POLITECNICO DI TORINO

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Master's Thesis

Second-hand fashion start-ups: innovative business models and their role in sustainability

Supervisor:

Prof. Andrea Tuni

Candidate:

Adele Rey

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"Diventa ciò che sei."

(Pindaro)

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Abstract

The fashion industry is a key driver of environmental degradation, contributing significantly to global waste and resource inefficiency. As awareness of these issues grows, the need for a shift toward more sustainable practices in fashion has become urgent. An innovative solution comes from second-hand fashion start-ups, which promote circular economy principles. By focusing on reusing, repairing and recycling garments, such companies offer a sustainable alternative to the traditional fast fashion model. This thesis investigates how second-hand fashion start-ups support sustainability, with a particular emphasis on their business models characteristics and impact.

The aim of this research is to investigate the innovative business models of 11 second-hand fashion start-ups and assess their sustainability impacts. Data collected through interviews and secondary sources reveal that a common trait among the emerging value propositions of the start-ups is the integration of circular practices and key technological innovations. The findings show that the most widely used circular model among the sampled start-ups is based on the "reuse and redistribution" pattern. Additionally, it has been confirmed that digital technology plays a crucial role in the innovative business models of second-hand fashion start-ups, either as a core technology or as an enabling technology. Furthermore, the results indicate that the start-ups in the sample contribute not only to environmental sustainability but also to social value by creating job opportunities and promoting social inclusion: these businesses are making measurable progress toward achieving the *United Nations' Sustainable Development Goals*.

This work offers valuable insights for managers and practitioners in the second-hand fashion industry, showing how circular business models can be integrated into start-ups to foster environmental, social and economic sustainability. Future research could expand the sample size and geographic scope to offer a more comprehensive understanding of the sector's impact and help uncover new characteristics of the innovative business models employed by start-ups. Additionally, further investigation into the role of digital technologies, such as AI and blockchain, in enhancing transparency and operational efficiency, as explored in this study, can help drive the sustainability agenda forward within the second-hand fashion industry.

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1. Introduction

The global fashion industry represents a cornerstone of contemporary consumer culture, yet it remains one of the most resource intensive and environmentally damaging sectors (Ellen MacArthur Foundation, 2017). Large quantities of textiles are produced, consumed and discarded each year, worsening environmental degradation and social inequalities (Ellen MacArthur Foundation, 2017).

The *European Environment Agency* has pointed out that European textile consumption is the fourth largest driver of environmental and climate change pressure, after housing, food and mobility. It ranks third in terms of water and soil use along the value chain, and fifth in terms of resource use and greenhouse gas emissions. In addition, chemicals in textile products contribute significantly to environmental pressure and they have a negative impact on the ecosystem (European Environment Agency, 2023).

The prevailing linear model of fashion production, characterized by a "take, make and dispose" approach, is unsustainable since it is based on intensive use of non-renewable resources and generates a significant amount of waste that is not reintegrated into production systems (Ellen MacArthur Foundation, 2017). The linear approach not only increases pressure on global resources but also contributes to environmental degradation, highlighting the urgency of a systemic redesign of production and consumption patterns, promoting practices that maximize the value of materials throughout the product lifecycle (Ellen MacArthur Foundation, 2017).

Considering this troubling reality, it is crucial to embrace a fundamental shift towards circular models, which prioritize resource efficiency, reuse, and recycling, offering a path to transform the industry and mitigate its environmental impact. In line with this goal, the *United Nations' Sustainable Development Goals* (SDGs) provide a globally recognized framework for addressing sustainability challenges across all sectors. Given its significant impact, the fashion industry can play a leading role in achieving SDGs, particularly *SDG12 (Responsible Consumption and Production)*. However, this purpose will require innovative approaches and collaborative efforts encompassing the entire value chain, from design and production to consumption and disposal.

In this challenging scenario, the second-hand fashion industry can be seen as a transformative force, offering innovative solutions to fight the inefficiencies of *fast fashion*. Moreover, the second-hand market has gained significant popularity, thanks to changing consumer preferences towards sustainability and ethical consumption. The sector is exponentially growing and it has an important potential to reduce waste, extend the life of products and promote circularity: in 2024 the global used clothing market was expected to reach $350 billion by 2028, growing three times faster than the traditional apparel market (ThredUp, 2024). Second-hand fashion therefore offers a unique opportunity to align innovative business practices with sustainability goals, generating both environmental and economic benefits (Todeschini et al., 2017).

To further explore the potential of the sector, this thesis aims to answer the research question: *"What are the innovative business models adopted by start-ups in the second-hand fashion industry and what impact do they have on sustainability?"*. To address this question, the study focuses on a sample of 11 start-ups operating in the second-hand fashion sector, using an exploratory approach based on qualitative insights from interviews and social media analysis. This comprehensive methodology allows the identification of key drivers of innovation and sustainability in the second-hand fashion industry: findings show that the selected start-ups not only address critical environmental issues such as textile waste and resource inefficiency but also promote social inclusion and economic resilience.

The theoretical foundation of this research is based on contributions related to sustainable business strategies and circular economy frameworks, which emphasize the need to design models that simultaneously generate economic, environmental, and social value (Boons and Lüdeke-Freund, 2013). Extending this perspective, it is crucial to integrate the four value dimensions - value proposition, value creation, value delivery and value capture - as central elements for systematically transforming business practices and understanding how companies innovate in the context of sustainability (Geissdoerfer et al., 2018b).

In line with this approach, recent policy developments within the European Union reinforce the relevance of this research. One of the most significant initiatives is the introduction of the *Digital Product Passport*, planned for 2027 as part of the *European Ecodesign for Sustainable Products Regulation*. This tool aims to improve transparency and traceability throughout the lifecycle of textile products by providing detailed information on the composition, sustainability and circularity of each item. The goal is therefore to

encourage the recycling and reuse of materials and to promote a regulatory environment that actively supports the principles of circularity and sustainability (European Commission, 2022).

This research consequently seeks to bring attention to the transformative potential of second-hand fashion start-ups in promoting sustainability in the fashion industry. By analyzing their innovative business models, the study aims to contribute to the broader debate on sustainable innovation. It also aims to provide practical guidance to stakeholders across the textile value chain, supporting the global transition towards a more equitable and environmentally responsible fashion ecosystem.

2. Literature Review

2.1. The need for a new sustainable paradigm in the textile industry

The textile industry has experienced rapid expansion with the *fast fashion* model, which has led to overconsumption and serious environmental and social damage (Todeschini et al., 2017). Is it required to analyze the dynamics associated with the production, consumption and disposal of textiles to understand the current impacts and to identify opportunities for transition to more sustainable models. In this context, circular economy and innovation are emerging as necessary responses to sustainability challenges (Bocken et al., 2019). Despite the widespread interest in these concepts, little research has explored in detail how second-hand fashion start-ups are redefining sustainability in the textile sector. Therefore, it is crucial to contextualize the emerging business models and their impacts, exploring the theoretical and practical foundations that support the research, and to provide a critical review of the existing literature.

2.2. Sustainability and circular economy

As stated by the *World Commission on Environment and Development,* sustainability implies "the use of resources to meet the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). In addition, the concept of the *Triple Bottom Line* emphasizes that organizations should not only measure the financial profit they generate, the economic bottom line, but also evaluate their performance in terms of their social and environmental impact. The social aspect focuses on the well-being of communities, fair labor practices, and overall contribution to societal welfare. The environmental aspect, on the other hand, addresses an organization’s responsibility towards reducing ecological footprints, preserving natural resources, and ensuring the long-term health of ecosystems. Therefore, the *Triple Bottom Line* approach requires companies to assess and balance these three dimensions - people, planet, and profit - to create long-term value (Elkington, 2004). Thus, sustainability can be defined as an approach that seeks to integrate the economic, social and environmental dimensions in a balanced way that ensures benefits for both present and future generations.

The circular economy, in this context, is described as a regenerative system that minimizes resource use, waste, emissions, and energy losses through the design of durable

products, maintenance and other key techniques as repair, reuse and recycling (Geissdoerfer et al., 2020). This process helps closing the loop of material use and can contribute to minimize the environmental impact across all stages of the economic system, from production and distribution to use and disposal (***Figure 1***). Thus, the circular economy has a narrower focus on economic and environmental aspects, while sustainability is broader and more holistic, encompassing social dimensions as well. From this perspective, circular economy is seen by some researches as indispensable but not sufficient to achieve full sustainability, while for other studies it is the central goal for an industrial transformation leading to a sustainable environmental balance (Geissdoerfer et al., 2017).

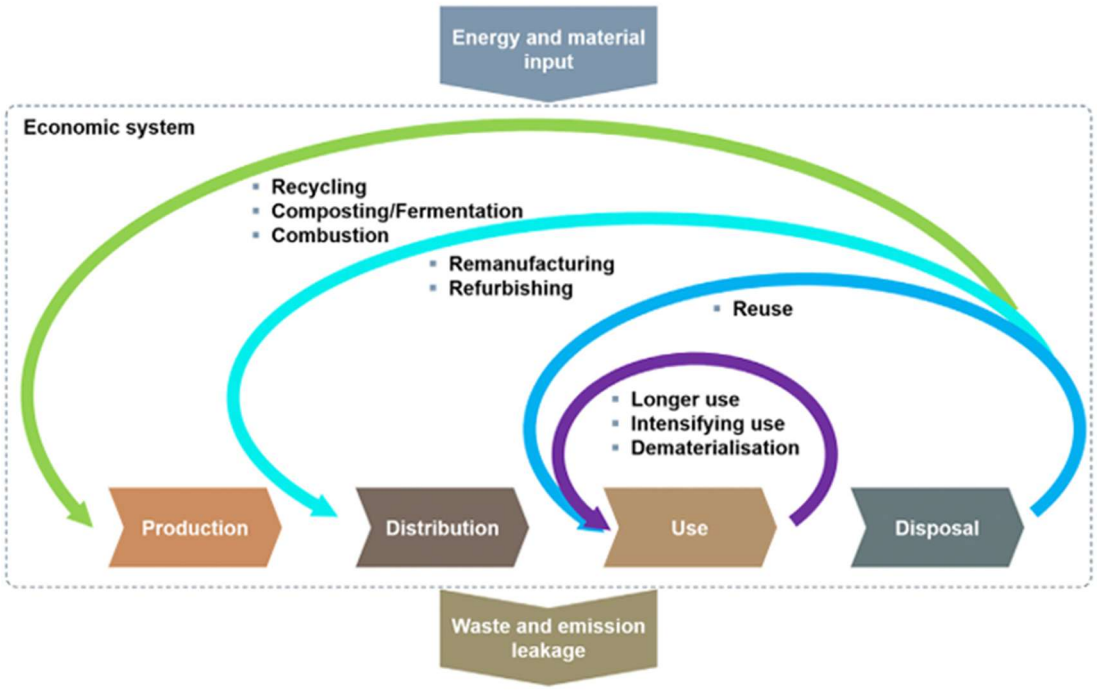

Figure 1. *The circular economy* (Geissdoerfer et al., 2020)

The latter view of centrality is supported by the fact that circular economy is closely aligned with the SDGs defined by the *United Nations* (UN) and represents a strategic response to global challenges related to economic, social and environmental sustainability. The *UN Agenda 2030 for Sustainable Development*, adopted in 2015, outlines a global action plan for achieving sustainable growth by 2030. It includes 17 SDGs (***Figure 2)***, each with specific targets aimed at addressing the world's most pressing issues, including poverty, inequality, climate change, environmental degradation, and peace and justice (United Nations, 2015).

The link between the circular economy and the SDGs highlights the need to engage all stakeholders - governments, businesses, *Non-Governmental Organizations* (NGOs) and citizens - in collective action to facilitate the shift toward a more sustainable economy (Anjum et al., 2025). Indeed, creating more effective interactions between all stakeholders can optimize value flows within production chains, thus contributing to improve sustainability in the long term. (Urbinati et al., 2017; Galvão et al., 2020).

***Figure 2**. The 17 SDGs of the 2030 Agenda* (United Nations, 2015).

2.3. Sustainable and Circular Business Models

A Business Model is defined as a system that describes how a company creates, distributes, and captures value (Bocken et al., 2014). It serves as the blueprint for a company's operations and strategy, encompassing every aspect from the initial idea to the long-term sustainability. The concept of value in this context is central, as it not only defines what the company offers to its customers but also how it maintains economic viability while contributing to the broader market. Understanding and optimizing the four value dimensions of a business model is crucial for business success (Bocken et al., 2014), especially in an ever evolving and competitive environment:

- *value proposition* represents the offering that a business proposes to the market, outlining the benefits that the product or service provides to customers. It answers the fundamental question: "*Why should customers choose our product or service over the competition?*". The value proposition can be linked to various aspects such as

innovation, quality, price, convenience, or a combination of these elements (Bocken et al., 2014; Richardson, 2005);

- *value creation* refers to all the activities and processes through which a company develops, produces, and optimizes its products or services. It includes key resources, essential activities, competencies, partners, and technologies that allow the company to generate the value offered to customers. It is the core of business operations, focusing on the efficiency and effectiveness of resources (Bocken et al., 2014; Richardson, 2005);

- *value delivery* is about the channels and ways in which the created value is distributed to the final customers. This includes the choice of distribution channels, managing customer relationships, and the effectiveness of post-sale services. Well-structured value delivery ensures that the product or service reaches consumers in the most effective and timely manner possible (Bocken et al., 2014; Richardson, 2005)

- *value capture* focuses on how the company generates revenue from its value proposition. It involves managing the cost structure and various sources of income, such as product pricing, subscription fees and advertising revenue. The effectiveness of value capture depends on the company's ability to translate its value proposition into sustainable income streams over time (Bocken et al., 2014; Richardson, 2005).

An important tool that helps define a business model in this scenario is the *Business Model Canvas* by *Alexander Osterwalder*. Thanks to nine key building blocks (customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure), it facilitates to visualize and explore the various components of a business making it easier for entrepreneurs to design, challenge, and refine their business strategies (Bernardes & Nogueira, 2017). ***Figure 3*** shows how Business Model Canvas can be adapted to include both the four traditional value dimensions of a business model and the TBL approach. By incorporating the *People*, *Planet* and *Profit* dimensions in the value proposition, the model not only addresses the conventional business aspects (such as revenue streams and customer relationships) but also emphasizes the

broader impact of business decisions on society and the environment, thus leading to the definition of a *Sustainable Business Model*.

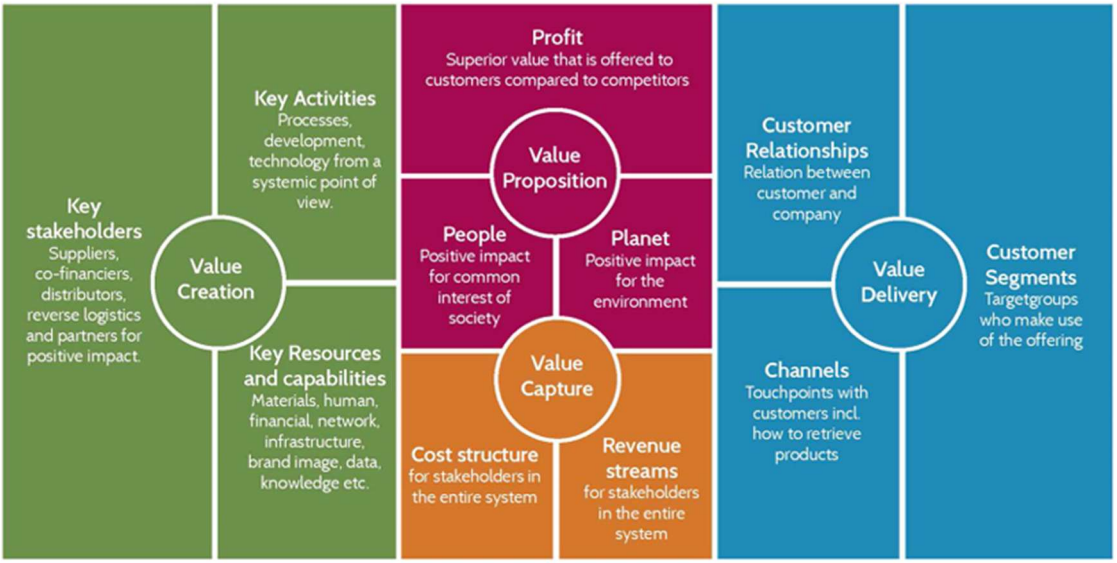

Figure 3. *Adapted sustainable Business Model Canvas* (Bocken et al., 2018)

Sustainable Business Models (SBMs) represent an evolution of the conventional business model concept, as they either incorporate sustainability-related principles, goals, or concepts, or embed sustainability throughout all dimensions of value creation (Geissdoerfer et al., 2018b). Unlike traditional models that focus primarily on profit, SBMs aim to capture economic value while simultaneously preserving or regenerating natural, social, and economic capital beyond the organization's immediate boundaries (Schaltegger et al., 2016). Specifically, SBMs are defined as business models that involve proactive multi-stakeholder management, generate both monetary and non-monetary value for a diverse range of stakeholders, and maintain a long-term perspective on value creation and sustainability (***Figure 4***) (Geissdoerfer et al., 2018b).

Circular Business Models (CBMs) represent a specific subset of SBM (Geissdoerfer et al., 2018b), characterized by their emphasis on integrating the principles of the circular economy across all four value dimensions. CBMs can be defined as business models that cycle, extend, intensify, and/or dematerialize material and energy flows, with the goal of reducing resource inputs and minimizing waste and emissions within an organization (Geissdoerfer et al., 2020). In CBMs, the circular economy principles go beyond the

traditional concepts of slowing, closing, and narrowing resource loops (Bocken et al., 2016), thus incorporating additional dimensions as illustrated in ***Figure 4***.

"Slowing" (or extending) loops specifically refers to prolonging the life cycle of products to decrease resource consumption; "closing" (or cycling) loops pertains to recycling, which re-establishes the connection between post-use materials and production while "narrowing" loops focuses on reducing resource usage per product, thereby enhancing efficiency (Geissdoerfer et al., 2018a; Lüdeke-Freund et al., 2019). The definition offered by Geissdoerfer et al., 2020 further enriches these concepts by introducing the idea of an intensified use phase (intensifying) and the replacement of physical products with service and software solutions (dematerializing) (Geissdoerfer et al., 2020).

As a result, CBMs empower companies to transcend conventional linear processes, fostering a more sustainable and regenerative economic system (Lüdeke-Freund et al., 2019). This is achieved through innovative and collaborative strategies that enable businesses to minimize waste and promote material reuse (Lüdeke-Freund et al., 2019).

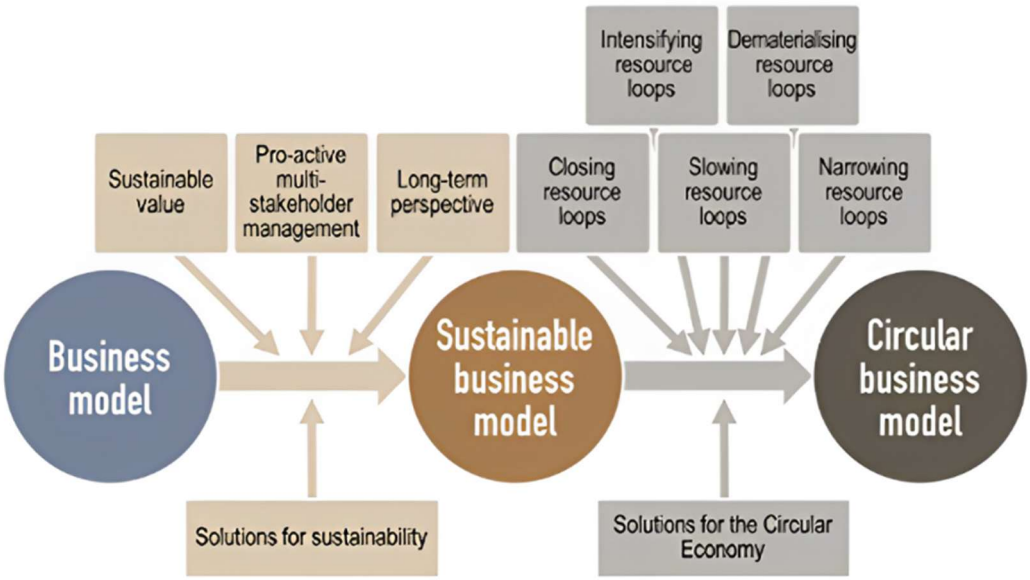

Figure 4. *Comparison of traditional, sustainable and circular business models* (Geissdoerfer et al. 2018a).

However, CBMs should not only be considered as strategies to enhance resource efficiency but also as *Resilient Adaptive Complex Systems* (RCAs), which are designed to respond to both local and global challenges. This vision emphasizes the flexibility and

dynamic nature of CBMs, integrating complex systems theory with resilience and adaptability. The ability of CBMs to evolve in response to shifting conditions makes them key drivers for long-term sustainability, enabling businesses to navigate economic and environmental challenges effectively (De Angelis, 2022).

The transition to a circular economy therefore requires more than just a theoretical understanding; it demands a profound transformation in the way businesses operate. The success of CBMs hinges not only on their internal strategies but also on robust cross-sector collaboration and the adoption of innovative tools. However, the practical implementation of circular models has been slower than anticipated, highlighting the need for businesses to receive better support in adapting their practices. This gap between theory and practice underscores the urgency of providing businesses with the necessary resources to accelerate the adoption of circular principles, making the transition to a circular economy critical for both sustainable economic growth and environmental protection (Bocken et al., 2019a).

2.4. The second-hand fashion sector

2.4.1. The fashion impact and the second-hand solution

Fashion is typically defined as the style of clothing and accessories worn during specific periods (Hassan et al., 2022). This results in short product life cycles, diverse product varieties, unpredictable and volatile demand, and long, rigid supply chains within the textile industry (Hassan et al., 2022). As the sector expands, the environmental impacts associated with it are becoming increasingly evident (Ikram, 2022).

Clothing production consumes large amounts of energy and water, significantly contributing to pollution. Additionally, washing certain fabrics releases harmful microplastics into the ocean, with polyester, which makes up about 60% of garments, being particularly problematic (Ikram, 2022).

The issue of waste is equally pressing, as fast fashion encourages clothes to be worn only a few times before being discarded, causing unnecessary environmental and social damage (Ikram, 2022). In the European Union, most used clothing ends up in landfills, with only a small fraction being recycled or reused (European Environment Agency, 2023). A significant portion of these textiles is exported to Africa and Asia, where their final disposal is often

uncertain and may include landfilling (European Environment Agency, 2023). In total, textile production accounts for 10% of global CO_2 emissions, pollutes rivers and streams, and depletes water sources (Ikram, 2022).

Furthermore, social concerns persist within the industry, as manufacturers often pay low wages and subject workers to hazardous conditions in order to minimize costs (Ikram, 2022). Textile industry jobs are typically characterized by poor job security with a disproportionate number of informal workers and women, who face not only unequal pay but also limited union representation (Suarez-Visbal et al., 2023). All these exploitative practices significantly contribute to environmental harm (Suarez-Visbal et al., 2023).

Sustainable fashion consumption represents a solution to this critical scenario and occurs in three stages: production, purchase, and post-purchase (Ikram, 2022), with the second-hand sector playing a key role in the final stage. The second-hand market, which includes any clothing that has been previously owned or used, regardless of its age, (Cervellon et al., 2012), is experiencing rapid growth, driven by increasing consumer awareness of sustainability and ethical consumption (ThredUp, 2024). As mentioned in *Chapter 1*, the *ThredUp Resale Report* states that the global second-hand fashion market is expected to grow three times faster than the traditional apparel market, reaching an estimated $350 billion by 2028. ThredUp's credibility comes from its position as a leader in the resale market, offering a platform for buying and selling pre-owned clothing while promoting sustainability. The company's annual resale report is based on comprehensive market analysis and consumer insights, making it a reliable source for trends in the second-hand sector. This exponential growth is fueled by the improving consumer awareness of sustainability and consumer ethics, supported by increasingly accessible technologies and digital platforms (ThredUp, 2024). Looking further ahead, the second-hand market could represent a $700 billion market by 2030, covering 23% of the global fashion market (Ellen McArthur Foundation, 2021). Implementing this could reduce the textile industry's overall CO_2 emissions by up to 16%, contributing approximately one-third of the reduction needed to limit global warming to 1.5 degrees (Ellen McArthur Foundation, 2021). As such, understanding the motivations behind sustainable fashion consumption and tracking the social and environmental consequences of *fast fashion* waste disposal are becoming increasingly crucial (Ikram, 2022).

2.4.2. Circular Business Models in the second-hand fashion sector

According to the *Taxonomy of Circular Economy Business Models*, companies can adopt various approaches within the circular framework (Urbinati et al., 2017). These approaches can be categorized based on whether they focus on the upstream or downstream side of the value chain. The upstream side of the value chain involves the earlier stages of production, such as design, sourcing materials, and manufacturing. Brands that design garments specifically with recyclability or reuse in mind are examples of upstream-focused models. These companies prioritize creating products that are easier to disassemble, repair, or recycle, thus facilitating their reuse in future production cycles (Urbinati et al., 2017). On the other hand, the downstream side refers to activities that occur later in the production process, typically involving the consumption and disposal of products (Urbinati et al., 2017). Notably, second-hand fashion belongs to the downstream supply chain, where the emphasis is placed on concrete strategies for ensuring that garments are not just discarded, but instead are revalued and repurposed within the economy for as long as possible (Lüdeke-Freund et al., 2019; Urbinati et al., 2017).

The circular business models patterns most applicable to the second-hand sector (Lüdeke-Freund et al., 2019) are listed below.

- *Reuse and redistribution* refers to the practice of reusing a product for the purpose it was initially designed for, with minimal alterations or enhancements (Lüdeke-Freund et al., 2019). In the clothing industry, manufacturers are increasingly offering their own reuse services by creating platforms for second-hand goods, both online and in physical stores (B2C models), thereby enabling product reuse among both existing and new customers (Hvass, 2014). Additionally, these activities can also occur purely through C2C platforms, such as *Vinted* (Dekhili et al., 2025), where users directly engage with one another. As pointed out by Lüdeke-Freund et al., 2019, a hybrid model is exemplified by companies that gather second-hand clothing from customers, carefully select and prepare these items, and subsequently resell them online (Turula, 2016). These service providers of reuse and redistribution often act as "market makers" (Schweizer, 2005), as they create new market segments within the industry and facilitate connections between market participants that were previously unfeasible (Lüdeke-Freund et al., 2019). These examples typically involve the transfer of ownership from the original user to the second-hand user (Lüdeke-Freund et al., 2019).

However, clothing rental businesses offer an alternative model based on the principle of "functionality rather than ownership" (Bocken et al., 2014), seeking to enable individuals to repeatedly reuse garments, thus maximizing the value derived from each item (Lüdeke-Freund et al., 2019).

- *Repair and maintenance* are activities that help extend the lifespan of a product by ensuring its continued functionality through inspection and servicing (Bocken et al., 2016). Some companies offer lifetime warranties, implicitly guaranteeing repair and maintenance services. Alternatively, external service providers can offer repair and maintenance as standalone services, such as shoe repair or clothing mending, and generate value by extending the life of products (Lüdeke-Freund et al., 2019). The primary benefit for customers is the prolonged usability and functionality of their products, which reduces the need for purchasing new items (Lüdeke-Freund et al., 2019). This aligns with the archetype of sustainability known as "promoting sufficiency" (Bocken et al., 2014), as it encourages the use of existing products to their fullest potential, reducing the demand for new consumption (Lüdeke-Freund et al., 2019). This is especially valuable for products that are less influenced by changing trends (Lüdeke-Freund et al., 2019).

- *Recycling* aligns perfectly with the concept of "creating value from waste" (Bocken et al., 2014). The primary forms of value creation associated with this approach are downcycling and upcycling (Lüdeke-Freund et al., 2019). Downcycling involves converting used materials into products of lesser value (e.g., turning clothing into stuffing), whereas upcycling, which is closer to the concept of second-hand, transforms materials into higher-quality products with improved functionality (Lüdeke-Freund et al., 2019).

- *Cascading and repurposing* are patterns that may initially seem less related to the second-hand sector and less common (Lüdeke-Freund et al., 2019). When a company produces and sells both finished goods (e.g., garments) and raw materials (e.g., fibers), it must establish comprehensive forward and reverse supply chains (Lüdeke-Freund et al., 2019). This process includes producing the clothing, delivering it to customers, organizing its return to the company, and then processing it into fibers, which are subsequently marketed (Lüdeke-Freund et al., 2019). The complexity of managing

these different cascades requires reverse logistics and textile recycling, which also aligns with the principle of “creating value from waste” (Bocken et al., 2014).

Repair and maintenance, as well as reuse and redistribution, are the two patterns most closely associated with the second-hand sector, as they are entirely related to the downstream part of the supply chain (Urbinati et al., 2017). They align with the circular economy principle of “slowing resource loops” (Bocken et al., 2016), which focuses on retaining product value by extending the lifespan of goods and facilitating their reuse (Lüdeke-Freund et al., 2019).

On the other hand, recycling and cascading and repurposing may initially seem less closely related to the second-hand concept, as they deal with the downstream part of the supply chain, but they also pertain to its upstream part (Urbinati et al., 2017): they relate to the circular principle of “closing resource loops” (Bocken et al., 2016) and are focused on retaining material value (Lüdeke-Freund et al., 2019).

Overall, all four patterns align with the circular economy principle of "narrowing resource loops" as this perfectly reflects the second-hand paradigm by eliminating the need for new raw materials and focusing instead on optimizing the use of existing resources (Bocken et al., 2016).

2.4.3. Consumer behaviors and preferences towards second-hand fashion

Educating consumers about the environmental advantages of second-hand fashion can help raise awareness of responsible consumption. Indeed, more environmentally conscious consumers are aware of the benefits of this new trend in terms of product durability and environmental impact (Choudhary et al., 2022; Galvão et al., 2020).

Despite growing awareness, some psychological and practical barriers still limit the widespread adoption of second-hand and rental fashion models. One of the most significant concerns relates to hygiene and perceived health risks, which often discourage consumers from engaging in collaborative consumption. Research has shown that many individuals hesitate to purchase or rent pre-owned clothing due to fears about cleanliness and the

potential spread of germs. These concerns, while not always justified, represent a major psychological obstacle to the adoption of circular fashion practices (Choudhary et al., 2022). To overcome this issue, trust in service providers and clear assurances of high hygiene standards are essential (Bernardes and Nogueira, 2017). For example, the start-up *0KG*, which specializes in clothing rental for tourists, faced initial resistance due to consumer skepticism about garment hygiene. To address these concerns, the company launched an information campaign detailing its rigorous cleaning processes, which significantly strengthened consumer trust and promoted a broader acceptance of shared fashion models (Bernardes and Nogueira, 2017). This highlights the importance of transparent communication strategies and consumer education in reducing psychological barriers and encouraging participation in circular fashion (Bernardes and Nogueira, 2017).

Moreover, in the second-hand fashion sector, balancing aesthetics with sustainability is crucial to making ethical choices more appealing. Successfully tackling these challenges can help circular fashion redefine the industry, promoting responsible and stylish consumption (Xue and Huang, 2023).

In this context, *Schwartz's value theory* and the *Theory of Planned Behavior* (TPB) provide useful tools for understanding how human values influence consumer choices in relation to sustainable fashion and the circular economy. *Schwartz's value theory* proposes that individual choices are guided by a system of universal values, organized into categories ranging from the search of novelty and autonomy to the preservation of tradition and security, which interact to influence behavior in complex ways (Anjum et al., 2025). If applied to sustainable fashion, this theory can explain why some consumers may be more motivated by values related to collective ownership and environmental responsibility (such as the value of universalism or benevolence), while others might prioritize security and tradition, leading to more conventional purchasing behaviors.

On the other hand, the TPB suggests that human behavior is the result of three main factors: *attitudes toward the behavior* (which refer to whether the individual feels the behavior as positive or negative), *subjective norms* (the influence of others' opinions or social pressure), and *perceived behavioral control* (the individual's perception of their ability to carry out the behavior, based on available resources and capabilities) (Anjum et al., 2025).

The link between the two theories lies in how the fundamental values described in *Schwartz's theory* influence consumers' attitudes, their perceptions of what is socially

acceptable (the subjective norms), and their perception of the feasibility of adopting sustainable behaviors (the perceived behavioral control). Basically, integrating these two theories allows to understand how individual values (such as orientation toward sustainability) can translate into positive attitudes, which influence social norms and the perception of the feasibility of behavior. This explains how greater awareness of circular economy concepts and SDGs can motivate consumers to adopt sustainable behaviors, such as recycling garments, through a cultural shift rooted in both individual values and the social and psychological factors that influence everyday choices (Anjum et al., 2025).

Other valuable theories drive consumers' attitude towards innovation and towards the adoption of online platforms for the rental of used clothing, identifying usefulness, ease of use, consumer attitudes and social pressure as key factors. The *Unified Theory of Acceptance and Use of Technology* (UTAUT) highlights how perceptions of the usefulness, ease of use, and social influence shape consumer adoption behaviors while the *Source Credibility Theory* (SCT) emphasizes the importance of trust and the reliability of the source of information. This is particularly relevant in the context of social media, where influencers and micro-celebrities play a significant role in shaping consumer decisions. If consumers perceive these figures as credible, they are more likely to adopt behaviors such as using platforms for renting sustainable clothing. The combination of UTAUT and SCT in the context of sustainable fashion offers a compelling explanation of how targeted marketing strategies and effective communication by trusted influencers can have a significant impact on younger consumers' purchasing intentions (Shrivastava et al., 2021).

The solidity of these theories is further supported by research, which shows that younger generations, particularly those active on platforms like *Instagram*, respond strongly to influencers endorsements promoting sustainable practices, including circular fashion. Therefore, integrating these theories into marketing strategies could enhance engagement with sustainability-conscious consumers (Kovacs, 2021).

Although technological innovation and ethical practices are relevant aspects, sometimes they did not emerge as decisive factors that influence consumer behavior. A study conducted in the United Kingdom and Lithuania (Šalčiuvienė et al., 2024) found that perceived social and emotional value played a key role in consumers' decisions to buy or rent used second-hand clothing online. In this context, perceived social value refers to the status and esteem consumers seek by expressing their sustainability-conscious identity, while perceived

emotional value is linked to the pleasure and excitement they experience from wearing unique, trendy, or exclusive pieces without committing to ownership.

While younger consumers show strong environmental awareness and care for ethical and social issues, their attention is often drawn to practical factors such as saving money, fashion trends, and the ability to get rid of unused clothes. As a result, even though they appreciate the eco-friendly values of platforms like *Vinted*, they continue to engage in high consumption of *fast fashion* (Palomo-Domínguez et al., 2023). Fortunately, the current paradigm is evolving: satisfaction with the low price sometimes disappears when quality and ethics are neglected. Young people seek transparency, knowing the origin of the materials, the working conditions and the environmental impact of the products they buy. Millennials and Gen Z are therefore essential in reducing the stigma associated with buying second-hand clothes and changing the dynamics of consumption (Shrivastava et al., 2021).

2.4.4. The rebound effect

The increasing consumer interest in sustainable fashion also has its drawbacks. The rebound effect, known in the field of CE as the *Circular Economy Rebound* (CER) phenomenon is primarily driven by the fact that secondary offerings are likely to be used in addition to, rather than instead of, primary products (Meshulam et al., 2024). The argument is further supported by sellers that often offer second-hand products at lower prices compared to primary goods (Dekhili et al., 2025). Such mechanisms can lead to unintended negative side effects that contradict the goal of sustainability, and these effects are not always immediately visible (Dekhili et al., 2025).

Peer-to-peer platforms encourage users to be highly responsive, pushing them to sell quickly by imposing short shipping deadlines for items sold (Dekhili et al., 2025) and leveraging their moral licensing (Ciechelska et al., 2023). Frequently cited for its success, *Vinted* is increasingly discussed for methods that encourage over-consumption, such as frequent notifications for price drops and new offers. Additionally, peer-to-peer second-hand platforms provide enjoyment to consumers (social connections, the search for unique clothes, etc.) and facilitate resales (Dekhili et al., 2025). A recent study explored the impact of second-hand fashion consumption on users of the *Vinted* platform (Dekhili et al., 2025): the most significant findings revealed that the more time a customer spends online, the

greater their consumption and impulse to buy, raising questions about the role of digital platforms in the second-hand fashion sector (Dekhili et al., 2025).

2.5. Innovating fashion Business Models

2.5.1. Business Model Innovation

The concept of *Business Model Innovation* (BMI) deals with modifying BMs through processes such as creation, diversification, acquisition, or transformation in response to internal or external drivers (Foss & Saebi, 2017; Geissdoerfer et al., 2018b). More specifically, BMI can involve the transformation of an existing BM within established companies or the development of entirely new BMs in start-ups (Geissdoerfer et al., 2016).

As highlighted by Pieroni et al. (2019), the dynamic nature of BMI can manifest at different levels of intensity, depending on the degree of novelty introduced and the scope of changes, which may affect individual components - such as the value proposition (Bocken et al., 2014) - or the broader systemic and architectural structure of the BM (Foss & Saebi, 2017). Rather than focusing solely on "what is offered," BMI is primarily concerned with transforming "how business is conducted" (Amit & Zott, 2012). Additionally, BMI can be triggered by various internal and external factors, including shifts in competitive environments or regulatory changes (Pieroni et al., 2019).

In recent years, BMI has gained increasing attention, particularly in efforts to BMs with the principles of the CE and sustainability (Pieroni et al., 2019). Sustainability-oriented BMI integrates sustainability principles as key drivers for BM design, whereas CE-oriented BMI incorporates CE principles or practices into BM development (Pieroni et al., 2019). Although the concepts of sustainability and CE have largely been treated as separate fields of knowledge, there is an opportunity to leverage synergies between them, as CE is on an evolutionary trajectory (Blomsma & Brennan, 2017). Its scope continues to expand, incorporating additional constructs from the broader sustainability domain, with increasing attention to social dimensions and efforts to mitigate rebound effects (Pieroni et al., 2019).

Moreover, it is crucial to distinguish between CBM innovations and CBM strategies or patterns (Henry et al., 2020). CBM innovations refer to the concrete processes through which firms implement their CBM strategies, while CBM strategies represent the comprehensive approaches that firms adopt in transitioning to CE (Henry et al., 2020).

2.5.2. Fashion Business Model Innovation

According to the definitions previously provided, the integration of CE principles is itself conceived as an innovation within a BM (Pieroni et al., 2019). This thesis is particularly supported in the fashion industry, where the CE is identified as a socioeconomic and cultural macro-trend driving innovative BM alternatives to the fast fashion paradigm (Pieroni et al., 2019). This perspective highlights that "the fashion industry requires sustainable innovations for its imperative transition toward a CE" (Huynh, 2022).

According to Todeschini et al. (2017), other macro-trends of innovation in the fashion sector include consumer awareness and corporate social responsibility (CSR). In line with this view, the second-hand sector is already recognized as a key driver for BMI in fashion, offering a viable solution to impact-related issues, as previously discussed (Todeschini et al., 2017). Specifically, the effects of the second-hand market on BMI are substantial, often leading to profound changes in value proposition, delivery channels, customer relationships, key activities, and revenue streams (Todeschini et al., 2017).

The second-hand sector is classified under the broader macro-trend of the sharing economy and collaborative consumption (Todeschini et al., 2017). From this perspective, the sharing economy represents a global, cultural, and economic paradigm shift from ownership to access, materializing through models such as collaborative and access-based consumption (Todeschini et al., 2017). These models foster economic growth driven by innovation and entrepreneurship and help mitigate the environmental effects associated with large-scale production (Todeschini et al., 2017). Furthermore, the second-hand market is also defined as part of the *Redistribution Markets* (RM) system, a category within collaborative consumption, which encompasses the selling of used goods, either with or without financial transactions (Gopalakrishnan & Matthews, 2018). In this sense, collaborative consumption is not merely a cultural reaction against consumerism but rather a conscious and efficient alternative that aligns collective and individual needs with available resources (Todeschini et al., 2017).

The final macro-trend of innovation identified in the fashion industry is technological innovation (Todeschini et al., 2017), which will be a key focus of this study. Technological innovation, particularly its branch digital innovation (Huynh, 2022), plays a crucial role in transforming BMs (Bocken, 2014), enhancing the efficiency, scalability, and sustainability of second-hand and CE practices in the fashion industry (Todeschini et al., 2017). As a key

driver of technological advancements, digital transformation is evolving in parallel with the shift toward sustainability across various industries (Ranta et al., 2021), further reinforcing its impact on innovative and sustainable BMs (Huynh, 2022). As pointed out by Huynh, 2022, *the 2020 Year Zero Circular Fashion Report* emphasizes that circular fashion cannot reach its full potential without the support of digital technologies (Circular Fashion Summit & lablaco, 2020). In this context, digital innovations are not only key enablers but also driving forces behind CBMs (Ranta et al., 2021).

2.5.3. Digital innovation

Digital innovation refers to product or business process innovations that incorporate *Information and Communication Technologies* (ICTs) or rely significantly on them for their development and implementation (Huynh, 2022). In the fashion industry, numerous digital innovation tools are employed across the entire value chain. However, nowadays, only some of these tools are utilized in the downstream segment, particularly within the second-hand market (Huynh, 2022).

The second-hand fashion industry has greatly benefited from the proliferation of smartphones and tablets, leading to the creation of various apps and mobile technologies (Ikram, 2022). Through these innovations, fashion brands can engage with consumers more effectively by developing digital fashion marketplace (Ikram, 2022). Digital platforms, which host operational activities and services, are increasingly integrated with the *Internet of Things* (IoT) and blockchain technology, serving as enabling drivers for service-based models (Huynh, 2022). Strongly aligned with key second-hand fashion principles such as repair, renting, and reuse, they contribute to the servitization, dematerialization, and virtualization of fashion (Huynh, 2022). As a result, garment lifecycles are extended, ownership is shared, and fashion consumption cycles slow down (Huynh, 2022).

Within this context, the IoT plays a crucial role in facilitating individual actions and interactions among users (Huynh, 2022). For instance, when a consumer wishes to rent a garment for a special occasion, they can use personal devices to access a mobile app, place an order, and scan QR codes to check in and return the item (Huynh, 2022).

Blockchain technology, when integrated into supply chain models, further enhances service-based models by improving business efficiency and sustainability (Huynh, 2022).

Since blockchain permanently records transactions and assets (Ikram, 2022), it provides a powerful tool for increasing transparency in logistics and ensuring the secure transfer of data and documents among stakeholders. Additionally, the tracking of fashion products through unique digital IDs enhances authenticity and accountability throughout the supply chain (Pérez et al., 2020).

Moreover, *Artificial Intelligence* (AI) is increasingly adopted by fashion brands to simulate human intelligence in various ways (Ikram, 2022). AI-driven applications enhance customer experiences, predict future fashion trends, analyze sales patterns, and understand aesthetic preferences (Thomassey & Zeng, 2018). As pointed out in *The State of Fashion 2025* by *McKinsey*, AI is also reshaping consumer behavior by addressing challenges in purchasing decisions as rising prices and economic pressures are driving more consumers toward resale channels for better value (McKinsey & Company, 2025). However, an abundance of choices can negatively impact engagement and conversion rates (McKinsey & Company, 2025). AI-driven curation is transforming brand and product discovery, with 79% of consumers valuing AI recommendations tailored to their needs and 82% seeking AI to streamline purchase research. In response, 84% of organizations are prioritizing hyper-personalized experiences, enhancing AI infrastructure, and optimizing product content for AI-powered searches over the next year (McKinsey & Company, 2025).

2.6. The role of circular start-ups in BMI and sustainable fashion

Adopting CBMs and corresponding innovations is often first observed in new entrants, such as start-ups, due to their flexibility and capacity to foster disruptive sustainability innovation (Henry et al., 2020). *Circular start-ups*, in particular, are new, independent, and active companies pursuing a CBM (Henry et al., 2020), created with sustainability values at their core and adopting proactive strategies that incorporate innovation and collaboration in supply chains (Todeschini et al., 2017). In the fashion industry, they are often inherently sustainable, as their founders prioritize social and environmental responsibility (Todeschini et al., 2017).

The role of start-ups in developing a sustainable fashion industry is crucial, bridging the gap between incumbents willing to innovate their BMs toward sustainability (Todeschini et al., 2017). Incumbents, although effective in maintaining competitive advantages, struggle

to identify new opportunities and adapt to change, whereas start-ups excel in innovation but face challenges in securing competitive advantages (Todeschini et al., 2017). Strategic collaborations within an open innovation framework can be beneficial, particularly in enhancing CSR (Todeschini et al., 2017). Start-ups can leverage their expertise in sustainable innovation to provide consulting, knowledge, and networking for large firms aiming to develop green products and initiatives (Todeschini et al., 2017).

Considering the three phases of BMI development - *Sensing*, *Seizing*, and *Transforming* - (Teece, 2007) start-ups excel in sensing, as incumbents often exhibit organizational inertia and prefer incremental CE strategies such as recycling and reuse rather than radical BM changes (Hockerts & Wüstenhagen, 2010; Huynh, 2022). However, start-ups face challenges in seizing, which involves testing BMs through experimentation (Bocken et al., 2018) to assess their impact on sustainability and CE principles (Huynh, 2022) . Consequently, start-ups, being new market entrants, embrace higher levels of circularity, contributing significantly to CE transition (Henry et al., 2020).

By mapping CBM strategies and innovation types, five new CBM archetypes emerge in circular start-ups (Henry et al., 2020):

- *platform-based models*: start-ups pursue business models built around *Business to Business* (B2B), *Business to Consumer* (B2C) or *Consumer to Consumer* (C2C) marketplaces for (excess) resources. Thus, they facilitate trading or sharing of products, knowledge, infrastructure or services (Henry et al., 2020);

- *service-based models*: start-ups embed products in a service-system without customer ownership of the physical good aiming for higher, and better controllable usage efficiency. This approach financially incentivizes durability, reuse, and repair as their dominant CBMs (Henry et al., 2020);

- *nature-based models*: start-ups operate nature-based systemic solutions to deliver services (or products) with the objective to lower input of non-renewable natural capital and increase investment in renewable natural processes (Henry et al., 2020);

- *waste-based models:* process secondary materials - derived from post-consumer or post-producer waste streams- which lose their original use case but can be re-applied

in new contexts. Some start-ups in this category pursue upcycling strategies (Henry et al., 2020);

- *design-based models:* aiming to increase usage efficiency or avoid residual resource streams, design-based start-ups adopt circular innovations mostly in the pre-market phase of their product or service through source material minimization, product design or production process efficiency. By utilizing existing waste streams and fostering awareness, they address key challenges in CBMs and play a pioneering role in accelerating the transition to a CE (Henry et al., 2020).

Three key innovation "actors" in circular start-ups - *Downstream*, *Source*, and *Upstream* - further shape this classification, with the *Source* of innovation, being core or enabling technology, closely linked to digital innovation (Henry et al., 2020). The distinction between core and enabling technology (Potting et al., 2017) implies that the former is specific to a product or process, whereas the latter applies across industries and broader socio-economic systems, pointing out again the fundamental role of technology as a driver of innovation in circular start-up BMs (Henry et al., 2020).

2.7. Policies and initiatives for textile sustainability

Policymakers can play a crucial role in creating favorable conditions for the adoption of sustainable models, for example by reforming taxes on virgin products and promoting new policies that support circular fashion (Ellen McArthur Foundation, 2021). According to the *Organization for Economic Co-operation and Development* (OECD), reflecting the full environmental costs in market prices is an essential step. For example, carbon taxes are one potential tool that can incentivize more sustainable practices within the textile industry by making the environmental impact of production more visible to businesses and consumers alike, making the price of non-sustainable practices less competitive (OECD, 2019). The European Union is actively working to promote a more sustainable and circular model in the textile sector, with the aim of making *fast fashion* obsolete by 2030 and significantly reducing the extraction of natural resources and the generation of waste. To reach its goal, the European Union has put in place several policies and initiatives, including the *European*

Strategy for Sustainable and Circular Textiles, which provides incentives to companies that adopt sustainable practices. One of the most important initiatives is the *Digital Product Passport*, planned for 2027, which will provide detailed information on the composition, sustainability and recyclability of textile products, improving traceability along the entire value chain and countering the *fast fashion* paradigm. Although the implementation of these policies poses significant challenges, it can accelerate the transition to a circular economy and position the European Union as a global leader in promoting sustainability in the textile sector (European Commission, 2022).

Despite progress in the adoption of circular economy policies, the social ambition of these initiatives remains limited. It is therefore crucial to improve circularity policies and concurrently address social and economic inequalities, especially for the most vulnerable groups such as women, ethnic minorities and migrant workers (Suarez-Visbal et al., 2023).

To conclude, circular models have already been proven effective in reducing environmental impacts, but could achieve even more significant results if supported by targeted public policies and a shared strategic vision, thus contributing to the development of a more inclusive and sustainable economic system.

2.8. Gaps in the literature, research contributions and future perspectives

Despite the growing interest in innovation, sustainability and social inclusion, there is a significant gap in the literature that limits the understanding of the potential of second-hand fashion start-ups.

The existing literature on circular start-ups has extensively explored the role of CBMs in fostering sustainability and innovation across various industries. Some research provides a broad analysis of CBMs in circular start-ups, examining their structures, key drivers, and strategic approaches (Henry et al., 2020). However, while some studies mention fashion-related ventures, none have specifically focused on the second-hand fashion sector. Other studies have investigated innovative BMs within the broader fashion industry, identifying macrotrends and drivers shaping the sector (Todeschini et al., 2017). Nevertheless, their work does not isolate second-hand fashion start-ups, leaving a gap in understanding how these businesses develop and implement CBMs in a CE context. The absence of dedicated

studies indicates a lack of empirical and theoretical insights into how second-hand fashion start-ups operate, innovate, and contribute to sustainability.

Methodologically, previous studies have relied on various approaches. Some have conducted extensive literature reviews to conceptually map the fundamental principles behind BMI (Pieroni et al., 2019). Others have adopted an empirical approach, analyzing a large sample of circular start-ups to identify common CBM patterns (Henry et al., 2020). Moreover, other researchers have employed a hybrid methodology instead, combining literature reviews, expert interviews, and case studies of selected fashion start-ups (Todeschini et al., 2017). However, no study to date has systematically investigated the intersection of second-hand fashion start-ups and CBMs empirically.

Moreover, the literature gives little space to the cultural and social dimensions that second-hand fashion start-ups can influence. These enterprises not only help to redefine the perception of the value of used clothing, but also promote more responsible consumer behavior and challenge the dominant culture of *fast fashion*.

This research aims to fill these gaps by exploring how second-hand fashion start-ups can develop and apply CBMs in a sustainable way. The goal is to integrate empirical data and theoretical analysis in order to obtain a comprehensive view of the dynamics governing these initiatives.

3. Methodology

3.1. Aims of the chapter

The aim of this chapter is to describe how the research was conducted and the methodological choices made in order to answer the research question: *"What are the innovative business models adopted by start-ups in the second-hand fashion industry and what impact do they have on sustainability?"*. In particular, it describes the sample selection criteria, the data collection tools and the analysis techniques used, focusing on the qualitative approach adopted to understand the dynamics of innovation in the business models of the start-ups.

3.2. Research approach

This research is empirical and exploratory, with an approach focused on understanding innovative business practices in the context of second-hand fashion start-ups and their impact on sustainability. The analysis focuses on a relatively new and under-researched phenomenon for which there is no established theory, thus justifying the adoption of an empirical-exploratory approach. Although the descriptive aspect constitutes an important part of the research, the main objective is not limited to the mere collection of data on the business models of start-ups. The research goes further and aims to explore the underlying dynamics and identify the innovative factors that characterize these business models and their impact on sustainability. The aim is to collect qualitative data in order to gain meaningful theoretical insights and outline innovative business models, which justifies the exploratory rather than purely descriptive approach. The qualitative nature of the approach allows for a deeper understanding of the internal dynamics of these start-ups, focusing on the main themes that emerge from the data collected. The choice of a qualitative approach is also justified by the need to study new phenomena for which the collection of numerical or quantitative data would not be adequate, given the challenges of accessing such data in the context of start-ups. As emerging businesses, start-ups often do not have the infrastructure or resources to systematically collect or track detailed quantitative metrics, especially those related to environmental impacts. Many start-ups are still in the early stages of their development and may not prioritize or implement specific measurement systems for assessing sustainability performance. This lack of quantitative data further reinforces the

decision to adopt a qualitative approach, which allows for a deeper exploration of business practices and sustainability-related challenges without relying on precise numerical inputs.

This study takes the form of an investigation based on 11 case studies of start-ups operating in the second-hand fashion sector. The sample was selected using a non-probabilistic sampling technique with the aim of obtaining a heterogeneous and informative selection that would allow the study of a variety of innovative business models. The sampling approach used is purposive heterogeneous sampling, which allows the selection of cases that have significant and diverse characteristics but are relevant to the research objectives. The use of this technique allows for a comprehensive overview of innovative business models and their relationship with sustainability (Saunders et al., 2009). ***Figure 5*** provides a schematic representation of the research approach, divided into stages.

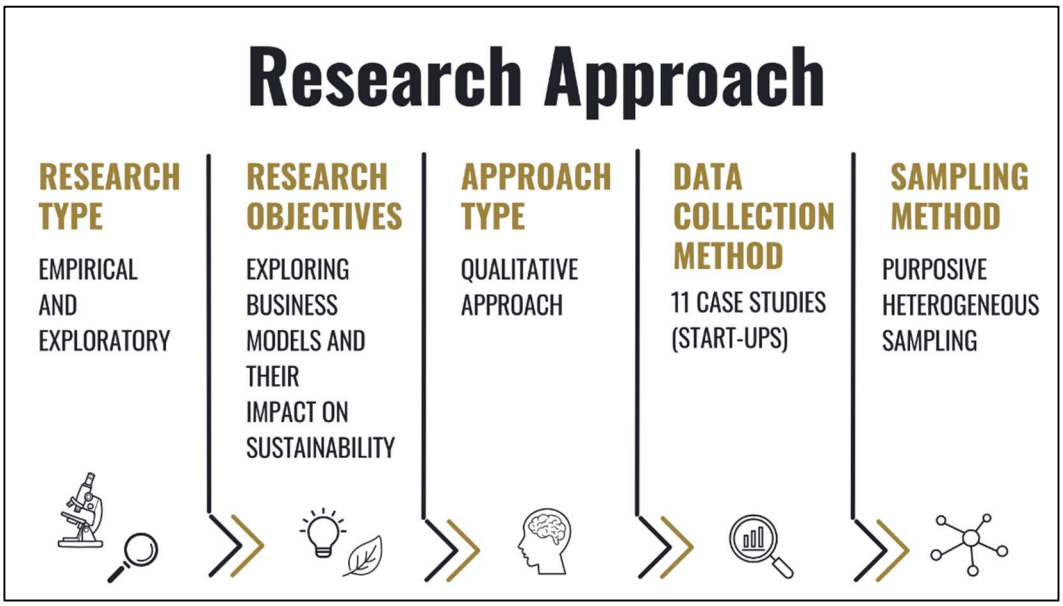

Figure 5*. Schematic representation of the research approach stages.*

3.3. Definition of the sample

In order to select the cases to be included in the sample, it was necessary to adopt a precise definition of "start-up", a concept that is not easy to find in the literature, since there are several conflicting interpretations. After a thorough review of existing definitions, it was decided to use the one provided by *Crunchbase*, a leading online platform that offers detailed information on companies and start-ups, enriched with some additional considerations. According to *Crunchbase*, a start-up is a company that meets certain financial and

operational parameters, including: annual revenue of less than $100 million, fewer than 500 employees and a valuation of less than $2.5 billion (Crunchbase, 2018). These parameters were chosen to distinguish start-ups from more mature and established companies. In addition, following the guidelines of the *European Start-up Monitor 2020/21 Report*, two criteria were established: start-ups had to be less than 10 years old and demonstrate innovative potential (European Start-up Monitor, 2020). Innovation was only considered significant if it affected at least two of the four value dimensions of a business model (i.e. value proposition, value creation, value delivery and value capture) from the preliminary screening of secondary sources, thus ensuring that the sample was representative of truly innovative business models (Bocken et al., 2014; Geissdoerfer et al., 2023). In order to ensure consistency with the regulatory framework within the European Union, where start-up regulations are standardized, it was decided to focus exclusively on start-ups operating within the EU.

The selection of start-ups was made through an extensive online search using keywords such as *start-up*, *sustainability*, *circular economy* and *innovation*. Through a snowballing process of searching for relevant articles and websites, the websites of the start-ups were identified and the information provided was analyzed for consistency with the selection criteria. It is important to emphasize that a rigorous screening process was applied during the selection phase: some companies, despite having sustainable and innovative features in their business models, were excluded because they did not fully meet the criteria defined for the sample. In particular, companies were excluded if they were more than 10 years old or had a turnover of more than $100 million, as was the case with *Rebelle*, *Vestiaire Collective*, *ThredUp*, *Poshmark* and *Grailed*. Start-ups such as *Rebag*, which meets all the requirements but operates in the United States, were also excluded due to the geographical scope limitation of the study.

After this skimming process, the sample was officially defined. Although some of the selected start-ups such as *Rifò* and *Fortunale* are not traditionally associated with second-hand fashion since they mainly focus on eco-friendly production from scratch, the concept remains relevant. These companies are involved in textile recycling or promote projects that encourage reuse, such as *Fortunale*'s *"Diamoci una Maglia"* project and *Rifò*'s *"Love Lasts Warranty", "Forever Service"* and take-back services. Although their main focus is not directly related to the reuse of used clothing, their inclusion in the sample was considered

useful to enrich the analysis with greater heterogeneity and to deepen the dimension of social sustainability, an issue in which these start-ups are particularly involved. Finally, the start-up *Made in Carcere* was included in the sample; although it did not fully meet the selection criteria (it was founded in 2007 and operates as a non-profit organization), it was considered significant for its innovative vision of social sustainability. ***Table 1*** lists all the selected start-ups with a brief description of their focus on sustainability. The start-up *Made in Carcere* is highlighted with a warning symbol (triangle), as it does not fully meet the final selection criteria.

3.4. Sources and data collection

Data collection primarily involved analyzing secondary data from the start-ups' official websites and social media channels, which were considered reliable and relevant sources, as well as conducting semi-structured interviews with members of the selected start-ups. Social media analysis proved to be particularly useful as it provides an immediate insight into the core principles of each start-up, such as information on the business model, the sustainable practices adopted and the value dimensions on which they operate (Reinecke et al., 2023). In addition to website and social media data, additional secondary data was collected for some start-ups, including *Corporate Sustainability Reports* (*CSRs*), where available, and other relevant information from online resources. Such data was essential to complement the understanding of each start-up's business model, in particular to assess their commitment to sustainability. In order to collect primary data, all start-ups were contacted by email to verify the availability of an active member of the organization to participate in an interview. Six start-ups, including *Fortunale*, *Rifò*, *Must Had*, *Your Closet My Closet (YCMC)*, *Dresso* and *Made In Carcere*, agreed to participate. The average duration of the interviews was approximately 20 minutes. The start-up *Atelier Riforma* was not available for an interview during the period requested but provided additional documents that contributed to a better understanding of its business model and vision in terms of sustainability. ***Table 1*** shows the data sources used for each start-up and the types of information collected, ranging from interviews to secondary data obtained from company documentation.

The interviews were conducted in the form of semi-structured interviews, which fall into the category of "*qualitative research interviews*". In a semi-structured interview, the researcher has a list of topics and questions to cover, although the order and selection of

questions may vary. This approach allows some flexibility to adapt to the specifics of each organization and the circumstances that arise during the interview. For example, some questions may be omitted depending on the organizational context or the discussion that develops, while other more specific questions may be added to explore certain aspects of the start-up's business model or innovative focus. The semi-structured approach allows for an in-depth exploration of the specific motivations, challenges and goals of the start-ups, without being limited by pre-defined questions that may not perfectly fit the answers and the context (Saunders et al., 2009). This approach made it possible to gain a rich and articulate understanding of the different start-ups, exploring not only the general aspects related to sustainability, but also the specific innovation goals and challenges faced by each of them. The interviews therefore not only allowed for the collection of useful data but also facilitated direct interaction with the protagonists of the start-ups, which provided valuable qualitative insights. ***Appendix A*** provides the skeleton used for the semi-structured interviews with the full list of topics and questions covered.

3.5. Data preprocessing

All interviews were audio-recorded, with the explicit consent of each interviewee, to ensure accuracy and completeness, and were then fully transcribed for analysis. Data collection adhered to fundamental ethical research principles, including privacy protection and informed consent. None of the start-ups requested anonymity, so their company names are listed in ***Table 1*** while all collected data were treated with the utmost confidentiality in compliance with applicable regulations.

The interviews were transcribed using *LM Notebook*, an AI-based transcription and analysis software that facilitated data processing. The transcriptions were then manually refined to ensure precision. Moreover, *ChatGPT Plus* and *DeepL*, two AI-based tools, were employed to ensure accurate and efficient translation of the interviews from Italian to English.

The analysis of the start-ups' business models in the sample was carried out through two primary approaches. Initially, an inductive approach was applied, which involved constructing a table containing the most significant and descriptive statements about the business models of the selected start-ups. The statements were derived either from the

interviews with the start-ups or, for those that did not participate, from their websites. The statements were then analyzed using the open coding method to identify key themes and patterns emerging from the different business models. The identified themes were subsequently mapped to the established CBM patterns (Lüdeke-Freund et al., 2019).

The second approach was deductive, focusing on the four core value dimensions of the business models - value proposition, value creation, value delivery and value capture (Bocken et al., 2014; Richardson, 2005). For each start-up, the dimensions were identified and analyzed in a separate table, where they were again aligned with the CBM patterns (Lüdeke-Freund et al., 2019). Additionally, the core and enabling technologies (Potting et al., 2017) supporting each business model were specified to facilitate a comprehensive mapping of how the start-ups incorporate circular economy principles and technological innovation into their business models to enhance both sustainability and operational efficiency.

The combination of the inductive and deductive approaches is an example of the hybrid method of abductive reasoning. As defined by the *Stanford Encyclopedia of Philosophy*, abductive reasoning is the process of formulating the most plausible explanation for a set of observations when information is incomplete. This method bridges the gap between deduction and induction, offering a robust framework for analyzing and categorizing complex data (Stanford Encyclopedia of Philosophy, 2021).

The analysis of the sustainability impact of the start-ups' business models took a more inductive and descriptive approach. The key sustainability-related elements were identified and described through a comprehensive review of the various sources. This approach focused on the environmental, social and economic impacts observed across the different start-ups, providing a broader understanding of how their business models contribute to or challenge sustainability within the sector.

Table 1. *Cases description*

Start-up Name	Ctry	Est. Year	Empl. Count	Sustainability Focus	Data Type	Data Sources
Atelier Riforma	IT	2019	<10	Optimizing textile waste for recycling, reuse, and upcycling in the circular economy	Primary and Secondary	Documents provided by the company, company website and social media
Cloov	IT	2022	<10	Sustainable fashion promoting rental, resale and repair, efficient logistics and transparency	Secondary	CSR, company website and social media
Rifò ("Take back" and "Forever" services", "Love Lasts Warranty")	IT	2017	11-50	Circular fashion, waste reduction through textile recycling, ethical craftsmanship	Primary and Secondary	Interview with CEO, CSR, company website and social media
Musthad	IT	2021	<10	Optimizing textile waste for recycling, reuse, and upcycling in the circular economy	Primary and Secondary	Interview with CMO, company website and social media
YCMC by Mastra Sa'	IT	2019	<10	Encouraging reuse by facilitating clothing exchanges, ensuring inclusivity for individuals of all identities and backgrounds	Primary and Secondary	Interview with CEO and COO, company website and social media
Dresso	IT	2021	11-50	Sustainable fashion promoting resale, efficient logistics, and transparency	Primary and Secondary	Interview with CEO, company website and social media
Fortunale ("Diamoci una maglia")	IT	2018	<10	Circular fashion, waste reduction through recycled garments, supporting local communities	Primary and Secondary	Interview with CEO, company website and social media
Reflaunt	UK	2018	11-50	Promoting the reuse of high-quality fashion items through the resell on multiple platforms	Secondary	Company website and social media

Table 1. *(Continue)*

Start-up Name	Ctry	Est. Year	Empl. Count	Sustainability Focus	Data Type	Data Sources
Her-Age	IT	2021	Not available	Encouraging reuse of authenticated second-hand luxury goods by ensuring transparent transactions	Secondary	Company website and social media
Micolet	ES	2015	51-250	Encouraging reuse of second-hand fashion, maintaining a high standard of quality and reliability throughout the process	Secondary	Company website and social media
Made in Carcere ("Emporio Sociale", "Second Chance Platform")	IT	⚠ 2007	⚠ 0	Sustainable fashion through upcycling, social inclusion, and empowerment	Primary and Secondary	Interview with CEO, company website and social media

4. Results

To answer the research question of this study, "*What are the innovative business models adopted by start-ups in the second-hand fashion industry and what impact do they have on sustainability?*", this chapter has been divided into two sections. The first section focuses on the innovative business models of the 11 second-hand fashion start-ups in the research sample, thus addressing the first aspect of the research question. The second section is dedicated to the analysis of the impact of these innovative business models on sustainability, answering the second part of the research question. A purposive sampling strategy was applied, selecting 11 cases. In the context of this exploratory study, the results of a relevance assessment are presented, based on the prevalence of factors observed across the selected cases.

4.1. Innovative Business Models of second-hand fashion start-ups

Table 2 shows explicative statements for each innovative business model of the start-ups in the sample. A first coding of the key themes and aspects was conducted, followed by a second coding to trace the main patterns of innovation in the CBMs. ***Table 3*** summarizes the results of the data analysis process, describing the four value dimensions of the BMs across the cases. Since technological innovation was found to be a constant presence in all the models, ***Table 3*** also specifies the core and enabling technologies for each start-up, where core technologies are central to their value proposition and value creation while enabling technologies support or enhance the value creation and delivery.

Table 2 - Start-ups' CBM classification

Start-up	Source	Explicative statement from source	CBM implementation	CBM patterns (Lüdeke-Freund et al., 2019)			
				Reuse and Redistribution	*Repair and Maintenance*	*Recycling*	*Cascading and repurposing*
Atelier Riforma	Company's website	Atelier Riforma promotes circular fashion by optimizing the recovery of post-consumer textiles through artificial intelligence and digitalization, focusing on upcycling. By connecting different stakeholders in the supply chain, the company reduces environmental impact and creates economic value and inclusive job opportunities	Post-consumer textile recovery, upcycling focus	✓		✓ (upcycling)	
Cloov	Company's website	Cloov offers an integrated technological solution with a strong focus on rental, enabling brands to adopt a circular business model through resale and repair as well.	Rental-focused platform with resale and repair services	✓	✓		
Rifò ("Take back" and "Forever" services, "Love Lasts Waranty")	Interview with CEO	*"Our zero-kilometer circular model includes the Take-Back Service to collect old garments, the Love Lasts Warranty to extend product lifespans, and the Forever Service to recycle items once they're no longer usable, creating a sustainable and responsible cycle."*	Take-back service and recycling, repair warranty extensions	✓	✓	✓	

Table 2 (Continue)

Start-up	Source	Explicative statement from source	CBM implementation	CBM patterns (Lüdeke-Freund et al., 2019)			
				Reuse and Redistribution	*Repair and Maintenance*	*Recycling*	*Cascading and repurposing*
MustHad	Interview with CMO	*"MustHad helps fashion brands and textile manufacturers give their waste new life by facilitating strategic connections with specialized partners for circular solutions."*	Waste diversion and recycling partnerships for circular solutions	✓		✓	
YCMC by Mastra Sa'	Interview with CEO and COO	*"Our business model is centered around clothing exchange, made scalable and accessible through technology, to reduce carbon footprint and promote responsible consumption."*	Clothing exchange platform to reduce carbon footprint	✓			
Dresso	Interview with CEO	*"Our model tracks the circular economy in the fashion industry, enabling the monitoring of all resale transactions."*	Tracking circular economy transactions in fashion	✓			
Fortunale ("Diamoci una maglia")	Interview with CEO	*"Besides the organic yarn and dyeing, circular economy is one of our core principles: customers return their used garments in exchange for a discount, and we regenerate the fibers to give new life to the product."*	Garment return and fiber regeneration			✓	

Table 2 (Continue)

Start-up	Source	Explicative statement from source	CBM implementation	CBM patterns (Lüdeke-Freund et al., 2019)			
				Reuse and Redistribution	*Repair and Maintenance*	*Recycling*	*Cascading and repurposing*
Reflaunt	Company's website	Through customized solutions such as branded platforms and concierge services, Reflaunt helps fashion brands, retailers, and marketplaces increase customer acquisition, loyalty, and optimize multichannel distribution, with logistical support to ensure efficient second-hand product lifecycle management.	Customized solutions for product lifecycle management	✓		✓	
Her-Age	Company's website	Her-Age is the first authenticated luxury fashion platform with NFTs, promoting circularity and sustainability in a secure, managed marketplace, partnering with a repair company.	Luxury fashion with NFTs and circular marketplace	✓	✓		
Micolet	Company's website	*Micolet is an online platform where you can buy and sell quality second-hand clothing, offering a sustainable alternative to fast fashion using artificial intelligence.*	Online second-hand clothing marketplace	✓			

Table 2 (Continue)

Start-up	Source	Explicative statement from source	CBM implementation	CBM patterns (Lüdeke-Freund et al., 2019)			
				Reuse and Redistribution	*Repair and Maintenance*	*Recycling*	*Cascading and repurposing*
Made in Carcere ("Emporio Sociale", "Second Chance Platform")	Interview with CEO	*"Our model combines social and environmental sustainability by recovering discarded fabrics to create job opportunities and improve the lives of marginalized people, promoting a circular and regenerative economy."*	Social impact through fabric recovery and job creation in marginalized communities			✓ (upcycling)	

Table 3 – Innovative business models of second-hand fashion start-ups in the sample

Start-up	**CBM pattern** (Lüdeke-Freund et al., 2019)	**Value Proposition**	**Value Creation**	**Value Delivery**	**Value Capture**	**Core technology**	**Enabling technology**
Atelier Riforma	Recycling (upcycling), Reuse and Redistribution	Re4circular is a unique technology that connecting businesses across the fashion and recycling sectors, promoting the reuse, recycling, and upcycling of textile waste	Efficient sorting of textiles through AI, pairing fashion brands and collecting entities with second-hand shops, social workshops and recycling professionals	The platform provides businesses with a seamless way to access and trade textiles for circular fashion processes	Charging users an annual subscription for access to its technology and marketplace. Buyers can purchase garments through the platform, paying a fee per transaction	"Re4Circular" (digital marketplace with AI sorting)	Photography for AI sorting
Cloov	Reuse and Redistribution, Repair and Maintenance	SaaS solution for fashion brands, enabling them to adopt a circular business model that focuses on rental, resale, and repair services	Management of unsold inventories, take-backs, refurbished items, samples and archives. Improvement of brands SLA and CRM	Efficient logistics, washing and quality control, ensuring sustainability and transparency in operations	Platform fees and monetization of real time data for brands	White-label platform with real-time data	Logistics, digital tracking
Rifò ("Take back" and "Forever" services, "Love Lasts Warranty")	Recycling, Reuse and Redistribution, Repair and Maintenance	Return used clothing in exchange for a discount on future purchases. Free repairs are offered, along with the responsible management of products at the end of their life	Collecting used clothing, recycling and repair garments with social cooperatives and local artisans, ensuring transparency	Collection network that facilitates easy returns of used items, while offering discounts in exchange	Sale of sustainable garments, incentivized by the return program	Textile recycling technologies	Digital tracking, logistics, e-commerce platform

Table 3 (Continue)

Start-up	**CBM pattern** (Lüdeke-Freund et al., 2019)	**Value Proposition**	**Value Creation**	**Value Delivery**	**Value Capture**	**Core technology**	**Enabling technology**
MustHad	Reuse and Redistribution, Recycling, Repurposing	SaaS solution to pair textile waste from brands with the most suitable operators	Automated matching algorithm to pair textile waste (production waste, leftovers, returns) with recycling (mostly upcycling) and reuse operators. Providing excess inventory data management, circular solutions scanner, circular supply chain traceability and circularity reporting	The platform offers a seamless way to access and trade textiles for circular fashion processes. Future plans include adding physical traceability and enabling access also for circular operators to find feedstocks	Subscription fee and percentage on activated projects. Future plans include revenue from circular operators	Matching algorithm and digital platform	Physical traceability system (under development)
YCMC by Mastra Sà Srl	Reuse and Redistribution	SaaS solution for fashion retailers that enables a scalable and sustainable clothing exchange	Personalized and tech-driven way to swap clothes, tokenizer and decarbonizer tools, AI-driven personalization	In-store exchanges and remote lockers	Platform licensing fees, value-added services (AI styling and quality control), transaction fees	Tokenization system	Digital wardrobe platform, personalization via AI
Dresso	Reuse and Redistribution	Enabling brands to integrate secondary market sales, promoting product traceability via blockchain	Integrated and fully managed white-label platform with resale automation and data intelligence for brands	The platform automatically connects those looking for a new product with those who already own it, incentivizing resale	Revenue from platform fees and monetization of re-sell data for brands	NFC tags, blockchain technology	White label platform

Table 3 (Continue)

Start-up	**CBM pattern** (Lüdeke-Freund et al., 2019)	**Value Proposition**	**Value Creation**	**Value Delivery**	**Value Capture**	**Core technology**	**Enabling technology**
Fortunale ("Diamoci una maglia")	Recycling	Return old garments in exchange for a discount on new ones	Value is created through the regeneration of old garments into high-quality fibers reused to create new clothing, utilizing innovative technologies	Customer-centric process: after purchasing a new item, customers return used garments via the same courier, making the recycling process seamless	Sale of sustainable garments, incentivized by the return program	Textile recycling technologies	Logistics, e-commerce platform
Reflaunt	Reuse and Redistribution, Recycling	RaaS solution for pre-loved products, enhancing customer loyalty and acquisition while driving incremental revenue through multi-channel resale solutions and personalized experiences	*Take-Back Program* + *Branded Recommerce Platform* for fashion brands, *Concierge Resale Service* for luxury brands and retailers and *Reflaunt Distribution Network* for marketplaces. Partnership with DHL logistics	Customers (companies) are provided with clear visibility into pricing, marketplace options, and transaction status	Commissions on sales, revenue sharing with brands and marketplaces, and fees for customized services like branded resale platforms	Proprietary resale platform, algorithms, inventory management	In-house photograpy, DHL logistcs

Table 3 (Continue)

Start-up	**CBM pattern** (Lüdeke-Freund et al., 2019)	**Value Proposition**	**Value Creation**	**Value Delivery**	**Value Capture**	**Core technology**	**Enabling technology**
Her-Age	Reuse and Redistribution, Repair and Maintenance	Secure marketplace for authenticated second-hand luxury fashion with NFTs, promoting sustainability and circularity	Expert authentication process, leveraging blockchain and NFTs to ensure authenticity	"White glove service" platform, ensuring a seamless experience for buyers and sellers with exceptional customer service, authentication, and transparent shipping	Transaction fees, professional seller services, and exclusive auctions, capitalizing on its trusted position in the luxury resale market	Advanced authenticati on through NFT and blockchain	Advanced e-commerce platform, logistics
Micolet	Reuse and Redistribution	Offering high-quality second-hand clothing through an online marketplace where customers can buy and sell items	Collecting and curating second-hand clothing, leveraging AI technology and logistics for quality control and efficient operations though the online platform	Customers can easily browse, buy and sell second-hand clothing, with fast shipping and responsive customer support	Commission on each transaction, and capitalizing on the growing demand for affordable and sustainable fashion	E-commerce platform, AI-driven technology	Logistics
Made in Carcere ("Emporio Sociale", "Second Chance Platform")	Recycling (upcycling)	Creating high quality fashion from discarded fabrics, while supporting marginalized individuals	Recovery of discarded fabrics, development of social tailoring communities, support for emerging young designers	Physical spaces at events and digital platforms, to connect social tailoring communities and young designers to buyers	As a non-profit, it captures the sale of upcycled and customized products, reinvesting in social and sustainable projects	No central technology	Digital platform, CRM

Value proposition:

The value propositions of the 11 second-hand fashion start-ups showcase innovative business models centered on sustainability and circular economy principles. Their primary goal is to minimize waste, extend the lifespan of garments, and transition from the traditional "take, make, dispose" model to a regenerative approach. Although circularity is a common theme, each start-up adopts a unique strategy.

Many of them place technology at the core of their value proposition, though their approaches to achieving sustainable second-hand solutions vary. Some focus on direct-to-consumer platforms, such as online marketplaces for second-hand items (e.g., *Micolet* and *Her-Age*), while others, including *Cloov, Musthad, Reflaunt*, *Atelier Riforma* and *Dresso*, offer software solutions that integrate circular practices by connecting stakeholders within the fashion industry. The target markets of these businesses also differ: some aim at the luxury second-hand market, where traceability is crucial, while others serve a broader audience by providing affordable second-hand fashion.

In contrast, technology does not play a central role in the value propositions of other start-ups like *YCMC, Rifò, Fortunale* and *Made in Carcere*. These companies place greater emphasis on consumer engagement by offering innovative sustainable practices. They provide incentives such as discounts, free repairs and personalized experiences to encourage participation in the second-hand market. In doing so, they foster customer loyalty, strengthen the connection between consumers and brands, and promote sustainability.

Value creation:

Value creation refers to the activities, resources and partnerships that enable companies to bring their value proposition to life. In the context of the sample, each company leverages its unique strengths to enhance the customer experience, improve operational efficiency and contribute to the broader movement of circular fashion.

A common theme among the value creation of the start-ups is the use of technology to drive efficiency and sustainability. In start-ups where technology is central in the value proposition, the value creation is primarily driven by the technology itself, as seen with *Atelier Riforma, Cloov, Musthad, Her-Age* and *Micolet*. In other cases, value creation can

refer to enabling technologies that complement the value proposition and offer additional services based on technological innovation, as seen with companies like *Dresso* and *YCMC*. The technologies involved in the value creation across the sample include blockchain, NFTs, NFC and AI, all of which play vital roles in enhancing operations and offering innovative services to customers. Even in start-ups like *Rifò* and *Fortunale*, where technology is not the central focus of the business, it remains essential for creating value, particularly through textile recycling technologies. In addition, these start-ups, as well as *Reflaunt*, create value by offering innovative services, such as take-back programs and rental practices (e.g., *Cloov*), which close the loop in the fashion supply chain and contribute to a more sustainable and circular model.

Lastly, many start-ups create value through strategic partnerships with key stakeholders, including local artisans, recycling professionals, and, most importantly, social cooperatives (e.g., *Musthad, Made in Carcere, Rifò, Atelier Riforma*). By incorporating these partners, start-ups ensure that their operations have a positive impact on local communities while enhancing their sustainability efforts.

Value delivery:

Building upon the frameworks of value proposition and value creation, value delivery strategies are crucial to ensure that the promised value is effectively distributed to customers. Technology plays an important role in the value delivery of the sample too, acting as an enabling tool that supports the seamless delivery of value to customers.

A recurring theme among the start-ups is the focus on creating a seamless, customer-centric experience (e.g., *Fortunale, Micolet*). Whether through digital platforms (e.g., *Musthad, Atelier Riforma*) or physical locations (e.g., *YCMC, Made in Carcere*), many of these businesses strive to make accessing second-hand fashion as convenient as possible. For instance, platforms facilitating the exchange of second-hand garments often feature integrated systems that automatically connect buyers with sellers, encouraging resale (e.g., *Dresso*).

Additionally, several start-ups prioritize transparency in their operations. Clear communication regarding pricing, transaction status, and product authenticity is a common theme, especially in a market where the second-hand nature of products may raise concerns about quality or fairness. Providing real-time updates on transaction status and ensuring

customers know what to expect throughout the process enhances satisfaction and strengthens the customer-business relationship (e.g., *Reflaunt* and *Rifò*).

Moreover, the logistics behind these operations - whether focused on efficient shipping, quality control or return processing - are essential to successful value delivery. Start-ups that streamline logistics, such as offering easy returns services (e.g., *Fortunale, Rifò*) or ensuring that garments are cleaned and refurbished before resale or rental (e.g., *Cloov*), create a smooth experience for customers.

A distinguishing feature found in *Her-Age* is the "white glove" assistance service, which guarantees premium customer service, authentication, and transparent shipping processes. This high-touch service appeals to customers seeking assurance and a personalized shopping experience, particularly in the second-hand luxury market where the authenticity of goods is paramount.

The varied approaches to value delivery reflect a deep understanding of consumer behavior and market trends, positioning these businesses to effectively meet the growing demand for sustainable fashion while ensuring long-term success.

Value capture:

The start-ups employ various mechanisms to transform their value proposition and value creation efforts into viable income streams. While there are several similarities in their value capture strategies, there are also significant differences that reflect the diversity of approaches within the sample.

A key commonality among the start-ups is their reliance on platform-based revenue models. Many companies generate income through platform fees and transaction charges: they thus can earn revenue from the use of their platforms or from each sale or exchange conducted on them (e.g., *Atelier Riforma, Dresso, Cloov, Mushad, YCMC, Her-Age, Micolet*). Additionally, the growing trend among the start-ups is the offering of premium services to enhance customer experience and drive revenue. Several companies provide additional services such as personalized styling or quality control, for which they charge additional fees (e.g., *YCMC, Reflaunt*). By offering value-added services, businesses generate supplementary income while differentiating themselves in a competitive market. Some start-ups, particularly those operating in the high-end second-hand market, generate

revenue through exclusive services such as auctions, professional seller support, and premium customer experiences (e.g., *Her-Age*).

Moreover, several start-ups capitalize on data monetization by leveraging the wealth of real-time consumer and transaction data generated by their platforms. Data is highly valuable to brands and retailers since they use it for targeted marketing, inventory management and consumer insights (e.g., *Cloov, Dresso*). This shift toward data-driven value capture reflects the increasing importance of data in modern business models, particularly within the tech-enabled fashion sector.

Revenue-sharing with brands is present in *Reflaunt's* business model. By collaborating with brands, it taps into additional revenue streams while promoting the growth of circular fashion practices within the mainstream fashion industry. Start-ups such as *Fortunale* and *Rifò*, which sell garments produced through recycling processes, generate revenue from the sale of sustainable clothes. *Made in Carcere*, however, represents a unique case, as it follows a non-profit model, with revenue generation focused on social impact rather than financial profit. This model reflects a different approach to value capture, prioritizing social good over financial returns and aligning with broader social and environmental goals.

Whether through platform fees, transaction charges, data monetization, or premium services, the start-ups in the sample have developed innovative ways to ensure that their business models remain profitable while supporting the broader mission of sustainability and circularity in the second-hand fashion industry.

4.1.1. BMs description and CBMs patterns

The start-ups in the second-hand fashion sector analyzed in this study stand out for CBMs that primarily focus on the "reuse and redistribution", "recycling" and "repair and maintenance" patterns, as outlined in the last columns of ***Table 2*** (Lüdeke-Freund et al., 2019). Each company approaches sustainability in a different way, but they all share the goal of promoting responsible management of fashion products and reducing environmental impact.

Micolet focuses on the concept of "reuse and redistribution" in the most classic sense, creating an online marketplace where consumers can buy and sell second-hand clothing. This model meets the demand for accessible and affordable fashion while reducing the

consumption of new clothes. The start-up stands out for its rigorous selection process and quality control, ensuring a reliable and convenient buying and selling experience.

Her-Age, unlike *Micolet* which focuses exclusively on the "reuse and redistribution" model, also adopts this model but with a key distinction: it integrates the "repair and maintenance" model and it targets the luxury market. The company offers a safe marketplace for second-hand fashion trade, specializing in high range garments. Here, quality control and authenticity of items are crucial. *Her-Age* is also recognized for offering an exclusive "white glove service", ensuring a flawless customer experience, with safe shipments and repair services. *Her-Age*'s commitment is to ensure the integrity of luxury products and promote sustainability in the fashion sector.

YCMC, *Dresso* and *Cloov* customize the "reuse and redistribution" model directly on their clients' websites , but each start-up does so in a distinctive way. *YCMC* and *Dresso* both collaborate with fashion brands to integrate second-hand clothing management into the brands' own virtual spaces, facilitating consumer-to-consumer exchanges (as shown in ***Table 4***). *YCMC* focuses primarily on bilateral exchanges, where consumers give away items in exchange for others of equal value. On the other hand, *Dresso* allows consumers to buy used clothing from other consumers, standing out for its ability to automate the resale process between users.

Cloov's approach to "reuse and redistribution" is significantly different. This is primarily because its re-commerce service on the brands' platforms is based on their take-back and faulty items. But most importantly, it introduces the concept of fashion rental, allowing brands to rent out unsold inventories, returns, samples, and archived items. As a result, *Cloov* applies the "repair and maintenance" model too, which is essential to ensure the good quality of the garments being rented out. According to *Cloov*, fashion rental offers brands a solution that allows them to transform the traditional transactional model into a relational one, where customers become more loyal through the use and return of products, rather than buying them permanently. Fashion rental not only attracts new customers but also offers a sustainable alternative to the destruction of unsold goods at the end of the season, reducing waste and improving environmental impact. Reverse logistics plays a central role in this model: while in traditional commerce, returns are seen as an additional cost, for *Cloov*, the return is the natural conclusion of the rental cycle, fostering a more efficient and low-impact operation. The model is also beneficial for brands, which can generate higher

revenue from renting a single item than from its sale price, as products can be rented up to 25 times. After several rental cycles, clothes are sold as second-hand, offering customers the opportunity to buy them at a discounted price. In this way, brands increase earnings and build stronger relationships with customers, enhancing visibility and brand perception.

Reflaunt, following the path of the above mentioned start-ups, integrates the "reuse and redistribution" model by offering fashion brands a "*Take-Back*" program that allows them to collect used items from customers and manage them through branded re-commerce platforms, with a recycling option. It sets itself apart by also providing a recycling option, thus incorporating the "recycling" CBM pattern as well. Additionally, the start-up offers a "*Concierge Resale Service*" for luxury brands and providing retailers with access to *Reflaunt's* global second-hand product distribution network.

In the business models of *Atelier Riforma* and *Musthad*, the “recycling” CBM pattern is at the core of their operations, always paired with the “reuse and redistribution” one. Both start-ups match production waste, returns, and inventory excesses from fashion brands and collecting entities with operators specialized in reuse or recycling, creating circular solutions for fashion.

In this context, *Atelier Riforma* emphasizes the importance of upcycling, which consists of transforming waste material into a product of higher economic and artistic value. According to *Atelier Riforma*, this practice is not only a useful solution but a necessary one. The start-up realized that upcycling is essential to reduce waste and preserve the planet's natural resources: it is a more effective solution compared to other textile recycling methods, which often fail to produce high-quality new materials due to the presence of mixed fibers. *Atelier Riforma* stresses that upcycling can also represent an alternative to consumerism and the disposable mentality. In their business models, through a network of expert tailors, it is possible to transform used garments into unique new creations. In this way, the consumer becomes part of a circular economy, reducing the demand for non-renewable resources and adopting a more conscious approach to product choices.

The upcycling pattern plays a central role in *Made in Carcere's* business model too. The start-up is an emblematic example of how recycling can be integrated with a positive social impact as its goal is to transform wasted textiles into new garments, using the labor of disadvantaged people. Although it was founded in 2007, *Made in Carcere* considers itself

a “*re-start-up*” and continues to innovate by experimenting with new business models, such as the recent “*Emporio Sociale”* and “*Second Chance Platform*” projects.

The “recycling” CBM pattern is also fundamental in the "*Diamoci una maglia*" project by *Fortunale*, which promotes a model focused on recovering used garments in exchange for discounts on new purchases on the start-up e-commerce. This approach allows old garments to be regenerated into new fabrics, thus contributing to reducing environmental impact and giving new life to what would otherwise be discarded. *Rifò* follows a similar strategy with its "*Take-back*" service, supported by the "*Love Lasts Warranty*" and "*Forever Service*" projects. *Rifò* thus adopts a comprehensive circular approach by integrating "recycling," "reuse and redistribution," and "repair and maintenance" CBM patterns in its operations, promoting a responsible and clear product lifecycle with a strong commitment to sustainability.

In short, the start-ups in the sample represent concrete examples of how CBMs are influencing second-hand fashion, with “reuse and redistribution” as the most prevalent CBM pattern, followed by “recycling” and, finally, “repair and maintenance”. In many instances, the “reuse and redistribution” model stands alone, as seen in *Micolet*, *Dresso*, and *YCMC*. In other cases, it is combined with the "repair and maintenance" pattern, as demonstrated by *Cloov* and *Her-Age*. *Reflaunt*, on the other hand, combines "reuse and redistribution" with the "recycling" pattern, a combination that is becoming increasingly significant for start-ups like *Atelier Riforma* and *Musthad*. For *Fortunale* and *Made in Carcere*, the "recycling" model is the primary focus, to the point that it is the only pattern applied in their business models. As previously mentioned, *Rifò* stands out by integrating all three CBM patterns: "reuse and redistribution," "recycling," and "repair and maintenance". ***Table 4*** illustrates the customers, as well as the origin and destination of the circular flows for each start-up. The start-ups are also grouped according to the CBM patterns they adopt.

Table 4 *– Circular flow and customer types of the cases*

	Start-up	Customers	Circular flow origin	Circular flow destination
reuse and redistribution	*Micolet*	Consumers	Consumers who sell used clothing	Consumers who buy used clothing
	Dresso	Fashion brands	Consumers of fashion brands (clients of *Dresso*), who provide their used clothing for resale	Consumers of fashion brands (clients of *Dresso*), who receive used clothing through the resale process
	YCMC by Mastra Sà Srl	Fashion retailers	Consumers of fashion retailers (clients of *YCMC*), who provide their used clothing for exchange	Consumers of fashion retailers (clients of *YCMC*), who receive used clothing through the exchange process
reuse and redistribution + repair and maintenance	*Her-Age*	Consumers, Fashion brands and professional sellers	Consumers/brands or professional sellers who sell authenticated second-hand luxury fashion items	Consumers who buy second-hand luxury fashion items
	Cloov	Fashion brands	Fashion brands' unsold inventories, take-backs, refurbished items, samples, and archives	For rentals, items are returned to the brand; for resale, items are sold to second-hand stores
reuse and redistribution + recycling	*Reflaunt:* • *Take-Back Program + Branded Recommerce Platform* • *Concierge Resale Service* • *Reflaunt Distribution Network*	• Fashion brands • Luxury brands and retailers • Marketplaces	• Consumers of fashion brands who provide used clothes • Consumers of luxury brands/retailers who provide used clothes • Marketplaces themselves, who wants to resell their garments	• Consumers of fashion brands who buy used clothes • Consumers of luxury brands/retailers who buy used clothes • Consumers, after they buy clothes from the *Reflaunt's Distribution Network*
	Atelier Riforma	Fashion brands and collecting entities	Textile waste from fashion brands and collecting entities	Second-hand shops, workshops and recycling professionals
	Musthad	Fashion brands	Textile waste from fashion brands	Recycling and reuse operators

Table 4 *(Continue)*

	Start-up	Customers	Circular flow origin	Circular flow destination
recycling	*Made in Carcere ("Emporio Sociale", "Second Chance Platform")*	Consumers	Discarded fabrics recovered from various sources	Consumers, after upcycling
recycling	*Fortunale ("Diamoci una maglia")*	Consumers	Consumers who return their old garments	Consumers themselves, as the clothing is recycled to produce new garments
reuse and redistribution + recycling + repair and maintenance	*Rifò ("Take back" and "Forever" services, "Love Lasts Warranty")*	Consumers	Used clothing returned by consumers	Consumers themselves, as the clothing is either recycled to produce new garments or repaired for reuse by them

Additionally, as shown in ***Table 5***, the innovative business models of the cases analyzed share several characteristics with the CBM archetypes of start-ups developed by Henry et al. (2020), including platform-based, service-based, nature-based, waste-based, and design-based models. These elements are observed across different categories within the same business model. The platform-based model was the most observed in the CBMs of the analyzed start-ups, standing alone in start-ups like *Micolet, Dresso* and *YCMC*, and combined with other models in other cases. For example, *Musthad*, *Atelier Riforma* and *Reflaunt* reflect traits of the platform-based model while also offering solutions for textile waste recovery, demonstrating characteristics of the waste-based model. The waste-based model is also observed in *Made in Carcere*, *Rifò* and *Fortunale*, as these start-ups are focused on recycling practices. In the cases of *Rifò* and *Fortunale*, characteristics of the waste-based model are associated with traits of the nature-based archetype, specifically in producing items from recycled fibers, as well as characteristics of the design-based archetype (along with *Musthad*), due to their focus on eco-design. The service-based model was observed in cases like *Rifò, Cloov* and *Her-Age*, all of which offer repair services.

Table 5 *- CBM archetypes adopted by start-ups in the sample* (Henry et al., 2020).

	Platform-based model	**Service-based model**	**Nature-based model**	**Waste-based model**	**Design-based model**
Micolet	✓				
Dresso	✓				
YCMC by Mastra Sà Srl	✓				
Her-Age	✓	✓			
Cloov	✓	✓			
Reflaunt	✓			✓	
Atelier Riforma	✓			✓	
Musthad	✓			✓	✓
Made in Carcere ("Emporio Sociale", "Second Chance Platform")				✓	
Fortunale ("Diamoci una maglia")			✓	✓	✓
Rifò ("Take back" and "Forever" services, "Love Lasts Warranty")		✓	✓	✓	✓

4.1.2. The role of digital technologies and traceability in fashion innovation

4.1.2.1. Digital technologies as a tool for innovation

The innovative business models in the sample show that digital technologies are rapidly transforming the fashion industry, especially for start-ups where technology is central to their value proposition.

"We define ourselves as a fashion-tech start-up. We offer a modular, low-code/no-code digital platform designed to enable the rental service in the fashion sector." (Cloov)

Cloov's white-label software enhances the operational sustainability of brands by analyzing real-time data to monitor unsold items, automate garment rotations and calculate the right time for sales. Additionally, it provides analytics to track performance and updates the CRM systems of partner brands.

Similarly, *Reflaunt* has developed a modular technology that can adapt to brand platforms without the need for internal technological development, enabling the resale of second-hand products. The core of this innovation lies in advanced algorithms that optimize inventory management and automate the sales process.

In this field, *Musthad* is making innovative use of digital technologies with an automated matching algorithm that pairs rejected textiles with the best recycling or redistribution options, addressing the problem of post-consumer textile waste. The algorithm directly contributes to value creation by facilitating the efficient repurposing of waste materials, which helps fashion brands minimize their environmental impact while capturing value from otherwise discarded goods.

By setting the same goal, *Atelier Riforma* has developed *Re4Circular*, an innovative patented technology aimed at transforming the circular fashion sector. It is a unique digital platform that combines AI and an online marketplace, connecting fashion brands and collecting entities with companies and professionals in the circular fashion industry. Thanks to the "AI-Powered Classification Technology", a simple photo of the garment and its label is enough to extract useful information such as garment type, material composition, seasonality, color and product condition. *Re4Circular* contributes to value creation by streamlining the process of selecting the most appropriate recycling, upcycling or reusing route for each garment, thus optimizing the use of materials and ensuring sustainability.

Re4Circular is not just an internal technology; it is a tool available to any entity that wishes to use it, allowing the circular approach to be applied on a much larger scale. Furthermore, *Atelier Riforma* is developing the *RivestiTo* project, which aims to bring the *Re4Circular* technology to a mobile application, intending to apply the business model locally in the city of Turin. This application will enhance value delivery by making it easy for local businesses and consumers to engage in circular fashion practices, thus creating a more accessible and scalable model for recycling and upcycling garments in local contexts. Moreover, the AI-driven capabilities directly contribute to the creation of value through enhanced customer engagement and sustainability outcomes.

AI plays a key role in managing large volumes of second-hand clothing for *Micolet* too. Thanks to its ability to analyze enormous amounts of data, AI makes processes faster and more efficient. More specifically, it automates repetitive tasks like retouching and background removal from photos of product images sold on the *Micolet's* platform. Additionally, AI enhances *Micolet's* value proposition by offering a personalized online shopping experience by suggesting items based on individual customer preferences, such as size and purchase history. During the COVID-19 pandemic, AI enabled *Micolet* to handle a 60% sales increase and manage twice as many items as before, saving time and resources.

However, *YCMC's* point of view is different, emphasizing that technology is not part of the core value proposition but rather serves as an enabler to achieve their goals, adding value within the value creation process and making their service more attractive:

"AI is not the core innovation of our business model but rather its enabling technology. Our innovation lies in the traditional sustainable practice of swapping, which we are currently working to make feasible using the tokenizer tool, allowing people to acquire clothing by 'paying' with items they no longer use." (YCMC)

YCMC's tokenization contributes to value creation by transforming physical items into digital tokens, making the exchange of clothes secure and standardized. The integration of AI through *Ami*, a virtual personal stylist, further enhances value creation by enabling personalized recommendations and insights, helping users make more informed and sustainable fashion choices based on their individual style preferences.

Similarly to *YCMC,* as mentioned before, technology is not central to the value propositions of the innovative business models of *Rifò*, *Fortunale*, and *Made in Carcere*:

"Innovation is not just about technology. It encompasses any process, concept, product or service that adds value compared to the existing state of the art. Innovation is thus rooted in tradition." (Rifò)

Rifò's value proposition relies on its sustainable practices, rooted in textile recycling and the adoption of new technologies like fiber regeneration to create high-quality, eco-friendly products. The company's model creates value by enhancing and communicating the ancient practice of textile recycling in an innovative way, using new technologies for fiber regeneration and its e-commerce platform to promote them. The innovation concept developed by *Fortunale* aligns with this paradigm, while *Made in Carcere* explains:

"In our business model there is no technology, there is just common sense and pure attention." (Made in Carcere)

They clarify that the only technologies they use are CRM systems, which help simplify their process of engaging with people. Ultimately, *Rifò*, *Fortunale* and *Made in Carcere* focus on reducing social and environmental impact, using innovation not as a technological purpose, but as a tool to foster positive and sustainable change.

4.1.2.2. The revolution of digital traceability and blockchain

The traceability of clothing items is a central issue in the business models of the start-ups in the sample. Most of them adopt control measures to ensure a safe service by verifying the authenticity and consistency of the items and making sure that consumers are informed about their second-hand purchases. For example, *YCMC* implements an intermediation control that solves issues which may arise between the parties involved in the exchange of items, often related to the lack of trust. *Reflaunt*, on the other hand, has preferred to delegate these procedures to an external partner. *DHL Supply Chain* not only handles logistics but also inspection, evaluation, photography and digital insertion of products into *Reflaunt's* proprietary system.

An issue that has generated considerable debate among the start-ups is the introduction of the *Digital Product Passport* by the EU. The *Digital Product Passport* is a digital labeling system that collects and shows all product information, such as the materials used, its environmental impact and the stages of production. It is an "accessible" document that provides useful information to both consumers and other interested parties. The start-ups interviewed share their views on this topic:

"The Digital Product Passport initiative can help Italy in terms of traceability in production supply chains: consumers should always have as much information as possible to make the best decision when purchasing." (Rifò)

"The Digital Product Passport will transform the fashion world. In 99% of cases, the information companies need to input into the digital passport will be stored on the blockchain as it ensures immutable traceability of every stage of the product's lifecycle." (Dresso)

Thanks to blockchain technology, every movement of the product can be securely recorded, ensuring that the data remains unaltered, which in turn boosts consumer trust and transparency. *Dresso* also highlights the favorable moment the company is experiencing, explaining:

"Four years ago, we developed a model to track the circular economy in fashion, patenting a system that ensures the traceability of second-hand market items using Near Field Communication (NFC) tags on the blockchain. Thus, we now have the exclusive opportunity to provide brands with digital passports, fostering the growth of the secondary economy. It allows us to bypass internal company checks on the authenticity and consistency of exchanged products, enabling the seller to scan the NFC tag, which the buyer can then scan, ensuring the product is original and matches the description. Additionally, thanks to this information, brands will be able to track the re-sell data of each product." (Dresso)

This approach directly links blockchain to value creation by ensuring more accurate and transparent tracking systems, which, in turn, enhance value delivery through improved customer confidence and traceability throughout the product lifecycle. Many start-ups are getting used to this new paradigm. *Rifò*, however, acknowledges the importance of technology, even though it is not central to the start-up, thus enriching its initial statement:

"Innovation is not just about technological progress, but technology plays a key role in ensuring traceability and transparency in fashion supply chains." (Rifò)

Since 2022, the start-up has introduced a QR code on its packages to automate the return service and improve traceability. Moreover, since September 2023, thanks to a partnership with the start-up *BCome*, *Rifò* has integrated information on traceability and environmental impact for its 100 best-selling products on its website. Another significant project for *Rifò* in 2025 deals with the improvement of its take-back service using a blockchain-based solution to better track collected items. In collaboration with its Swedish partner, *PaperTale*, *Rifò* will develop a traceability solution to increase transparency in the service: users will receive real-time notifications when the status of their items changes, such as when they move from "in the box" to "sent for reuse". These kinds of innovations thus improve value delivery, promoting greater confidence in the brand's sustainability claims and enhancing the customer experience through transparent processes.

Similarly, *Cloov* is making a mark in the industry by integrating QR codes into rented clothing items. The start-up has also announced the development of a patented device to certify and verify the authenticity of articles, offering customers the opportunity to consult detailed information on rental rotations. *Musthad*, in turn, is refining its traceability system, currently focused on an informational level. In turn, *Atelier Riforma* is developing a bidirectional system that enables both sellers of second-hand clothing and buyers of upcycled items to trace the history of each item and discover who contributed to its transformation, emphasizing the craftsmanship involved. Among future projects, the inclusion of data on natural resources saved through upcycling is planned. These efforts contribute to value creation by offering additional insights into the sustainable processes behind each item, strengthening the circular economy's core principles and attracting a more environmentally-conscious customer base.

Blockchain, meanwhile, already represents the core technology for one of the start-ups in the sample. *Her-Age*, with its re-commerce platform, is pioneering the integration of blockchain security with the authenticity of luxury products by incorporating *Non-Fungible Tokens* (NFTs) into the certification process of items. The use of blockchain and NFTs in this field has the potential to transform the second-hand market by combating counterfeiting, verifying the origin and characteristics of products and ensuring that materials are sourced ethically and sustainably. *Her-Age's* "*NFTize Only*" service has been

specifically designed for this purpose, providing users with transparent and immutable proof of ownership. In this way, consumers can make conscious purchases, confident that they are acquiring not only a physical product but also a piece of digital history. In this case, technological advancements not only enhance the value proposition but also significantly improve the value capture by adding verifiable data that can be monetized through NFTs, creating new revenue streams for businesses in the circular economy.

4.1.3. Evolution of start-up business models in response to EU regulations

The *Digital Product Passport* is a central element of the *Ecodesign for Sustainable Products Regulation* (ESPR), approved by the EU in 2024. It requires companies to implement stricter measures for managing the disposal and recycling of products at the end of their life cycle.

"The ESPR regulation is fundamental since it forbids the destruction of unsold products, including returns, obsolete items, damaged goods, or excess stock, in order to reduce waste." (Musthad)

Additionally, *Musthad* emphasizes the importance of the *Green Claims Directive*, aimed at combating greenwashing - the practice of companies presenting themselves as eco-friendly without adopting concrete sustainable practices. *Cloov* describes greenwashing as the use of vague terms like "eco-friendly" without tangible proof, focusing communication on individual products rather than the company's entire strategy, and packaging that appears ecological without real substance. Overall, the EU's focus on ensuring transparency and authenticity in companies' environmental claims is growing.

Atelier Riforma, *Cloov*, *YCMC* and *Musthad* emphasize that all these regulations are part of the *European Green Deal*, which aims to make Europe climate-neutral by 2050, and are covered by the principle of the *Extended Producer Responsibility* (EPR). The EPR requires companies to properly manage the end-of-life of products, ensuring continuous responsibility throughout their life cycle. EPR regulations are gaining increasing importance, and the start-ups in the sample have recently updated their business models and value propositions to meet the needs of companies that must comply with such rules.

A concrete example of start-up business models' evolution in response to new regulations is represented by *Musthad*.

"The founders initially created an e-commerce marketplace dedicated to upcycled products, creating a community of artisans, upcyclers, and workshops that quickly surpassed 100 partners. At this stage, the goal was to provide them with a platform to sell their products. However, with growing interest from brands and companies who wanted to connect with workshops and artisans to manage the end-of-life of garments, the founders decided to evolve Musthad's model from Business to Business to Consumer (B2B2C) to a Business to Business to Business (B2B2B) one." (Musthad)

In this new model, the first "B" is *Musthad*, the second represents the client companies looking for solutions to manage the end-of-life of their materials, and the third "B" involves companies that repurpose these materials. The shift from B2B2C to B2B2B enhances the value creation aspect of *Musthad's* business model by enabling companies to leverage *Musthad's* platform for recycling and repurposing materials, directly improving sustainability efforts. It also led to the introduction of a *Software as a Service* (SaaS) solution, specifically addressing the needs of businesses and facilitating compliance with increasingly stringent environmental regulations. The SaaS model directly impacts value delivery by providing businesses with a flexible, scalable solution to comply with regulations and manage the end-of-life of their products. *Atelier Riforma* also adopts a B2B2B model, offering the *Re4circular* platform, which connects the same two types of companies as *Musthad*.

Another example of adjustment is observed in *YCMC*, which has similarly evolved its business model. Initially oriented toward a B2C approach, *YCMC* chose to focus on B2B2C. This model is also delivered as SaaS, allowing large fashion companies to integrate sustainable practices into their e-commerce, reaching a wide consumer base.

"The business model we have developed does not involve selling directly to consumers; we are not a B2C. Although we tested the validity of exchanges with consumers to see if everyday people would be interested, our focus is on selling to businesses. Through our software, we are enabling large fashion companies to implement exchanges in their stores. Since large companies have an immense customer base, we are leveraging them to reach the entire audience interested in more sustainable fashion at acceptable costs." (YCMC)

YCMC's model exemplifies how shifting from B2C to B2B2C can enhance value delivery by leveraging the existing consumer base of large businesses while still promoting sustainable consumption practices. Additionally, value capture is optimized as large fashion companies can integrate *YCMC's* technology into their systems, increasing efficiency and reducing operational costs.

Similarly, *Cloov* and *Reflaunt* adopt B2B2C models but with specific approaches to address different needs within the circular fashion market. *Cloov*, as a SaaS, facilitates sustainability management through a platform that connects brands with consumers to manage rental and recycling. Its model strengthens the value proposition by offering a seamless and scalable solution for brands to adopt circular practices while also enhancing value creation through improved inventory management and consumer engagement. Meanwhile, *Reflaunt* has evolved its model into *Resale as a Service* (RaaS), allowing fashion companies to directly integrate resale platforms into their sales channels.

Dresso has also followed a similar path, stating that it began as a B2B2C marketplace for retailers and evolved its model over time. Now, with its new project "*2ndAct by Dresso*", it offers companies a solution where their consumers can interact to resell used items. While maintaining the B2B2C model, the significant change lies in the fact that *Dresso* is no longer just a marketplace but a platform that companies can integrate directly into their websites, enhancing the resale experience without relying on an external portal. A percentage of the resale is earned by the brand, and the consumer who sold the item can choose between a cash-out or a voucher for future purchases on the company's site. This strategy not only supports product circularity but also strengthens the relationship between the brand and the consumer, encouraging repurchase and loyalty.

Start-ups are also working to make the remuneration practices for client companies sustainable.

"Although the circular economy represents the only ecologically sustainable solution, it is not yet economically advantageous for the fashion supply chain. This is because every time a product is resold and its life cycle is extended, the revenue for the company decreases." (Dresso)

Dresso points out that some clothing brands may have a huge secondary market but do not fully exploit it. An example is *Monnalisa*, a brand producing formal children's wear

and a partner of *Dresso*. It is estimated that 20% of the company's annual turnover could come from the secondary market, as the clothes are worn only a few times before the child grows. Similarly, *Cloov* presents its model as an alternative to outlets or traditional retail points, where the brand would lose control over margins.

However, the EPR goes beyond just managing products at the end of their life cycle by requiring companies to adopt eco-design practices. This means that products must be designed with their environmental impact in mind at every stage, from production to recycling. Some start-ups are successfully facing this challenge. *Musthad*, for example, is developing eco-design consulting to support companies in designing products that are easier to recycle, while *Atelier Riforma* has already integrated these practices into its model, contributing to the transition to a circular economy. *Fortunale*, with its "*Ethic by Design*" approach, focuses on creating easily recyclable and regenerable garments while *Rifò* also stands out in this area by adopting cutting-edge solutions that fully meet the sustainability needs of the sector. The eco-design practices represent a shift towards more sustainable value creation, where the start-ups are responding to regulatory pressures and also creating long-term value through environmentally-conscious product design.

The shifts in business models are prime examples of how start-ups are redefining their value propositions, enhancing value delivery, and creating new revenue streams, all while leveraging EU regulations to comply with sustainability goals (***Figure 6***).

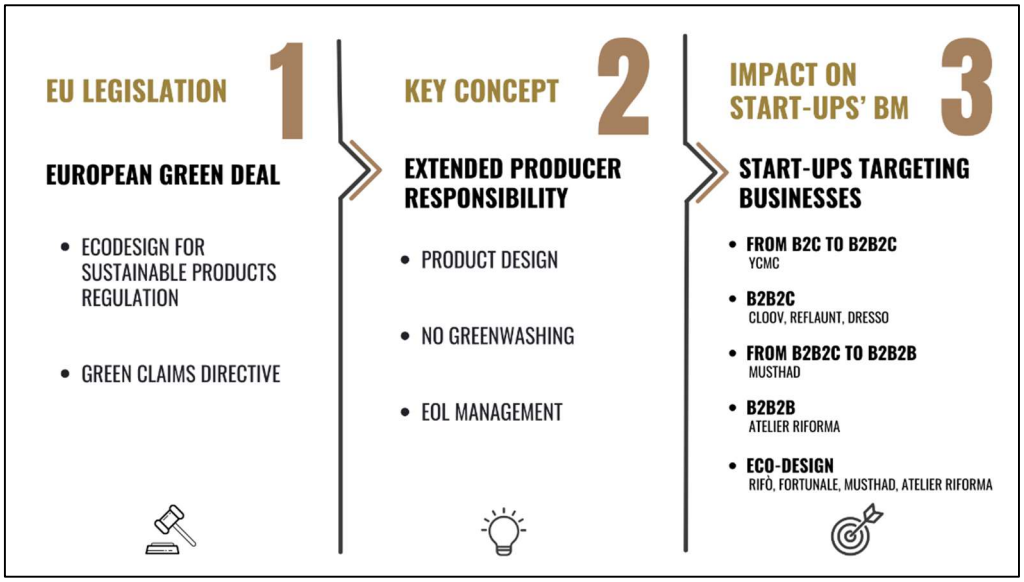

Figure 6 *- Impact of EU regulations on start-ups' business models.*

4.2. The sustainability impact of second-hand fashion start-ups

This section will examine the sustainability impact of the start-ups under analysis, focusing on their practices in relation to the environmental and social dimensions. The metrics used to evaluate their effectiveness, where available, will also be discussed. The economic aspect, as the third pillar of sustainability, will be addressed in relation to the results linked to the SDGs.

A comprehensive approach to sustainability is crucial, as reminded by *Musthad*, that highlights the interconnected nature of the three pillars: economic, social, and environmental. According to *Musthad*, addressing these dimensions together is essential for fostering sustainable and lasting development. However, different start-ups adopt varying perspectives on sustainability. *Cloov*, for instance, addresses the common perception that sustainability is often viewed as an additional cost for businesses. In contrast, *Atelier Riforma* presents a more inclusive approach, arguing:

"Sustainability should not be seen as an exclusive privilege, but as something that everyone should have access to." (Atelier Riforma)

According to *Atelier Riforma*, sustainability is grounded in a profound respect for natural resources - air, food, clothing - which are seen as gifts from the Earth that deserve care and value. At the core of their sustainability philosophy there is the concept of "restoring value", not only to natural resources but also to people.

In addition to these perspectives, companies in the sample are seeking formal recognition for their sustainability efforts through certifications that validate and measure their impact. One of the most significant certifications in this context is *B-Corp*, which represents an important milestone for companies committed to responsible and sustainable business practices.

B-Corp certification is a significant achievement for a company that wants to demonstrate its commitment to responsible and sustainable management. A *B Corp* is a company that obtains certification from *B Lab*, a non-profit organization that evaluates companies based on rigorous social, environmental, accountability, and transparency performance standards. In other words, a *B Corp* is a company that has passed an evaluation

that certifies its positive impact on people, communities, and the environment, going beyond the simple pursuit of economic profit (B Lab, n.d.).

In November 2020, *Rifò* obtained this certification, recognizing its commitment to sustainable and responsible business practices. In 2020, *Rifò's* first *B Impact Assessment* awarded the company a score of 99.9, 49 points above the average of ordinary companies, confirming its positive and significant impact in crucial areas such as *Governance*, *Workers*, *Community*, *Environment* and *Customers*. Moreover, the company focused on *Resource Conservation* and *Local Economic Development*, with over 80% of materials used in production coming from local and recycled sources. In 2022, *Rifò* took another step by adopting the legal status of a *Benefit Corporation*. Unlike *B-Corp* certification, which relates to an impact evaluation, the *Benefit Corporation* status involves a formal change in the company's legal structure, requiring the company by law to consider the collective well-being as an integral part of its mission and operations, with the obligation to report on social and environmental outcomes. Meanwhile, *Rifò* is working to obtain the certification from the *World Fair Trade Organization* (WFTO), another important recognition. This goal is part of its commitment to the public well-being, as adhering to the ten principles of *Fair Trade* allows the company to actively contribute to building a fairer and more sustainable economy. The ten principles of *Fair Trade* align perfectly with the SDGs and include: *Opportunities for Economically Marginalized Producers, Transparency and Accountability, Fair Trading Practices, Fair Payment, No Child Labor and No Forced Labor, No Discrimination, Gender Equality and Freedom Of Association, Good Working Conditions, Capacity Building, Promotion of Fair Trade, and finally, Climate Action And Environmental Protection* (World Fair Trade Organization, n.d.).

In *Cloov's* CSR, it is highlighted that the start-up is a benefit corporation established in 2022, with the goal of promoting a CBM in the fashion sector, promoting sustainability and reducing environmental impact. *Cloov* chose to adopt the benefit corporation legal structure, committing to pursue common benefits, but with more flexibility compared to a *Benefit Corporation* like *Rifò*, which is bound by legal obligations of transparency and external monitoring of its impacts. Benefit corporations are not subject to external verification and independent control as *Benefit Corporations* are. Although legally linked to pursue social and environmental goals, *Cloov* maintains the flexibility to self-assess and define its own metrics to measure progress toward its mission. In recent years, *Cloov* has

started to follow *Rifò's* example, adopting the *B Impact Assessment* as a tool to evaluate and monitor its social and environmental impacts. In 2023, the company recorded a significant improvement in its score compared to the previous year, highlighting its ongoing commitment to improving its business practices in line with common benefit goals.

4.2.1. The environmental impact

The environmental impact is one of the main concerns for start-ups, which show a growing commitment in implementing strategies aimed at reducing the ecological damage caused by the production and consumption of clothing.

Among the main issues that have emerged, *Atelier Riforma* points out how many garments, often beyond repair, are discarded thoughtlessly:

"An investigation into the management of used clothing revealed alarming situations, including the infiltration of organized crime. Frequently, clothing intended for charity ends up in the hands of large multinational corporations, which resell it at extremely low prices. This leads to massive landfills and shifts ecological problems to poorer countries. This unsustainable situation requires urgent attention." (Atelier Riforma)

In line with these worries, *Made in Carcere* emphasizes how the common consumption model is unsustainable, using the words of Ann Leonard: *"We consume and generate waste as if we had three planets available, when we only have one"*. *Made in Carcere*, while primarily focused on the social aspect, underscores that it always pays attention to the environmental impact and the need to minimize it.

A concrete example of how technology can help with environmental sustainability is represented for *Atelier Riforma* by *Re4Circular*, which reduces the time and resources needed for the management of discarded garments, preventing them from ending up in landfills. *YCMC* also highlights the importance of technology, stating:

"Our goal is to neutralize the carbon footprint of the fashion industry." (YCMC)

During the interviews, it emerged that many start-ups are focusing on monitoring and measuring the environmental impact of their operations. *Dresso* stated that it is already in

contact with some start-ups specializing in environmental impact measurement, which assess resource savings with each resale cycle. As soon as economic resources will allow, *Dresso* plans to begin measuring key environmental parameters such as CO_2 emissions, water savings, and the reduction of textile fibers used. Its long-term goal is to reduce CO_2 emissions in the second-hand market by 30%. Similarly, *Made in Carcere* has not yet implemented precise environmental impact measurements due to limited resources, but considers this objective a future priority.

Musthad, on the other hand, is already developing a standardized method for Life Cycle Assessment (LCA) that will provide brands with concrete data regarding CO_2 savings, water savings, and economic savings from their activities. In parallel, *Cloov* is creating an innovative tool that will provide brands with precise information on CO_2 savings linked to the number of rotations of items. Additionally, *Cloov*'s tool will focus on addressing and combating the rebound effect, which could be more prevalent in the fashion renting model due to shipping and returns, potentially increasing CO_2 emissions related to logistics and, consequently, raising the environmental impact.

A very interesting result was achieved by *YCMC*, which has already developed an effective environmental impact measurement system based on the "*Decarbonizer*," a tool that allows monitoring water savings resulting from clothing exchanges instead of purchasing new garments. Each exchange contributes to water savings, measured in a powerful unit: 2-liter water bottles. This system helps raise consumer awareness of the environmental impact of fashion by making the information easily understandable. According to *YCMC*, if even a small percentage of Italian companies adopted their system, it would be possible to save billions of water bottles.

Another crucial theme that emerged from interviews with *Rifò* and *Fortunale*, which are dedicated to second-hand fashion but whose main activity concerns sustainable production, is the importance of local production.

Rifò has adopted a zero-kilometer model, using recycled and recyclable materials recovered through its take-back service. The start-up has quantified the environmental savings of its sustainable practices using precise metrics: for instance, the production of recycled cashmere reduces water consumption by 66%, energy use by 67%, and CO_2 emissions by 85% compared to virgin production. Similarly, producing recycled wool

saves up to 99% of water, 76% of energy, and 92% of CO_2 compared to virgin wool production.

Fortunale, focuses on the use of pure yarns and natural dyes but places great value on local production too. Its commitment to a zero-kilometer supply chain is realized through the goal of creating 100% natural garments, such as those made with *Gentile wool from Puglia*, a material of the highest quality. Indeed, production takes place within a span of only 20 kilometer radius of the source, drastically reducing CO_2 emissions linked to the transport of raw materials. The start-up also highlights that, thanks to the absence of polyester in its garments, production reduces the environmental impact associated with plastic, cutting the use of this material by 70-80%. Another significant project by *Fortunale* involves planting pomegranate trees for every garment purchased by consumers, on land previously confiscated for criminal activities in Puglia. To date, 600 trees have already been planted, contributing to the offsetting of several quintals of CO_2 each year. ***Figure 7*** summarizes the efforts of various start-ups in monitoring and reducing their environmental impact, focusing on CO_2 emissions, water consumption, and waste reduction.

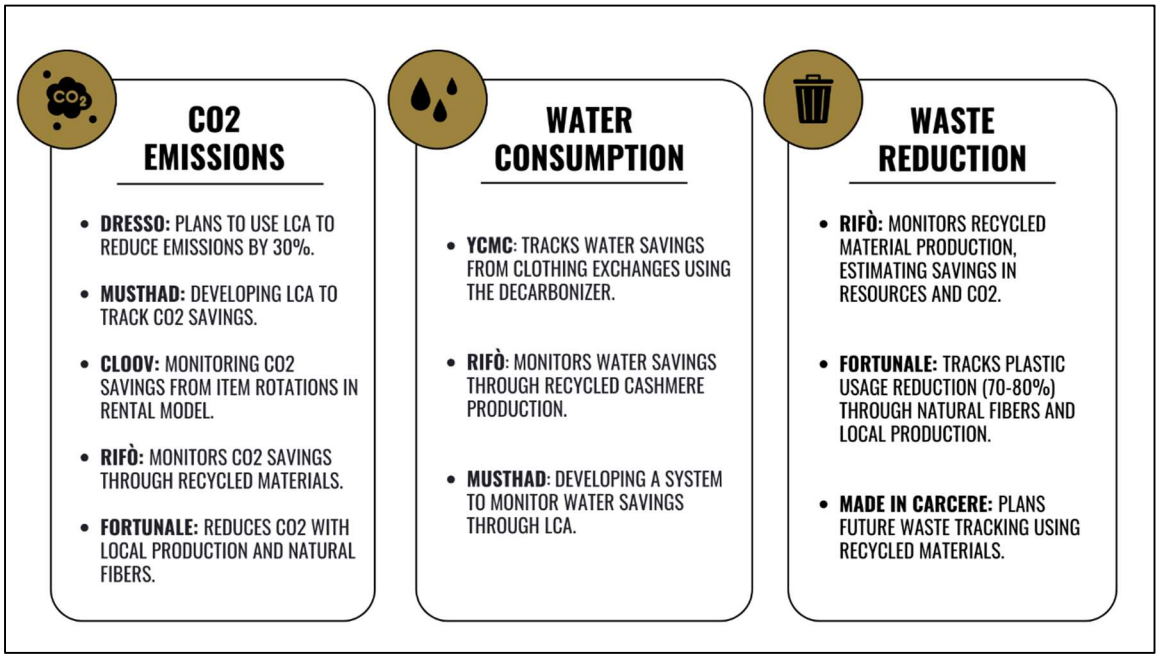

Figure 7 *- Environmental impact monitoring by start-ups*

4.2.2. The social impact

The second-hand fashion start-ups included in the sample have shown a remarkable commitment to improving their social impact, particularly through their involvement with social cooperatives and inclusion projects.

A significant example of this trend is *Atelier Riforma*, which defines itself as "socially oriented". The start-up stands out for its active engagement with social cooperatives, which aim to integrate people from disadvantaged backgrounds, such as migrants, women previously incarcerated and victims of violence.

"Social tailoring workshops are growing throughout Italy, not only giving second life to garments but also providing concrete opportunities for those involved in them." (Atelier Riforma)

Currently, *Atelier Riforma* collaborates with five social tailoring workshops, striving to ensure a stable and secure workflow. One such collaboration involves a tailoring workshop within the *Nemo Cooperative*, which offers employment opportunities for migrants from Africa. Here, people with prior experience in tailoring transform used jeans into backpacks, combining denim with traditional African fabrics. This process not only creates a unique and sustainable product but also carries deep cultural and historical meanings, reflecting the experiences of the people who contributed to its creation.

Musthad also works closely with social cooperatives and provides detailed documentation through its social balance sheet, ensuring transparency and awareness of how products are distributed and to whom they are directed. Similarly, *Fortunale* supports social inclusion in a tangible way: tree planting, associated with the sale of garments, is managed by a social cooperative that focuses on the reintegration of young people from disadvantaged backgrounds, such as those involved in the youth justice system.

"The young people involved in the program learn agricultural techniques, such as pruning and grafting, and many have already found employment opportunities through this initiative." (Fortunale)

Made in Carcere is a non-profit organization registered in the *National Single Register of Third Sector Entities* (RUNTS, *Registro Unico Nazionale del Terzo Settore*) and represents a pioneering example in the social start-up landscape. It is a *Third Sector Entity*

(ETS, *Ente del Terzo Settore*) distinguished by its commitment to the integration and inclusion of incarcerated individuals or those subjected to restrictions on personal freedom.

"Our operating model is based on the concept of "second chances", not only for discarded fabrics but also for people, who are trained and involved in productive activities that allow them to acquire professional skills, receive a regular salary, and rediscover their value and dignity." (Made in Carcere)

Made in Carcere has shown that when incarcerated people are supported in their social reintegration process, recidivism rates, which can reach up to 80%, drastically decrease. As a result, the reduction in recidivism leads to a decrease in the overall costs of the prison system, which amounts to approximately 60,000 euros annually for each inmate, contributing to a positive impact on the economy.

In the context of social innovations, *Made in Carcere* recently introduced an innovative metric, the *Gross Internal Wellbeing* (BIL, *Benessere Interno Lordo*), designed to measure the social impact of its projects. While traditional impact metrics mainly focus on the environment, the BIL aims to measure the relational and human impact of social inclusion initiatives, focusing on the well-being of individuals involved in reintegration programs. The BIL project currently involves 65 incarcerated individuals and 8 partners in Southern Italy, with the goal of creating new jobs and transferring skills to local cooperatives through the creation of a "Social Academy." The BIL was developed in collaboration with universities and research centers and aims to monitor the impact on individuals, communities, and stakeholders involved, providing a comprehensive assessment of the social effects of *Made in Carcere's* activities. A further step is the creation of a Research Center, which will collect and analyze empirical data on ongoing projects, serving as a reference point for the continuous improvement of operating models. The center will also act as a platform for disseminating these best practices nationwide, expanding the social inclusion model of *Made in Carcere* to new areas and vulnerable categories.

Another notable example of a start-up combining social commitment and sustainability is *Rifò*. The "*Nei Nostri Panni*" project, launched in 2022, addresses two crucial challenges: preserving local artisan traditions, particularly textile craftsmanship in the textile district of Prato, and creating employment opportunities for migrants in vulnerable situations.

“Through collaborations with local textile companies, the project involved five migrants in 2022, training them in the art of ‘cenciaiolo’, which involves recovering and sorting fabrics for reuse. At the end of the internship, all participants were employed, a success that highlighted the effectiveness of the project in integrating migrants into the workforce.” (Rifò)

In 2023, the project expanded, involving seven new participants, with growing demand from companies now requesting internships in new sectors such as weaving and knitting. *Rifò* also increased the monthly salary of participants from €500 to €900, ensuring them adequate economic support and facilitating their integration. This project demonstrated the start-up’s growing interest in traditional skills and sustainability in the textile sector.

Rifò has also adopted responsible purchasing policies to monitor supplier compliance with ethical and sustainable principles. In 2023, audits were conducted on three suppliers, with 28% non-compliance, which was addressed through a corrective action plan. From the social responsibility perspective, *Rifò* introduced a Supplementary Agreement in 2022 that offers benefits to employees, such as flexible hours, healthcare, annual bonuses, smart working, and transport reimbursements. The company has also worked on gender equality, with 72% of the team being women and zero pay disparity. *YCMC* shares this vision, adopting a gender equality plan that promotes gender equity within the company.

In 2023, *Rifò* also contributed to social projects by donating 20 garments to the *Associazione Tumori Toscana*, which provides free home care to cancer patients, highlighting its commitment to the local community. Similarly, *Micolet* developed a clothing donation system that facilitates large-scale redistribution. Sellers can donate unsold items to NGOs or individuals, contributing to waste reduction and promoting social integration.

The growing social commitment of start-ups in the fashion sector translates into an increasing focus on sustainability and inclusivity, both towards consumers and market dynamics. Several start-ups are trying to change the relationship between consumers and products, adopting approaches that reflect values of social responsibility, environmental awareness, and personalization.

"Personalization of inclusivity is definitely something we focus on." (YCMC)

YCMC is one of the most active start-ups in this regard. Its AI-based assistant, *Ami*, offers a fully inclusive and personalized experience, without labels or barriers that might cause discomfort for the user. The service stands out for its absence of prejudice, allowing anyone to explore their style identity with complete peace of mind. The same principle is reflected in the internal culture of the company, which daily promotes these values within the office.

Dresso, while not yet directly focused on social sustainability, considers allocating a percentage of its transactions to social sustainability initiatives, such as supporting local community projects and educational programs. While it recognizes that its current turnover does not fully justify this commitment, its prospects for the coming years suggest that this initiative will become a significant component of its activities.

In summary, as illustrated in ***Figure 8***, the fashion start-ups discussed are each making significant contributions to social inclusion and social responsibility through innovative practices that prioritize the well-being of individuals and communities. The initiatives span various sectors, ranging from the integration and empowerment of disadvantaged individuals into the workforce to the adoption of ethical business practices, as well as the promotion of gender equality and charitable efforts.

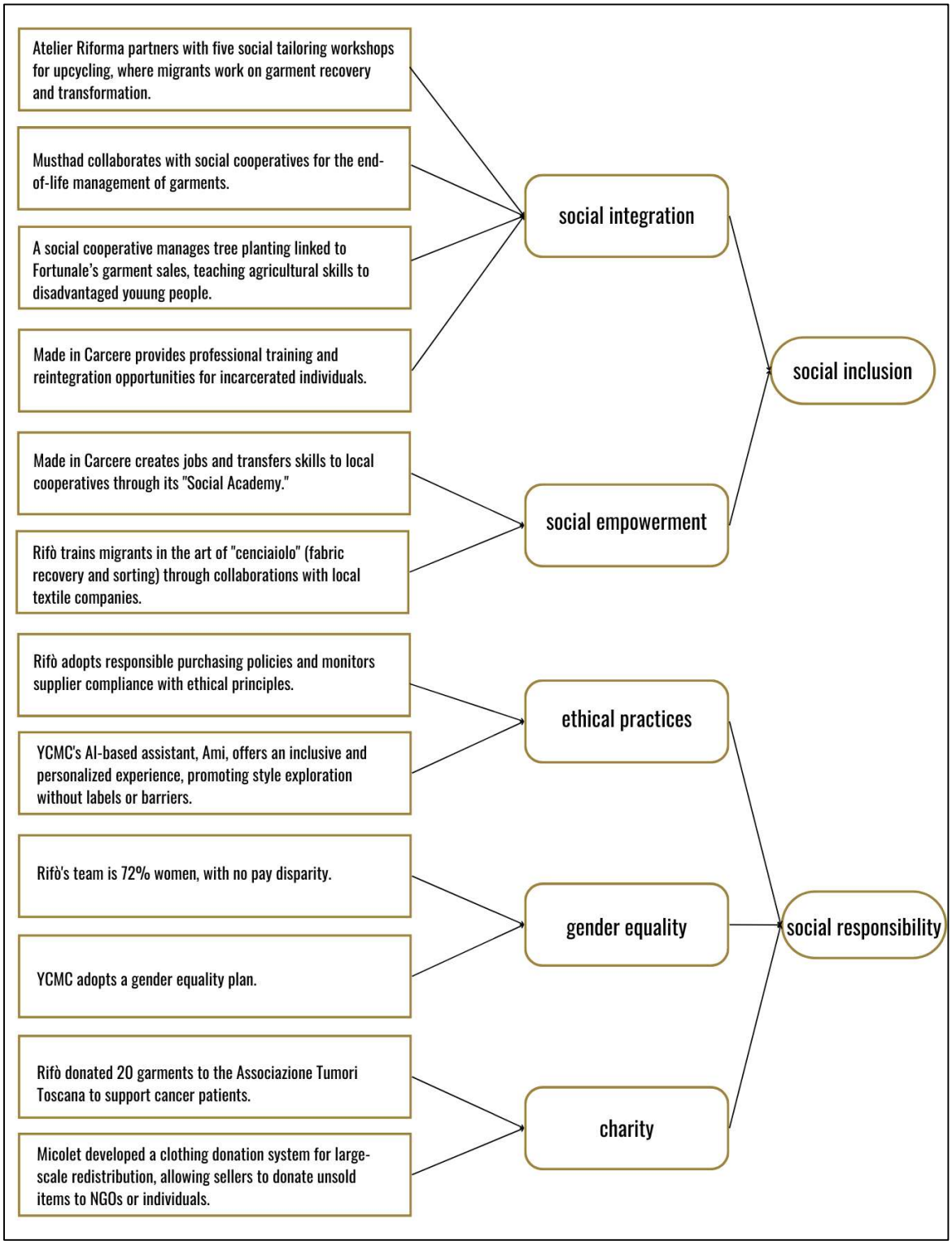

Figure 8 *- Overview of the social impact initiatives of second-hand fashion start-ups*

4.2.3. Contributions to SDGs

Achieving the SDGs is a crucial aspect in the analysis of the second-hand fashion start-ups included in the sample of this thesis. The companies not only aim to promote environmental sustainability, but they also match with several social and economic goals, generating a positive impact across various dimensions. Although all 11 start-ups in the sample have demonstrated the ability to combine economic commitments with social and environmental ones, only 4 of them – *Atelier Riforma*, *YCMC*, *Made in Carcere*, and *Rifò* – have specified directly which of the 17 SDGs they contribute to (***Table 6***). The definitions of the SDGs referenced in this section are taken from the official *United Nations* website, which is considered the primary source for such information (United Nations, 2015).

SDG12 and *SDG9* are two of the main goals to which all four start-ups contribute. These SDGs represent the central pillars of this research, as *SDG12* concerns responsible consumption and production, with the goal of reducing waste generation and promoting sustainable business practices, encouraging more efficient and environmentally friendly production and consumption models. *SDG9*, on the other hand, focuses on innovation and the development of resilient infrastructure, promoting inclusive and sustainable industrialization, with particular attention to technological evolution and inclusive growth.

SDG12, as emphasized by *YCMC* and *Atelier Riforma*, is the main objective for business models based on the circular economy. *Made in Carcere* also contributes to this SDG through the use of discarded fabrics, which are "requalified and given a second life, preventing them from ending up in landfills", thus reducing waste and promoting a longer lifecycle for textile materials. *Rifò* is committed to "producing clothing made from recycled and recyclable materials," as well as directly collecting post-consumer textile waste through a recovery service. In 2023, *Rifò* reached 14% of post-consumer recycled fibers, including wool, cashmere, and denim, collected through the recovery service, meeting its set target.

Furthermore, *Rifò* contributes to *SDG9* by "innovating production processes, recovering the ancient tradition of textile recycling": in 2023, the start-up achieved a significant result, using 85% of recycled textile fibers in production, surpassing the set target of 78%. *YCMC's* model, which promotes exchange through technology, and *Atelier Riforma*, which applies the patented *Re4Circular* technology, also contribute to this goal. *Made in Carcere* applies this objective through the digital evolution of management systems and the

improvement of multichannel platforms with companies and stakeholders, while also working on developing new research projects in social innovation, expanding its efforts to support other *Third Sector Entities* to promote the development, support, and replicability of its model.

SDG5, *SDG8* and *SDG11* are important in the second-hand fashion sector as well. *SDG5* deals with the elimination of gender discrimination, violence, and harmful practices, ensuring equal opportunities and access to resources for women and girls. The start-ups contributing to this goal are *Made in Carcere*, *Atelier Riforma*, *YCMC* and *Rifò*. *Made in Carcere* stands out for its commitment to gender equality, with over 90% of women involved in its projects. The three start-ups also contribute to *SDG8*, which generally aims to promote sustainable economic growth, create decent work opportunities, and reduce income and employment inequalities.

SDG11 is achieved by *Made in Carcere*, *Rifò*, and *Atelier Riforma* and focuses on creating more sustainable cities and communities, improving living conditions, and promoting the efficient use of resources to reduce the environmental impact of urban areas. *Rifò* contributes to this goal by creating job opportunities for vulnerable and fragile individuals through internships, professional training courses, and employment placement in local textile companies. In 2023, *Rifò* created 12 job opportunities for vulnerable people, going beyond the target of 10.

SDG10 and *SDG13* are goals achieved by some start-ups in the sample, too. *Made in Carcere* emphasizes its commitment to *SDG10*, which focuses on reducing social, economic, and political inequalities within countries, stating:

"We are constantly working to offer equal conditions and a second chance to women, men, and minors in detention." (Made in Carcere)

SDG13 is central for *YCMC*, as it requires immediate and significant actions to address climate change, reduce greenhouse gas emissions, and strengthen resilience to climate-related impacts.

"We achieve SDG13 by raising awareness about environmental impact, providing the tools necessary to understand how one's choices affect climate change. We promote responsible consumption education with the Decarbonizer tool, which allows users (or

companies) to measure their impact. If a person knows that their actions can save enough water to satisfy the thirst of five people, they are more likely to be motivated to take concrete actions." (YCMC)

As shown in ***Table 6**, Made in Carcere's* commitment to SDGs is particularly significant (contributing to 13 out of 17 SDGs) as it operates under the supervision of *Officina Creativa*, a cooperative dedicated to combating poverty (*SDG1*) and hunger (*SDG2*). *Officina Creativa* also adheres to *SDG3*, with particular attention to personal growth through bioimpedance and energy field measurements, as well as self-esteem and confidence questionnaires. *SDG4*, on quality education, is also pursued through training activities in schools, businesses, multinationals, and non-profit foundations. According to *Made in Carcere*, *SDG13* is closely linked to *SDG15*, as the former focuses on combating climate change and its consequences, while the latter centers on the sustainable management of forests and the fight against desertification and land degradation. *Officina Creativa*'s "green" commitment in the past year includes the installation of cutting-edge photovoltaic systems on the roofs of the headquarters, electrifying the company's fleet, and creating urban gardens on the operational office's terraces. In line with *SDG17*, *Partnerships for the Goals*, *Officina Creativa* points out its constant collaboration with the *Third Sector Entities*, Public Administration, private sector and civil society, creating inclusive partnerships based on shared principles and values. This goal matches *YCMC's* model, which, although not explicitly mentioned during the interview, emphasized its work on various partnerships with institutions and companies in the sustainability field.

Overall, as shown in ***Table 6***, the start-ups in the sample contribute significantly to a variety of SDGs, demonstrating a tangible commitment in the social, environmental, and economic fields.

***Table 6** - Alignment of start-ups with the SDGs.*

	Made in Carcere *(Officina Creativa)*	***YCMC***	***Rifò***	***Atelier Riforma***
SDG1: No Poverty *"End poverty in all its forms everywhere."*	✓			
SDG2: Zero Hunger *"End hunger, achieve food security and improved nutrition, and promote sustainable agriculture."*	✓			

Table 6 *(Continue)*

	Made in Carcere *(Officina Creativa)*	***YCMC***	***Rifò***	***Atelier Riforma***
SDG3: Good Health and Well-Being *"Ensure healthy lives and promote well-being for all at all ages."*	✓			
SDG4: Quality Education *"Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."*	✓			
SDG5: Gender Equality *"Achieve gender equality and empower all women and girls."*	✓	✓	✓	
SDG6: Clean Water and Sanitation *"Ensure availability and sustainable management of water and sanitation for all."*				
SDG7: Affordable and Clean Energy *"Ensure access to affordable, reliable, sustainable, and modern energy for all."*				
SDG8: Decent Work and Economic Growth *"Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all."*	✓	✓	✓	
SDG9: Industry, Innovation, and Infrastructure. *"Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation."*	✓	✓	✓	✓
SDG10: Reduced Inequality. *"Reduce inequality within and among countries."*	✓	✓		
SDG11: Sustainable Cities and Communities. *"Make cities and human settlements inclusive, safe, resilient, and sustainable."*	✓		✓	✓
SDG12: Responsible Consumption and Production. *"Ensure sustainable consumption and production patterns."*	✓	✓	✓	✓
SDG13: Climate Action. *"Take urgent action to combat climate change and its impacts."*	✓	✓		
SDG14: Life Below Water *"Conserve and sustainably use the oceans, seas, and marine resources for sustainable development."*				

Table 6 *(Continue)*

	Made in Carcere *(Officina Creativa)*	***YCMC***	***Rifò***	***Atelier Riforma***
SDG15: Life on Land *"Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss."*	✓			
SDG16: Peace, Justice, and Strong Institutions *"Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels."*				
SDG17: Partnerships for the Goals *"Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development."*	✓			

5. Discussion

This section discusses the key findings of this study, comparing them with existing literature.

The first relevant aspect is that the CBM patterns defined by Lüdeke-Freund et al. (2019) were used as a framework to categorize the most common practices and business strategies adopted by the start-ups in the sample. The results show that all the start-ups in the sample adopt at least one of the patterns of “reuse and redistribution” or “recycling”. In particular, the “reuse and redistribution” pattern (Lüdeke-Freund et al., 2019) was observed as a central or secondary activity in all the start-ups in the sample, reflecting the core principle of the second-hand sector itself. *Fortunale* and *Made in Carcere*, however, focus exclusively on the “recycling” pattern. The “repair and maintenance” pattern (Lüdeke-Freund et al., 2019), although less common, was observed in some start-ups such as *Rifò*, which offers free repair services for returned items, extending their useful life and thus reducing the need to purchase new products. This aligns with the concept of "creating value from waste" (Bocken et al., 2014), supporting the idea of extending the life cycle of existing products instead of introducing new products into the production cycle. The “cascading and repurposing” pattern (Lüdeke-Freund et al., 2019), was not observed in the analysis, which could be attributed to the specific choices of the sample. While this pattern appears to be less prevalent in the sample, other start-ups may be involved in downcycling and repurposing textiles for different uses. However, start-ups like *Rifò* and *Fortunale*, which focus on fiber recycling and material recovery, could potentially explore the adoption of cascading practices in the future. This approach would allow for greater integration between upstream and downstream phases of the supply chain, as well as industrial symbiosis (Lüdeke-Freund et al., 2019), further enhancing material recovery and reuse, and contributing even more to "closing resource loops" (Bocken et al., 2016).

Another relevant insight is that the results support the thesis proposed by De Angelis (2022), who considers CBMs as *Resilient Adaptive Complex Systems* (RCAs). The adaptability observed in the business models of the start-ups, which have increasingly turned to collaborations with fashion industry companies, modifying their models into B2B2B and B2B2C, reflects the intrinsic flexibility of CBMs. The start-ups have adapted to a context in which Extended Producer Responsibility regulations are becoming more

stringent, confirming the ability of CBMs to evolve in response to changing regulatory conditions and to address both local and global challenges (De Angelis, 2022)

A third relevant reflection is that the innovative business models of the cases analyzed share several characteristics with the CBM archetypes of start-ups developed by Henry et al. (2020): platform-based, service-based, nature-based, waste-based and design-based models (Henry et al., 2020). The most observed archetype in the CBMs of the analyzed cases is the platform-based model, reflecting the growing trend of digital marketplaces in the fashion industry that facilitates the redistribution of products. However, findings show that the integration of multiple CBM archetypes within the same business model is significantly present in the sample, highlighting the adaptability to address various sustainability challenges and reflecting the dynamic nature of the circular economy.

Another crucial aspect concerns the role of digital innovation in the evolution of business models of second-hand fashion start-ups. Digital technologies, such as platforms and mobile technologies, are used by all the start-ups in the sample, supporting Ikram (2022)'s thesis, which highlights how the adoption of these technologies is changing the relationship between fashion brands and consumers. Digital technologies not only facilitate the sale and purchase of second-hand items but also enable greater personalization and optimization of services, as demonstrated by the results. The start-ups are increasingly using technologies such as AI to analyze consumer aesthetic preferences and predict future trends, thus supporting the thesis of Thomassey & Zeng (2018). The cases analyzed have demonstrated an interest in making the shopping experience smoother and more targeted, as emphasized by McKinsey & Company (2025), which observes how AI is reshaping purchasing behaviors by driving consumers toward resale channels for better value. Furthermore, the issue of garment traceability, which emerged as one of the main challenges for second-hand start-ups in the sample, has prompted many to adopt blockchain solutions, supporting the arguments of Huynh (2022) and Pérez et al. (2020), who emphasize how this technology can ensure transparency and security in transactions and logistics processes.

6. Conclusion

This study explored the innovative business models adopted by start-ups in the second-hand fashion sector and analyzed the impact these models have on sustainability. In response to the growing need to reduce the environmental and social impact of the fashion industry, the start-ups analyzed are making a significant contribution to the transition towards more sustainable models, promoting circularity through practices such as reuse, repair and recycling of garments.

The findings show that all the start-ups analyzed have integrated circular economy into their operations, adopting advanced digital technologies such as blockchain traceability, AI, and digital platforms. Such innovations have a significant impact on environmental sustainability, helping reduce the consumption of natural resources and extend the useful life of products. Furthermore, the start-ups are progressively implementing systems to monitor and measure the effectiveness of their sustainability actions, allowing for continuous assessment of the impact of their practices. In addition to addressing ecological challenges, the innovative business models also play a central role in social inclusion by promoting local community resilience and empowering individuals, creating job opportunities and fostering a positive social impact. These efforts align with several of the *United Nations Sustainable Development Goals* (SDGs), particularly those related to *SDG12: Responsible Consumption and Production* and *SDG9: Industry, Innovation, and Infrastructure*. Ultimately, the integration of circular business models and innovation into start-up operations paves the way for the creation of a new economy that values both human and material resources and promotes transparency throughout the supply chain.

This study contributes to the literature on circular business models (CBMs) and innovation, offering new empirical insights into how these models are applied within the second-hand fashion sector, and their role in promoting sustainability. In particular, this work extends the concept of business model innovation (BMI) by exploring its application specifically within start-ups in the second-hand fashion sector. While previous studies have explored business model innovation within start-ups, they have typically focused on a wide range of industries or on more established fashion companies. This study is novel in that it investigates how start-ups in the second-hand fashion sector, a rapidly growing but underexplored area, are leveraging innovative, circular business models to promote sustainability. This research also provides empirical insights into how digital technologies,

such as blockchain and AI, are being integrated into the business model innovation process, offering a novel perspective on the intersection of technology and sustainability in second-hand fashion.

The research is useful to several stakeholder groups involved in fashion and sustainability. Firstly, the findings offer valuable insights for managers of both start-ups and established companies in the fashion and second-hand fashion sectors looking to innovate their business models sustainably. Policymakers can also benefit from these results, as the study provides useful suggestions for designing policies that encourage the adoption of circular technologies and support start-ups through targeted regulations, such as extended producer responsibility (EPR). For academics and researchers, the study represents a significant empirical contribution to the debate on the circular economy in the fashion sector, specifically highlighting the role of start-ups in driving innovation. It opens the door for further research on how circular business models (CBMs) can be scaled within the start-up ecosystem.

While the study offers significant theoretical and practical contributions, it presents several limitations that should be considered. The sample analyzed, consisting of 11 start-ups, is relatively small, and its geographical focus limits the ability to extend the results to all companies in the sector. The research adopts a qualitative approach, which allows for in-depth analysis of individual cases but does not permit general conclusions applicable to all start-ups in the sector. However, the qualitative methodology was chosen precisely to provide a more detailed understanding of the internal dynamics and innovative practices of start-ups, rather than to offer general answers applicable to every reality in the sector. Another limitation concerns the difficulty in accessing detailed sustainability data: many of the sampled start-ups are still in the development stages and lack the resources to collect and track quantitative metrics, which would have complemented the findings emerging from this study.

In light of the limitations, there is a clear need for future studies that involve larger and more diversified samples, including other geographic regions and a variety of start-ups, in order to expand the understanding of the impact of CBMs in the second-hand fashion sector. Quantitative studies on sustainability impact could be particularly useful to validate the findings and provide a solid foundation for supporting more informed business and policy decisions. Furthermore, another potential area for future research lies in exploring

the impact of emerging technologies, such as blockchain and artificial intelligence, on optimizing CBMs in the fashion sector. Future research could delve into how digital technologies can further improve traceability, transparency, and operational efficiency, fostering greater trust from consumers and supply chain actors. A final potential future direction could involve a deeper examination of public policies and existing regulations to identify how these can accelerate the transition to a more sustainable system, supporting the broader adoption of CBMs in fashion companies.

In conclusion, the emerging models of second-hand fashion start-ups are a powerful driver of social, environmental and economic innovation, accelerating structural change in the fashion sector and contributing to a global transition towards more responsible and sustainable consumption practices.

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ChatGPT Plus and Deepl, AI-based tools, were used to improve the readability and language of the work.

Appendix

***Appendix A**. Skeleton of semi-structured interview questions*

Section	Question
1. General Description and Business Model Innovaton	*Could you briefly describe your start-up and its business model?*
	What aspects of your business model are innovative and how? What makes it unique?
2. Alignment with Sustainability	*Is your business model aligned with specific Sustainable Development Goals? How?*
	What KPIs do you use to monitor the sustainable impact of your business model?
3. Environmental Impact and Circularity	*How does your business model contribute to circularity in the fashion industry?*
	How does your business model help reduce CO_2 emissions compared to the lifecycle of a new garment? Do you measure or track the emissions saved through your activities?
	Do you use any other metrics, apart from those mentioned, to measure the environmental impact of your activities?
4. Social Impact and Responsibility	*How does your business model contribute to generating a positive social impact and encouraging a shift towards more responsible consumption?*
5. Long-Term Goals and Innovation	*What are your long-term sustainability goals?*
	Do you plan to implement new initiatives or technologies to further improve your sustainable impact?
6. Additional Considerations	*Is there anything you would like to add, or any specific area we should be aware of, in order to better understand your company and its sustainable potential?*