligator, crocodile, lizard, snake, and python. Furthermore, RTR has extended its conscientious approach to encompass species categorized as protected, threatened, critically endangered, endangered, or vulnerable, thereby demonstrating a comprehensive commitment to safeguarding biodiversity.

### **5.3.3 Financial Analysis**

The assessment of RTR's operational effectiveness is based on the latest dataset extracted from Orbis in (2021b) and the financials insights provided by the company in

its report (Rent the Runway, 2021). Additionally, as of the time of writing, preliminary information concerning the first quarter of 2023 is accessible through various platforms such as Yahoo Finance and the Wall Street Journal. However, it's important to clarify that this thesis's primary objective is not to conduct an exhaustive and intricate financial scrutiny. Instead, this paragraph provides an overview of the company's general financial performance, thus excluding consideration of the first quarter of the current year. The purpose here is to ascertain whether the company's CBM can lead to positive financial outcomes. As for the prior financial examination of RTS, a comprehensive analysis encompassing metrics related to liquidity, leverage, efficiency, and profitability has been undertaken. Subsequently, unique attributes of the financial statement will be elucidated. For purposes of comparison, the industry median is based on SIC 56, representing the code for retail of women's clothing, and the median values for 2021 are extracted from data available on Ready Ratios (2022b). When analyzing the financial position of the company for the year 2021 in conjunction with industry medians, a comprehensive understanding of its performance emerges. The Return on Assets (ROA) demonstrates a declining trend for the company, with a value of -53.35% (though there is an improvement in recent years), indicating a substantial decline in the company's efficiency in generating profit from its assets. In contrast, the industry median ROA, although negative, is relatively less pessimistic. Furthermore, the Profit Margin for the company stands at -46.86%, signifying a significant struggle to maintain profitability. Conversely, the industry median Profit Margin is positive, indicating the industry's overall ability to generate profit. Among the Structure Ratios, the Current Ratio for the company has improved from 2.55 in 2021, suggesting better short-term liquidity compared to the previous year. However, the Shareholders Liquidity Ratio remains negative, underlining the company's difficulties in fulfilling short-term obligations from shareholder equity. Notably, the company's Debt-to-Equity Ratio consistently remains lower than the industry median throughout the years, indicating a relatively conservative approach to debt financing.

Comparing these findings with industry medians, it becomes evident that the company's negative ROE, in contrast to the industry's positive values, underscores its financial challenges. While the company exhibits improvements in liquidity and solvency

ratios, its struggles with generating profit are notable. Aligning with industry standards necessitates enhancing operational performance, particularly in terms of profitability and asset utilization. The company's challenge in achieving a satisfactory financial is attributed to the need for investments in customer experience and IT services, as indicated in the company's 2022 financial statement. With the increase in the number of subscribers and revenue after the challenges posed by COVID-19 in 2019, there is a pressing need for more efficient and appealing customer solutions, which aligns with the company's strategic goals.

## 5.4 Recycling Models

The selection of the company for analysis in the recycling BM was made after an evaluation of several companies. This evaluation involved a brief review of their websites and utilization of the ORBIS platform for the availability of financial data. The final decision was based on the available information and Recover Textile System emerged as the ideal company for analysis due to the abundance of information accessible and their innovative approach to their processes. Table 16 below presents the list of considered companies:

Table 16: List of companies considered for recycling analysis.

<i>Name</i>	<i>Brief Description</i>	<i>Financial Data</i>	<i>Sustainable reports</i>	<i>Website</i>
<i>Blue Jeans Go Blue</i>	The BJGG program collects denim across the US to divert it from landfills, and partners with Bonded Logic Inc. to recycle it into Ultra Touch Denim Insulation.	No	No	<a href="https://bluejeansgogreen.org/">https://bluejeansgogreen.org/</a>
<i>Circ</i>	Circ is a technology system that returns clothes to their raw ingredients. Circ can recycle polyester or poly-	No	No	<a href="https://circ.earth/">https://circ.earth/</a>

	cotton blends into the building blocks of virgin-grade polyester and make pulp that can be made into viscose and lyocell type fabrics			
<i>Infinited Fiber Company</i>	This company turns cellulose-rich waste that would otherwise be landfilled or burned into Infinna™, a premium-quality, circular textile fibre with the look and feel of cotton.	Yes	No	<a href="https://infinitedfiber.com/">https://infinitedfiber.com/</a>
<i>Pure Waste</i>	Pure Waste focuses on recycling cotton to create 100% recycled, ecologically sustainable yarns, fabrics, and ready-made garments using only materials that would otherwise go to waste.	Yes	Yes	<a href="https://purewaste.com/">https://purewaste.com/</a>
<i>Recover Textile System</i>	Recover™ transforms post-industrial and post-consumer textile waste into sustainable recycled fibres, closing the loop on fashion. They create low-impact, high-quality recycled cotton fibre, and fibre blends.	Yes	Yes	<a href="https://recoverfiber.com/">https://recoverfiber.com/</a>
<i>Rewoven</i>	Rewoven uses a mechanical recycling process to create 100% recycled fabric from 60% pre-consumer textile waste and 40% plastic waste.	No	No	<a href="https://www.rewoven.africa/">https://www.rewoven.africa/</a>

<i>The Billie Upcycling</i>	The Billie System is a mechanical textile recycling system that uses no water throughout the process of converting textile waste into recycled fibres.	No	No	<a href="https://billieupcycling.com/">https://billieupcycling.com/</a>
<i>SaXcell</i>	SaXcell, an abbreviation of Saxion cellulose, is a regenerated virgin cellulose textile fibre made from chemically recycled household cotton waste. More than 99% of the necessary dissolvent for this process can be reused.	Yes, partial	No	<a href="https://saxcell.com/">https://saxcell.com/</a>
<i>Worn Again</i>	Worn Again focuses on solving the challenging issue of converting polyester and polycotton blended textiles, and PET plastic, at their end of use, back into circular raw materials, using an innovative chemical recycling process.	No	No	<a href="https://wornagain.co.uk/">https://wornagain.co.uk/</a>

Source: Personal elaboration of the author

## 5.5 Recycling: Recover Textile System

Recover Textile System (RTS) is a Spanish enterprise that specializes in the manufacture of premium-grade recycled textile fibers with minimal environmental impact. The company has been a catalyst in the realm of sustainable fashion, pioneering the conversion of textile waste into recycled yarns as early as 1947. Recognizing the significance of sustainability in the fashion industry during a time when it was not yet widely acknowledged, the second generation of this family-owned business paved the

way. Formally launched in 2003, RTS has since emerged as a prominent global provider of recycled textile goods. Its products have garnered widespread acceptance from prominent brands and retailers across the globe. In addition to the production of recycled textile fibers, RTS extends its offerings to encompass technological advancements and sustainable solutions for its clients (Recover Fiber, 2023a). Presently, RTS operates three production facilities located in Spain, Pakistan, and Bangladesh. The company is consistently expanding and has strategic plans to further augment its operations in East Asia and Central/South America, thus satisfying the escalating demand for its products while simultaneously minimizing its carbon footprint by reducing the need for transportation. RTS's mission centers on achieving a circular fashion ecosystem by delivering inventive, cost-effective, and scalable recycled fibers and circular solutions (Recover Textile System, 2022). Through its unwavering commitment to sustainability, the company claims to make a significant contribution to the fashion industry's endeavors to curtail its environmental impact and forge a more sustainable future (Recover Fiber, 2023a).

### **5.5.1 Business Model Canva**

Drawing inspiration from Lewandowsky's (2016) model presented in the theoretical background chapter, the subsequent section examines the BM of RTS, based on information sourced from the company's website, reports, and online news articles. This analysis aims to provide a comprehensive overview of the distinctive features of RTS's BM.

**CUSTOMER SEGMENT:** RTS specializes in the production of recycled cotton fibers that are specifically designed for garment manufacturing. As a result, the company operates within the business-to-business (B2B) segment. With a strong mission-driven approach, RTS's customers are often motivated by environmental consciousness, giving rise to the concept of clients as partners. In fact, key customers such as Primark, C&A, and Florence Marine X actively collaborate with RTS, integrating their SCs ring expertise. As stated by the company, this integration involves incorporating the RTS process into the customer's existing SC when sold to the manufacturer, or collaborating with RTS's Strategic Alliance Partners around the world, which refers to manufacturers

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cooperating with RTS (Recover Fiber, 2023b). RTS's customer base extends beyond fashion brands to include companies in the home textile industry, further contributing to the implementation of circular practices in the textile sector (Recover Fiber, 2023b).

**VALUE PROPOSITION:** According to De Jong (2015), the value proposition is a crucial aspect of a CBM, and for RTS, their value proposition revolves around their products and processes. The company offers circular solutions to their clients, aligning with the core principles of the CE, which emphasize regeneration and efficiency (EMF, 2013a). Leveraging their expertise in transformation processes, RTS focuses on creating sustainable value by manufacturing recycled cotton that is cost-effective, of superior quality, and environmentally friendly. RTS differentiates itself in the market through meticulous process design and product offerings. They provide two main products: RCotton and RColorBlend, which vary in their composition of cotton and other fibers. These products are certified by third-party organizations, such as the Global Recycled Standard, guaranteeing reductions in water usage, global warming potential, energy consumption, and land usage (as indicated in table 17). In an era where consumers increasingly prioritize the environmental impact of brands, RTS caters to these conscious customers by offering versatile cotton that aligns with their sustainability values (Recover Fiber, 2023a). Furthermore, RTS goes beyond product manufacturing and extends its services to educate consumers and assist clients in adopting CE practices. Through technical guidance and support, the company helps manufacturers optimize the use of RTS's fibers, resulting in improved yarn and fabric quality in terms of durability and environmental impact (Recover Fiber, 2023a). By emphasizing both durability and sustainability, RTS demonstrates its commitment to delivering value to customers while operating in accordance with circular principles.

Table 17: Savings per product of RTS

<b>Savings of:</b>	<b>Water</b>	<b>Global Warming Potential</b>	<b>Eutrophication</b>	<b>Energy</b>	<b>Land Use</b>
<i>RCotton*</i>	52 900 liters	44.75 kg	0.61 kg	382.25 Kwh	97.21 m2
<i>RColorBlend**</i>	119 500 liters	641 kg	0.19 kg	3 557 Kwh	202 m2

Source: Recover Fiber, 2023d

\*Comparison is made with 100kg of cotton made of 25% recycled cotton and 75% conventional cotton.

\*\* Comparison is made with 100kg of the blend of 52% recycled cotton and 48% recycled polyester

CHANNELS: RTS utilizes a multi-channel approach to reach and engage its target audience. The company employs various channels to connect with potential customers, raise awareness about its sustainable textile solutions, and foster collaborations within the industry. First and foremost, RTS leverages its partnerships with key players in the TAF sectors. By collaborating with renowned brands like Primark, C&A, and Revolve, RTS gains access to their extensive networks and customer base. These partnerships not only provide a platform for showcasing RTS's products but also enable the integration of RTS's processes into the SC of these influential brands (Recover Fiber, 2023b). Additionally, RTS utilizes digital channels to amplify its message and engage with a wider audience. The company maintains an informative website that highlights its mission, products, and sustainability credentials. Social media platforms are also utilized to share updates, success stories, and educational content about the importance of circularity in the textile industry. Trade fairs and industry events play a crucial role in connecting RTS with potential clients and industry professionals. By participating in these events, the company can showcase its innovative products and establish valuable connections within the textile community.



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**CUSTOMER RELATIONSHIPS:** RTS prioritizes building strong and collaborative relationships with its customers, which are viewed as partners in their mission towards a more sustainable textile industry. The company understands the importance of feeding these relationships to drive long-term success and promote the adoption of circular practices. One key aspect of customer relationship management for RTS is providing exceptional customer support. As previously said, the company offers technical guidance and assistance to its clients, helping them optimize the utilization of RTS's recycled fibers. RTS also places great emphasis on transparency and communication. The company maintains open lines of communication with its customers, keeping them informed about the latest developments, innovations, and industry trends (Recover Fiber, 2023b). Through regular updates and collaboration, RTS fosters a sense of partnership and mutual trust, enabling customers to actively contribute to the circularity efforts. Moreover, RTS goes beyond transactional interactions with its customers by sharing knowledge and best practices. By providing valuable insights, RTS helps its partners align themselves with sustainable principles and make well-informed decisions regarding their SC.

**COST STRUCTURE:** Based on the information available in RTS reports and website, the company operates with a cost structure that supports its sustainable and CBM. The main cost drivers for the company include:

- **Raw Materials:** The procurement of textile waste, post-consumer clothes, and pre-consumer garments incurs costs associated with sourcing and transportation.
- **Production Processes:** The cutting, extraction, and shredding processes require machinery, equipment, and energy consumption, contributing to operational costs.
- **Research and Development:** The company invests in R&D activities to develop and optimize its proprietary technologies and formulas, ensuring the efficiency and environmental impact reduction of its processes.
- **Certification and Compliance:** RTS obtains certifications from third-party organizations to validate its adherence to quality and sustainability standards. These certifications involve costs related to audits, assessments, and compliance efforts.

- **Marketing and Sales:** Promotional activities, marketing campaigns, and sales efforts are essential for expanding the company's customer base and maintaining strong relationships. Costs include advertising, trade shows, and sales personnel.
- **Support and Infrastructure:** RTS invests in infrastructure, including facilities and production equipment, to support its operations. Additionally, ongoing customer support, technical guidance, and trackability services require dedicated resources.

**REVENUE STREAM:** Based on the information available in RTS reports and website, the company generates revenue through its B2B model by selling its recycled cotton fibers and related services to its customers/partners. The primary revenue streams for the company include:

- **Sale of Recycled Fibers:** RTS sells its fibers, which are made from recycled textile waste to fashion brands, textile manufacturers, and home textile industry companies. Revenue is generated through the sale of these sustainable fibers in various compositions and blends.
- **Technical Support Services:** The services assist customers in optimizing the utilization of RTS's fibers, enhancing the quality and environmental impact of their end products. Revenue is generated through service fees or included in the overall product pricing.
- **Partnerships and Collaborations:** RTS enters strategic partnerships and collaborations with key players in the industry. These partnerships often involve joint initiatives, such as integrating RTS's processes into the customer's SC or developing new fiber blends and yarns. Revenue may be generated through revenue-sharing agreements or licensing fees.
- **Certification and Consultation:** RTS's expertise in sustainability and circular practices enables the company to offer certification and consultation services to customers/partners. This revenue stream involves assisting customers in obtaining certifications and providing guidance on sustainable practices.

**KEY PARTNERS:** Key partners play a vital role in driving the success of RTS and ensuring the smooth functioning of the SC, facilitating the integration of various processes. Starting with suppliers, companies like Sysav are pivotal in providing the

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necessary components for the recycling process, forming the foundation for its feasibility (Enerva, 2022). Through collaborations with other fashion and textile companies, as well as the acquisition of post-consumer and pre-consumer garments, RTS gains access to the essential raw materials required for its operations. Research and development partners and quality certification companies also contribute significantly to the innovative advancements necessary for sustainable and efficient processing and product development. Collaborative efforts, such as the denim-centered alliance with ADM, a Pakistan-based company, aim to scale up new solutions for fibers containing denim. Strategic alliance partners, including manufacturers that adhere to RTS's standards, play a crucial role in incorporating recycled fibers into the textile industry. Notably, exclusive partnerships have been established, such as the agreement with Al Karam Textile Mills, granting them exclusive rights to use RTS fibers in Pakistan until 2025. Furthermore, investors and financial partners are instrumental in supporting RST, particularly in a nascent market (Recover Fiber, 2023c). Their backing is essential for sustaining operations, navigating the ever-changing industry dynamics, and expanding the company's global footprint and production capacity. Noteworthy investments have been made by STORY3 and Goldman Sachs Asset Management, showcasing the confidence and support garnered by RTS (Armental, 2022).

**KEY ACTIVITIES:** The key activities of RST encompass both production-related and service-related aspects, as well as educational initiatives. Once the clothing items are collected, large textile pieces are cut into smaller sections and treated with a minimal amount of water and anti-static spray. They are then shredded using a proprietary formula developed by RTS, preparing the fibers for integration into the SC. The company also implements an Environmental and Social Management System to assess and evaluate its performance in these areas. Additionally, all staff members undergo sustainability training to ensure a shared commitment to sustainable practices. Furthermore, the company places a strong emphasis on providing integration services for the entire SC, enabling seamless collaboration and optimization. Through these activities, RTS demonstrates its dedication to efficient production, environmental responsibility, and continuous education within the industry (Recover Textile System, 2022).

**KEY RESOURCES:** RTS possesses a range of key resources that are instrumental in driving its operations and enabling the company to achieve its sustainability objectives. These resources include cutting-edge technologies for cutting, extraction, and shredding textiles. These advanced technologies ensure efficient and precise processing of textile waste, maximizing the recovery of usable fibers. In addition to advanced technologies, RTS relies on proprietary formulas that have been developed to minimize the environmental impact of its processes. These formulas are designed to optimize resource utilization, reduce water consumption, and minimize energy requirements, resulting in a more sustainable production process. RTS's commitment to innovation is supported by its dedicated research and development (R&D) facilities. These facilities focus on color blending and product development, allowing the company to offer a diverse range of recycled fiber options to its customers. Packaging materials also play a role in RTS's resource portfolio. The company utilizes PET (polyethylene terephthalate) packaging, which is made from recycled polyester. This choice aligns with the company's commitment to circularity and reduces the environmental impact associated with packaging waste. Lastly, RTS's facilities in Spain operate on 100% renewable energy source, while in Pakistan facilities function with traditional energy sources due to the lack of alternatives in the country. Nevertheless, this commitment to renewable energy ensures that the company's operations are powered by clean and sustainable sources, further enhancing its overall environmental performance (Recover Textile System, 2022; Recover Textile System 2021).

**TAKE-BACK SYSTEM:** RTS recognizes the crucial significance of take back systems in fostering circular solutions within the industry. By engaging in the final cycle of waste recycling, which transforms discarded materials into new raw materials for production, the company acknowledges that its primary alliance lies with suppliers. As mentioned earlier, RTS has established a partnership with Sysav, a groundbreaking large-scale facility capable of automated textile sorting. The cornerstone of RTS's strategy for maintaining this pivotal relationship is the implementation of long-term supply contracts, specifically targeting post-consumer waste comprising up to 95% cotton (Enerva, 2022). The company's success heavily relies on efficiently sourcing waste materials, while

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simultaneously ensuring strong collaboration between all parties involved, including suppliers and customers. The mutual exchange of knowledge and adherence to industrial standards, as emphasized by the representative of Sysav in the post-partnership press release, underpins the understanding that close collaborations throughout the textile value chain are indispensable in transforming the textile waste problem into sustainable circular flows of raw materials (Abdulla, 2022)

ADOPTION FACTORS: Adoption factors for sustainable practices encompass both internal and external dimensions. RTS acknowledges the significance of not only external influences but also internal initiatives in driving sustainability. In this regard, the company places considerable emphasis on training its employees to embrace and implement sustainable practices within their operational activities. This internal commitment is evident through their active participation in various projects, industrial initiatives, and collaborative research with NGOs, which are prominently showcased on their website. RTS's proactive approach underscores their unwavering dedication and conscientiousness in integrating sustainability throughout their operations. By prioritizing employee training, they ensure that sustainable practices are deeply embedded within the company culture and seamlessly incorporated into daily routines. This internal focus enables RTS to effectively respond to external pressures for sustainability. As a company operating within a European Union (EU) member state, specifically Spain, RTS is subject to external forces and regulatory frameworks that promote sustainable practices. One example is the "Ley 26/2007, de 23 de octubre, de Responsabilidad Medioambiental" (Environmental Liability Law) (Responsabilidad Medioambiental 2007), which establishes legal guidelines for environmental responsibility, prevention, and remediation of environmental damage. Furthermore, initiatives like the EU's 2050 goals and regulations mandating compliance with corporate social responsibility (CSR) obligations serve as external drivers compelling the company to adopt sustainable practices. By aligning their efforts with these external mandates, RTS demonstrates their commitment to meeting industry standards and actively contributing to the broader sustainability agenda.

The BMC is represented in table 18:

Table 18: Business Model Canva - Recover Textile System

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>TAF companies as a source of textile waste.</li> <li>Suppliers of post- and pre-consumer garments.</li> <li>Strategic partners for manufacturing.</li> <li>R&amp;D partners.</li> <li>Third party certifiers.</li> <li>Investors and financial partners.</li> </ul>	<p><b>Key Activities</b></p> <ul style="list-style-type: none"> <li>Collection of waste.</li> <li>Transformation of waste to fiber.</li> <li>Integration of recycled fibers into the CSC.</li> <li>R&amp;D.</li> <li>Quality and Sustainability standards.</li> <li>Support services.</li> <li>Training of employees.</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>Sustainable fibers.</li> <li>Reduction of environmental impact.</li> <li>Differentiated products.</li> <li>Services for the SC.</li> <li>Certified quality standards.</li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>Long term partnerships with key players.</li> <li>Collaboration over know-how and methods.</li> <li>Support for tech and sustainability issues.</li> </ul>	<p><b>Customer segment</b></p> <ul style="list-style-type: none"> <li>Textile and fashion companies.</li> <li>Home textile industry.</li> <li>Apparel brands and retailers.</li> <li>Green customers.</li> </ul>
<p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>Technologies for cutting, extraction, and shredding.</li> <li>Proprietary formulas for reducing environmental impact.</li> <li>Strategic partnerships for supply chain integration.</li> <li>R&amp;D facilities for color blending and product development.</li> <li>Training resources for staff sustainability education.</li> <li>Packaging made of PET.</li> <li>Facilities running on 100% renewable energy.</li> </ul>			<p><b>Channels</b></p> <ul style="list-style-type: none"> <li>Direct sales.</li> <li>Online platforms for customers engagement and sales.</li> <li>Shows and industry events for showcasing products and services.</li> </ul> <p><b>Take-Back Systems</b></p> <ul style="list-style-type: none"> <li>Long-term contracts with suppliers.</li> <li>Long-term contracts with customers.</li> </ul>	
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>Research and development expenses and staff training.</li> <li>Procurement and collection costs for textile waste.</li> <li>Operational costs for cutting extraction, shredding, and fiber production.</li> <li>Certification and compliance costs.</li> <li>Marketing and sales expenses and packaging costs</li> </ul>		<p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>Sales of <b>RCotton</b> to partners and customers.</li> <li>Sales of <b>RCoColorBlend</b> to partners and customers.</li> <li>Tech support and trackability services revenue.</li> <li>Potential licensing or royalty fees for proprietary formulas or technologies.</li> <li>Potential revenue from investments and partnerships.</li> </ul>		
<p><b>Adoption Factors</b></p> <ul style="list-style-type: none"> <li>Internal factors: training of the employees; participation in projects, industrial initiatives, and shared R&amp;D</li> <li>External factors: mainly political and social, EU's laws particularly are toward sustainable practices.</li> </ul>				

Source: Personal elaboration of the author

## 5.6.2 Environmental assessment

It is now possible to assess the efficacy of individual building blocks within the BMC using the ReSOLVE framework (EMF, 2015) [Table 19]. Subsequently, a comprehensive analysis is conducted to investigate the environmental ramifications. This approach serves a dual purpose, acting as both a circularity assessment and a practical examination of the genuine environmental influence.

Table 19: ReSOLVE framework for Recover Textile System

<b>BM Components</b>	<b>Regenerate</b>	<b>Share</b>	<b>Optimize</b>	<b>Loop</b>	<b>Virtualize</b>	<b>Exchange</b>
<i>Partners</i>		X		X	X	X
<i>Activities</i>	X		X	X	X	
<i>Resources</i>	X		X	X		
<i>Value Proposition</i>	X	X	X	X	X	X
<i>Customer Segment</i>		X			X	X
<i>Customer Relationships</i>			X		X	X
<i>Channels</i>					X	
<i>Take-back system</i>			X		X	
<i>Adoption Factors</i>	X	X	X	X	X	X

Source: Personal elaboration of the author

\*Please note that the inclusion of X signifies the application of CE principles to the specific component of the BM.

Quantifying and evaluating the environmental impact in absolute terms poses a significant challenge. Yriberry et al. (2023) propose a set of measures to assess the impact of eco-design on products and processes. By utilizing the information provided in RTS's

sustainability reports, a comparative evaluation is conducted, considering available data from different years of the company (Recover Textile System, 2022; Recover Textile System, 2021; Recover Textile System 2020). The obtained results are presented in table 20:

*Table 20: Environmental performance indicator for Recover Textile System*

<b>Indicator</b>		<b>2022</b>	<b>2021</b>	<b>2020</b>
<b>Efficiency</b>	Indicator of circular material use rate	96,07%	100%*	n.a.
	% of renewable energy	44,38%	100%**	50,2%
<b>Ecological Footprint</b>	Scope 1	227 tCO <sub>2</sub> e	44 tCO <sub>2</sub> e	180,9
	Scope 2	1992 tCO <sub>2</sub> e	167,7 tCO <sub>2</sub> e	tCO <sub>2</sub> e***
	Scope 3	24,8 tCO <sub>2</sub> e	n.a.	

*Source: RTS reports (2020,2021,2022) with personal elaboration of the author*

\* Of material processed as an input

\*\* Spain was the only hub at the time, converted to 100% renewable energy in 2021

\*\*\* 2020 report does not differentiate between the three scopes

Note that:

- Scope 1: Direct emissions of RTS's fiber recycling plants.
- Scope 2: Indirect emissions from purchased energy for RTS's fiber recycling plants.
- Scope 3: Upstream and Downstream emissions along the value chain.

Furthermore, even if comparison with previous years is not possible due to missing information in the reports, in 2022 RTS claims to have made the following environmental savings, as represented in table 21:



Table 21: Savings in 2022 of RTS

<b>Water</b>	<b>Global Warming Potential</b>	<b>Eutrophication</b>	<b>Energy</b>	<b>Land use</b>
32.402.168.106 liters	50.484 tons	398.097 kg PO43- eq	353.745.513 KwH	58.781.940 m <sup>2</sup>

Source: RTS report (2022) with personal elaboration of the author

Despite the limited significance of the data in isolation, comparisons suggest that RTS is efficiently leveraging resources and mitigating inefficiencies in its operational processes. The assessment of the ecological footprint remains a topic of debate. However, it is important to acknowledge that the notable increase in material processed, approximately from 8 thousand tons in 2021 to 18.7 thousand tons in 2022, should be considered. Additionally, the information presented in the table 21 indicates a favorable environmental outcome arising from RTS's operational practices and ongoing commitment to sustainability.

### 5.6.3 Financial Analysis

The financial analysis of RTS's performance draws upon the most recent data available on Orbis from 2021 (ORBIS, 2021a). To evaluate the company's financial standing, multiple ratios encompassing liquidity, leverage, efficiency, and profitability have been examined and analyzed. These ratios serve as crucial indicators in assessing RTS's financial performance and provide valuable insights into the company's financial health and operational effectiveness. The median of the industry is based on SIC C22 (ReadyRatios, 2023a).

Starting with liquidity, the current ratio of 7 in 2021 indicates a substantial improvement compared to the industry median of 2.59. This signifies that RTS has a strong ability to cover its short-term liabilities with its short-term assets. The liquidity ratio of 4.7 in 2021 also surpasses the industry average of 0.83, highlighting the company's efficient use of liquid assets to meet short-term obligations. Additionally, the

cash ratio of 0.56 in 2021 is higher than the industry average of 0.22, indicating an improved cash position. Moving to leverage, the debt ratio of 0.0989 in 2021 is significantly lower than the industry average of 0.41. This suggests that RTS relies less on debt to finance its operations and has a stronger financial position with a healthier balance between debt and assets. In terms of efficiency, the asset turnover ratio requires more data for proper analysis. However, the profitability ratios present a concern. With a negative ROA of -14.39% using Profit (Loss) before tax in 2021 and -8.46% in 2020, and a negative ROA of -10.87% using Net income in 2021 and -6.40% in 2020, RTS has not been generating favorable returns on its assets. This indicates that despite its strong performance in liquidity, and leverage, the company has faced challenges in achieving profitability.

Considering the investments in facilities and energy solutions, it is plausible that RTS's focus is on long-term growth and expansion rather than immediate profitability. These investments may be impacting the company's profitability in the short term, as they require upfront costs before generating significant returns. In conclusion, RTS showcases strong ratios in liquidity and leverage when compared to the industry median. However, the negative ROA figures indicate that the company has struggled to generate favorable returns on its assets, affecting its profitability. It is important to consider the impact of the investments made in facilities and energy solutions on RTS's financial performance. By prioritizing long-term growth and expansion, RTS aims to position itself strategically for future success, potentially offsetting the temporary impact on profitability.

## **5.6 Sorting Model: Sysav**

Please note that the choice of Sysav as a case study for examining waste management practices was made based on several factors, including its partnership with RTS and the amount of information available on their website.

South Scania Waste Company, also known as the Sysav, is a Swedish company dedicated to the recycling and treatment of waste originating from both households and

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industries. Operating across multiple municipalities, Sysav plays a significant role in waste management by offering recycling services for various waste types beyond textiles. The company's mission is to dispose waste, refine and return valuable resources to society. The organization is structured into three primary branches, each responsible for distinct aspects: household waste management, combustible waste treatment, and research and development (Sysav, 2023a).

Annually, Sysav gathers an estimated 820,000 tons of waste, and an impressive 98% of this waste is recycled. This recycling process results in two main outcomes: approximately 58% of the waste is converted into new energy sources, while the remaining 40% is transformed into new materials. In the context of this analysis, the primary – but not only - focus will be on Sysav's textile sorting operations rather than an exhaustive examination of their comprehensive service portfolio. This approach aims to maintain a concentrated exploration of the TAF industry (Sysav, 2023a). However, it is crucial to acknowledge the expansive operational scope of Sysav, which encompasses waste streams extending from construction materials to textiles. While delving into the company's environmental and financial evaluation, it's noteworthy that the assessment will not exclusively revolve around textile waste due to a lack of specific information. Instead, the scrutiny will encompass the entirety of Sysav's operations. It is essential to bear in mind that the specifics of the textile-related business aspects are intrinsically linked to the company's overall functionality.

### **5.5.1 Business Model Canvas**

**CUSTOMER SEGMENT:** The customer segments that Sysav serves are diverse and span across various stakeholders situated within the Swedish municipalities. These segments consist primarily of households demonstrating active engagement with recycling and sustainability practices, educational institutes seeking responsible waste management solutions, industries, and retailers with waste disposal needs, as well as local municipalities striving for effective waste management strategies (Dashieva, 2017).

**CHANNELS:** Sysav, as introduced, operates as a waste processing company, handling substantial waste volumes. Given the scale and intricacies of its operations,

characterized by storage requirements, technical expertise, and advanced machinery usage, two prominent channels are discernible. The foremost and pivotal channel is the collection network. With its strategic presence across multiple Swedish municipalities, Sysav operates an extensive physical channel that facilitates access to its facilities for suppliers, including households, educational institutions, and industries (Sysav, 2021b). This channel ensures the efficient aggregation of waste, enabling the seamless flow of the primary resources vital to the company's functioning, namely waste materials. Complementing the primary collection network, the secondary channel holds paramount significance in facilitating operational scalability—the virtual channels, exemplified by Sysav's webpage. The company's website serves as a transparent repository, furnishing indispensable information for both suppliers and customers (often demonstrating interchangeability, as explained later in this analysis). Beyond serving as a platform for managing supply network logistics and adhering to regulatory frameworks, the webpage assumes the role of disseminating crucial data regarding the environmental impacts and benefits underpinning Sysav's recycling and sorting processes. This multifaceted digital tool serves not only as an educational resource for consumers but also functions as a central marketing instrument. Furthermore, due to Sysav's presence across diverse municipalities, the website plays an informative role by apprising customers about the appropriate disposal locations for distinct types of waste. This pivotal function enhances customer convenience while ensuring adherence to waste management guidelines.

**KEY PARTNERS:** For this block of the BMC the analysis encompasses two distinct focal points: firstly, an exploration of partners for the company as a whole, and secondly, an examination of partners critical to the textile sorting operations. Sysav, operating as a SC integrator (as outlined in the Value Proposition), is deeply integrated with a multitude of stakeholders, each playing a pivotal role in ensuring the efficacy of the operational process:

- **Swedish Municipalities:** Sysav plays a fundamental role in providing heating, electricity, and recycling services to the local population. Consequently, close collaboration with public authorities and municipalities becomes imperative. As

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illustrated by Dashieva (2017), these entities also collaborate in hosting seminars aimed at mitigating food wastage and waste management.

- **Service Distributors:** E. ON, the primary distributor within the power distribution grid, stands as a prominent partner in facilitating the dissemination of generated electrical power. Dashieva's (2017) insights indicate that distributors wield influence over pricing dynamics, with heat distribution - under Sysav's jurisdiction - serving as a principal mechanism for managing price fluctuations. This practice ensures profitability objectives are met while maintaining user stability in accordance with seasonal variations.
- **Certification Bodies:** Similar to many enterprises emphasizing sustainability, Sysav's adherence to process and product certifications bolsters transparency and reputation. Collaborative ties extend to both the International Organization for Standardization (ISO) and local authorities overseeing waste treatment permits. These affiliations are pivotal in reinforcing Sysav's credibility (Sysav, 2023b).
- **Educational Institutions:** An examination of Sysav's website demonstrates active involvement with local schools to cultivate responsible consumption habits and educate students on waste management protocols (Sysav, n.d.).

Shifting focus to textile partnerships, two primary categories emerge:

- **Technical Collaborations:** The development of SIPTex involved the IVL Swedish Environmental Institute. This endeavor is further enriched by a diverse consortium encompassing Swedish fashion entities, research institutions, regulatory bodies, and stakeholders across the textile value chain (Sysav, 2021c).
- **Partnerships as Suppliers and/or Customers:** Fashion companies, as the overmentioned Recover Textile System, collaborate with Sysav to reach agreements on specific composition types of material. Other fashion/textile that partnership with Sysav is Ikea, H&M, Renwecell for example (Sysav, 2021c).

**KEY ACTIVITIES:** The primary activities undertaken by Sysav predominantly encompass physical processes, spanning from the initial waste collection to the eventual sale of the resultant products or services. Within the broader scope of the company's operations, numerous activities, as well as resource allocations, are closely tied to the conversion of waste materials into renewable energy or heat, which can subsequently be

distributed to intermediaries or directly to end consumers. Focusing specifically on the Textile unit within the BMC, it's important to note that while certain activities may not align with the aforementioned overarching BM - such as waste incineration for heat generation - other activities are shared across the company's various units (Sysav, 2023a). The foremost key activity involves the collection of waste. This involves the gathering of waste materials from multiple locations. While most locations accept a diverse range of waste types, there are exceptions that do not handle some of them, such as the Lilla Hammar recycling center which does not handle electronic waste. The collection process can be executed through various means. Citizens and businesses have the option to deliver waste directly to designated collection centers. Moreover, waste collection for specific categories can be facilitated through a truck-based system that directly collects waste from residential properties. Additionally, expedited waste drop-off points are available in the cities of Malmo and Lund (Sysav, 2021b).

Once the waste collection phase is completed, the subsequent steps focus on the processing of textile waste. Specifically, the collected textile materials are transported to the facility Norra-Hammen, Malmo (Sysav, 2021c). This facility serves as a hub for the sequential processing stages, which can be delineated as follows:

1. The process initiates with the deposit of significant amounts of textile waste at the facility. These are then transported for initial sorting, utilizing near infrared and visual spectroscopy. When the textiles are illuminated, their materials cause varying reflections. Sensors detect and determine the fiber type based on these reflections. Siptex can manage three different colors and fiber types simultaneously, enhancing efficiency.
2. During sorting, materials matching the correct color and fiber type are identified. Compressed air is used to redirect these textiles to a separate conveyor belt, leading them to the cleaning stage.
3. In the purification step, near-infrared light and compressed air are again employed. This phase verifies material quality and identifies textiles that might have passed sorting erroneously. Purification ensures the final product's accurate color and fiber composition.

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4. Ultimately, the quality-assured material is compressed, bundled, and prepared for delivery as ReFab products.

Additionally, pivotal facets of Sysav's operations encompass educational initiatives and research and development endeavors, serving as fundamental pillars for the company's future trajectory. These activities are intricately interwoven, with the aforementioned educational and R&D pursuits forming the bedrock upon which an increasingly conscientious and streamlined approach to waste management and recycling is constructed.

**KEY RESOURCES:** Sysav's core strength lies in how it uses its resources. It owns various plants spread across 14 municipalities, which gives it access to a large market. This makes it easier for them to achieve cost savings as they work on a bigger scale (Sysav, 2021b). They use these resources not only for collecting waste, like having warehouses and employees, but also by partnering with organizations like the IVL Swedish Environmental Institute to come up with new ideas for the industry.

One major advantage that sets Sysav apart in textile sorting is its fully automated sorting machinery. This machine is a big part of how Sysav works and helps them meet their efficiency goals by working seamlessly with the rest of their operations. Another important resource highlighted by Dashieva (2017) is Sysav's ability to treat water during their processes. They're good at treating the water they use, so they can use it again for different tasks, which means they don't have to use as much regular tap water.

Lastly, Sysav's extensive knowledge and collaborations with different groups, like institutions and municipalities, are valuable resources for their long-term aim of making waste management more efficient. This collective know-how provides a strong base for Sysav's ongoing goals.

**CUSTOMER RELATIONSHIPS:** Customers play a pivotal role in ensuring the smooth operation of the internal processes within the company. As the primary source of waste and a significant contributor to the company's earnings, Sysav adopts a forward-looking approach to managing customer relationships. A prime illustration of this approach is evidenced through strategies like the reduction of heat prices during the summer months. This tactic serves the dual purpose of retaining customers who might be otherwise

affected by seasonal fluctuations and maintaining a stable customer base (Dashieva, 2017). This long-term perspective on customer engagement is a hallmark of Sysav's operational philosophy.

VALUE PROPOSITION: As outlined by Dashieva (2017), Sysav has structured its BM around the concept of the value chain. Notably, the starting point of this chain encompasses operational processes, culminating in the provision of services. The overarching value proposition revolves around delivering customer satisfaction through the quality of services offered. The crux of this proposition, as emphasized by the author, is anchored in the efficiency and novelty of the provided services. This fundamental principle is equally applicable to Sysav's engagement in the textile sorting domain. Here, their innovative system plays a pivotal role in facilitating the accurate sorting of textiles, encompassing both material composition and color categorization. In relation to the former, the product known as "ReFab" stands out. This product encompasses a spectrum of guaranteed fiber compositions, including:

- 95% cotton
- 70% cotton
- 95% polyester
- 60% polyester
- 95% acrylic

Additionally, customized product compositions can be accommodated through mutual agreement (Sysav, 2021c).

The essence of the value proposition for textile sorting rests upon the efficacy of providing customers with a swift and dependable solution. Sysav's textile sorting system has the capability to process approximately 4.5 tons of textile material per hour. This efficiency directly contributes to the textile value chain, thereby expediting the circularity process. This acceleration is coupled with an elevated level of precision, thereby presenting recyclers with the requisite materials without necessitating manual sorting of waste. This strategic advantage eliminates the need for recyclers to invest in machinery akin to the one owned by Sysav, particularly when their waste quantities and processing capacities don't align with such equipment's requirements.



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**COST STRUCTURE:** The most recent annual report, which the company released for the year 2022, provides comprehensive insights into the cost-related information. Analyzing the financial statement of Sysav (2021a), it becomes apparent that the company's operations are profoundly influenced by its cost structure. Notably, the marginal revenue constitutes a relatively poor portion of the overall revenue, accounting for approximately 7%. The composition of costs within Sysav's framework is as follows:

- **Production Costs:** These encompass expenses incurred in various processes like converting waste into heat, electricity, or recycled products. This category constitutes a significant portion, approximately 48%, of the total operating revenues.
- **Personnel Costs:** This accounts for the expenditures associated with the company's workforce.
- **Depreciation Costs on Tangible and Real Estate Assets:** This factor is particularly notable, making up around 15% of the operating revenue. Given the considerable number of facilities and assets required for processing the substantial influx of 800,000 tons of waste that Sysav receives annually, this level of depreciation is understandable. In addition, an additional 15% needs to be allocated for leasing and audit costs.

**REVENUE STREAM:** As for the cost structure, the most current annual report contains a comprehensive overview of revenue-related details (Sysav, 2021a). The revenue structure is meticulously outlined by the company within this report, offering insights that lead to the following conclusions:

- Approximately 43% of Sysav's revenue is derived from waste management and associated tariffs. This segment encompasses the earnings generated through the company's waste management services and the corresponding charges.
- Another substantial proportion of around 40% is garnered from the sale of electricity and heat. This revenue stream stems from the company's activities involving the commercialization of energy products like electricity and heat.

- An additional 9% of the revenue comes from the sale of recycled or sorted materials. This category encompasses the earnings generated from the disposition of materials that have been effectively recycled or sorted, contributing to the company's overall revenue.

**TAKE-BACK SYSTEM:** The take-back system employed by Sysav essentially involves establishing a correspondence with its suppliers. Specifically, within the CSC framework of the TAF, the company's primary role revolves around its capacity to retrieve waste materials. This retrieval process occurs through the aforementioned channels and modalities, and subsequently involves the processing of these waste materials for reintroduction into the market. Notably, the flexibility of being able to engage any individual, business, or institution generating waste as potential suppliers underscores the company's take-back system. This system inherently encompasses the competence to accept and process diverse forms of waste, managing them with utmost efficiency.

**ADOPTION FACTORS:** Regarding the adoption factors within the context of the other analyzed companies, both internal and external dimensions play pivotal roles.

- Internal factors are mostly influenced by the company's culture. Sysav, for instance, stands out for its transparent commitment to teaching and sharing information about environmental sustainability. You can see this commitment on their website. They actively participate in seminars, have an informative news section on their website, and even organize on-site visits for scholars. All of this helps them get their message across effectively. It also shapes the way their business operates, always keeping a focus on waste recovery and circularity.
- On the external side, Sysav deals with various stakeholders, as discussed by Deshieva in 2017. Using Fassin's theory, we can identify different types of stakeholders in Sysav. There are direct stakeholders like customers and municipalities. Then there's a stake keeper, in this case, E. ON, a power distribution company. Finally, there's a stake-watcher, represented by the European Union. These stakeholders have a say in Sysav's affairs. They can check how Sysav spends its money and even have a role in choosing who works at Sysav. E. ON, as a stake keeper, has economic power because it handles the

energy that Sysav produces and sends it to customers. And the stake-watcher, following Fassin's idea, ensures that everyone plays by the rules, including the regulations and laws that govern Sysav's operations and distribution network.

In table 22 the BMC of Sysav is illustrated:

### 5.6.2 Environmental assessment

Sysav's core focus revolves around the circularity of the value chain and waste management, a commitment vividly demonstrated by its adopted BM. The sustainability of this model can be visually represented through the ReSOLVE framework (EMF, 2015) table, which has been specifically tailored to align with the characteristics of Sysav's CBM. Table 23 prominently highlights the company's dedication to optimization and the implementation of loop-based concepts.

Table 23: ReSOLVE framework for Sysav.

Source: Personal elaboration of the author

<b>BM Components</b>	<b>Regenerate</b>	<b>Share</b>	<b>Optimize</b>	<b>Loop</b>	<b>Virtualize</b>	<b>Exchange</b>
<i>Partners</i>		X	X		X	X
<i>Activities</i>	X		X	X		X
<i>Resources</i>	X	X	X			
<i>Value Proposition</i>	X		X	X		X
<i>Customer Segment</i>	X	X		X		
<i>Customer Relationships</i>		X	X	X	X	
<i>Channels</i>		X	X		X	
<i>Take-back system</i>		X		X	X	
<i>Adoption Factors</i>	X	X	X	X	X	X

Table 22: Business Model Canva - Sysav

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>• Fashion companies in textile sorting operations.</li> <li>• Swedish municipalities</li> <li>• Collaboration with educational institutions</li> <li>• ISO and local authorities</li> <li>• E.ON for power distribution</li> </ul>	<p><b>Key Activities</b></p> <ul style="list-style-type: none"> <li>• Collection of waste</li> <li>• Sorting and processing of textile waste using automated machinery.</li> <li>• Educational initiatives and R&amp;D</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>• Delivering customer satisfaction through efficient services.</li> <li>• Innovative textile sorting system with high throughput and precision.</li> <li>• Providing a range of recycled fiber compositions.</li> <li>• Accelerating the circularity process in textile recycling.</li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>• Focus on maintaining stable customer relationships</li> </ul>	<p><b>Customer segment</b></p> <ul style="list-style-type: none"> <li>• Households.</li> <li>• Institutions.</li> <li>• Industries and retailers</li> <li>• Municipalities</li> </ul>
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>• Major cost components include production costs, personnel costs, depreciation costs on assets, leasing, and audit costs.</li> </ul>	<p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>• Owned plants across 14 municipalities.</li> <li>• Fully automated sorting machinery for textile</li> <li>• Water treatment capabilities</li> <li>• Extensive knowledge and collaboration with institutions.</li> </ul>	<p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>• Revenue sources include waste management and associated tariffs, sale of electricity and heat, and sale of recycled or sorted materials</li> </ul>	<p><b>Channels</b></p> <ul style="list-style-type: none"> <li>• Primary channel: physical collection network App.</li> <li>• Secondary channel: Digital presence through website for information and marketing.</li> </ul>	<p><b>Take-Back Systems</b></p> <ul style="list-style-type: none"> <li>• Establishing relationships with various suppliers and efficiently processing diverse forms of waste for reintroduction into the market</li> </ul>
<p><b>Adoption Factors</b></p> <ul style="list-style-type: none"> <li>• Internal factors: transparent commitment to environmental sustainability.</li> <li>• External factors: interactions with various stakeholders, including customers, E.ON, and regulatory bodies.</li> </ul>				

Source: personal elaboration of the author

To conduct a comprehensive evaluation of Sysav's environmental performance, we rely on a set of key metrics outlined by Yribbery (2023), which are presented and organized in table 24 (the following data are sourced at Sysav, 2022):

Table 24: Environmental performance indicator for Sysav

Indicator		2022	2021	2020
<b>Efficiency</b>	Indicator of circular material use rate	98%	98,2%	98,2%
	% of renewable energy	100%	n.a.	n.a.
<b>Ecological Footprint</b>	Scope 1	308308,2	n.a.	n.a.
		tCO <sub>2</sub> e		
	Scope 2	33,5 tCO <sub>2</sub> e	n.a.	
	Scope 3	60327,7	n.a.	
		tCO <sub>2</sub> e		

Source: Sysav (2022) with personal elaboration of the author

The Circular Material Use Rate indicates that 98% of received resources (waste) were successfully converted into energy, heat, or recycled materials, with the remaining 2% considered unsuitable for processing.

Sysav generates its own electricity and heat, primarily from waste. In 2022, the company produced 83,364 MWh of energy and consumed it internally. Additionally, approximately 6,668 MWh of electricity were purchased during periods when internal production couldn't meet demand. All purchased electricity is fossil-free since 2022.

The high ecological footprint, especially in terms of CO<sub>2</sub> emissions, can be attributed to the company's waste incineration activities. Sysav acknowledges this impact and aims to achieve net-zero emissions by 2030 by implementing Carbon Capture and Storage (CCS) technology. CCS involves capturing and storing carbon dioxide emissions from industrial sources, contributing to a net reduction in atmospheric CO<sub>2</sub> levels (Bui et al., 2018).

It's important to note that sustainability reports with comprehensive data are only available for 2022 due to data limitations. Consequently, most of the analysis is based on the data from that year.

### **5.6.3 Financial Performances**

Based on the financial data available from ORBIS (2021c) and the annual reports provided by Sysav on its website (Sysav, 2021a), this financial assessment aims to provide insights into the company's financial standing in 2021 within the context of the industry represented by the SIC code 49: Electric, Gas, and Sanitary Services. The assessment encompasses key aspects such as profitability, liquidity, and leverage (Ready Ratios, 2023c).

In the fiscal year 2021, Sysav demonstrated a notably high level of profitability, as evidenced by key financial ratios. Specifically, the net margin, operating margin, and Return on Assets (ROA) were recorded at 9%, 12%, and 5.18%, respectively. These figures indicate a robust financial performance during that period. It is worth noting that even though profitability in the preceding year, 2020, was considerably lower, likely influenced by the challenges posed by the COVID-19 pandemic, the increase in these three ratios by approximately 3 percentage points referring to 2019 signifies a positive trend. However, despite the improved profitability in 2021, Sysav did not fortify its financial position. The company reported a decrease in profits in 2022 (as per the Annual Report, 2022). This decline was attributed by the company to the unexpected surge in recycled metal prices in 2021, driven once again by the COVID-19 situation.

When comparing Sysav's financial metrics to the industry median, a mixed picture emerges. Sysav outperforms the industry median in terms of ROA, indicating a more efficient utilization of assets. However, the operating margin favors the industry median, suggesting that Sysav may have room for improvement in its marketing and pricing strategies to enhance its margins. It's important to note that the overall profitability margins in the industry are relatively low, underscoring the importance of economies of scale and rigorous cost and expense management in this sector. Regarding liquidity, the currency ratio, which has consistently been around 1.5 in previous years, surpasses the industry median for 2021, which stood at 0.9. This suggests that Sysav maintains a

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relatively conservative financial stance, emphasizing financial stability and risk management. While such an approach can offer advantages in terms of stability, it may raise questions about the efficient allocation of capital and potential missed growth and profitability opportunities. Lastly, Sysav's debt-to-equity ratio, averaging around 1.4, reflects a relatively low level of financial risk for investors, especially when compared to the industry median for 2021, which was 2.1. This indicates that Sysav has maintained a prudent approach to leveraging its capital structure, which can be viewed as a positive factor in terms of financial stability and risk mitigation.

In summary, Sysav's financial assessment for 2021 demonstrates strong profitability, a conservative liquidity stance, and a relatively low level of financial risk. However, it also highlights challenges in maintaining profitability, particularly in the context of a highly competitive industry with narrow profit margins. The company may consider strategies for improving operational efficiency and pricing to achieve sustained growth and profitability.

## CONCLUSION

In conclusion, this thesis has conducted a thorough examination of Circular Business Models (CBMs) within the Textile and Fashion (TAF) industry, shedding light on their strengths, weaknesses, and alignment with theoretical frameworks. Through the utilization of real-world cases and analytical tools, this study has provided insights into effective and sustainable CBM.

Starting with an examination of access-based models, such as those employed by Rent the Runway (RTR) and YCloset, the primary distinction between these two companies lies in their treatment of customers. While RTR continues to operate successfully, YCloset has ceased operations. This divergence can be attributed to the emphasis placed on customer-centric elements within their respective BMs. In particular, RTR has invested in enhancing its website to provide customers with a more engaging and enjoyable experience. Additionally, it has prioritized transparency regarding hygiene and policies. These aspects hold a central position within the framework of the Business Model Canvas (BMC) for access-based companies, with a specific emphasis on supporting *customer relationships*. This emphasis gains even greater significance when coupled with the establishment of efficient logistics and operational network, as outlined by EMF (2013a). For companies and brands aiming to transition from linear to CBMs, as a means of satisfying customer needs while simultaneously extending the lifespan of their products (as proposed by EMF in 2013a), customer relationships become a central pillar. This strategic approach contributes to reducing the environmental footprint of the TAF industry by encouraging customers to use items more frequently, thereby diminishing waste. Another noteworthy element within the BMC framework for access-based BMs is



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the *revenue stream component*. This aspect assumes particular importance as access-based businesses incur substantial costs associated with various operations, such as item take-back and hygiene processing. By expanding their value proposition to encompass not only renting services but also resale options, these companies enhance the feasibility of profitability. Nevertheless, it is worth noting that for RTR the substantial investments made in building up customer experience continue to exert pressure on overall profitability.

In the context of recycling business models, a closer examination of the analysis of the Recover Textile System (RTS) highlights the paramount significance of two critical aspects: strategic partnerships and resource ownerships. As anticipated from the theoretical framework, the imperative for securing valuable suppliers and fostering innovation capabilities elevates the following two components within the BMC framework to a pivotal position: *key partners* play a central role in ensuring a consistent supply of textile waste, particularly in the context of post-consumer waste, which has historically posed significant recycling challenges and exhibited irregular availability (De Ahuiar Huho, 2021; Ponnambalam et al., 2023). The establishment of stable sources for this type of waste is instrumental in facilitating the production of high-quality recycled fibers. Furthermore, the skills and technical knowledge required for such operations are further enhanced when innovative and efficient resources are employed (Coscieme et al., 2022), underscoring the critical importance of the *key resources*' component within the BMC. Additionally, effective partnerships that facilitate the exchange of knowledge are essential, as exemplified by RTS in its collaborative endeavors with customers. These partnerships not only enable the efficient flow of information but also contribute significantly to the success of recycling business models like RTS by fostering innovation and sustainability in the textile recycling process.

In the realm of textile sorting models, it is important to note that the study acknowledges a scarcity of theoretical insights. However, upon analyzing the business model of Sysav, several components of the BMC emerge as of paramount significance. First and foremost, the *value proposition* block reveals the necessity of diversifying this proposition. This diversification serves a dual purpose: it enables the scalability of

operations, such as waste collection, and helps offset the costs associated with R&D and initiation of processes in sorting technologies. In essence, a diversified value proposition becomes essential for ensuring the sustainability of Sysav's operations in the textile sorting domain. Furthermore, within Sysav's BM for textile sorting, the block pertaining to the *key resources* they possess plays a central role. The multi-year project undertaken by Sysav represents a pioneering achievement as the world's first automated textile sorting system. This resource is indispensable for the overall efficiency and economic viability of the sorting process. Lastly, the *external adoption factor and key partnerships* assume a pivotal role in maintaining a consistent supply of waste materials. Collaborative alliances with municipalities are instrumental, as they not only establish Sysav as the primary waste collector in the region but also contribute to educating the local population on responsible waste management practices. These partnerships not only serve the interests of the company but also play a crucial role in advancing the broader transition toward a circular industry, where waste serves as the primary source material. However, environmental concerns linked to its core operations warrant ongoing attention.

While delving into the case studies, it became apparent that the TAF industry needs to prioritize two key aspects: material flow and coordination. This necessity was exemplified by the RTS's requirement for a consistent waste supply before partnering with Sysav and the importance of coordinated partnerships mentioned earlier. Additionally, there is a growing emphasis on transparency in material flow and processes within the industry, as it facilitates the inclusion of consumers as suppliers within the CSC, as highlighted by Anderson et al. in 2020. The successful integration of these factors, combined with the application of technological knowledge, serves as the foundational elements contributing to the success of both the examined companies and, by extension, the overall CSC in the industry.

On the industry development front, this research underscores some imperatives: first when researching for suitable companies on the access-based models' analysis it became evident that such services are mostly exclusive to high-earning customers, with concerns on the possible profitability of this CBMs for a more everyday market. Second, even though the analyzed companies are sharing information on both their processes and

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their impact, such practice is not shared in the industry. From my point of view this type of incompleteness could be symptom of a still widespread unsustainable and greenwashing practices, hence recalling both the importance of governments and policy makers, and overall transparency over the entire supply chain, leveraging on brand reputation where possible.

In conclusion, this research contributes to the enhancement of our understanding of Business Models for adopting a circular approach within the TAF industry. It not only identifies key components but also highlights certain deficiencies in both theoretical frameworks and real-world applications. Moreover, it underscores the dual objectives of achieving economic viability and ecological responsibility, which are central concerns for all stakeholders within the industry.

SOURCES

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