







Toward the European Union 2030 Strategy for Textiles: A Review

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Abstract. The European Union 2030 Strategy for Textiles is a framework aimed at creating a sustainable and circular textile industry. This strategy includes a vision for 2030 where textile products are long-lived, recyclable, and made of recycled fibers while being free of hazardous substances and compliant with social rights. However, the strategy also presents challenges that require the adoption of comprehensive transformations across supply chains, governments, and societies. This study analyzes the scientific literature on circular and sustainable textile industry initiatives within the European Union's Strategy for Sustainable and Circular Textiles. A systematic literature review has been carried out to combine scientific insights with legislative analysis. Results show that more research is needed to determine the optimal technology for a Digital Product Passport for textiles (Action #1.2); and that issues such as standardizing consumer information and engagement in the circular economy remain unresolved for empowering consumers in the textile green transition (Action #2.1); that the Extended Producer Responsibility for textiles still needs to be examined from various perspectives due to upcoming legislative implementations (Action #3.1); and that understanding how to implement circular business models while maintaining profitability is crucial for textile companies (Action #4.3). Managers and policymakers can use this article to better understand how scientific literature can support the implementation of the European Union's Strategy for Textiles.

Keywords: Circular economy · Sustainability · EU Textile Strategy · Textile industry

1 Introduction

Contributors to environmental degradation worldwide, impacting various aspects of the environment through its extensive supply chain [1]. The environmental impact of the textile industry is profound and multifaceted. In 2021 this industry was responsible for the fifth-highest greenhouse gas emissions among sectors, the fourth-highest negative impact on the environment and climate change, and the third-highest water and land

usage when viewed from a global life cycle perspective [1]. There is therefore a growing movement and interest from governments, users, and companies towards sustainable practices within the textile industry to address these environmental concerns. Sustainable practices include adopting more sustainable materials such as organic cotton or recycled polyester, implementing water-efficient and cleaner production technologies, reducing energy consumption through renewable energy sources, developing recycling programs to manage textile waste, and encouraging consumer behavior towards more sustainable fashion choices [2].

In this context, the European Union has recently established the European Union's Strategy for Sustainable and Circular Textiles. Adopted in March 2022, this strategy aims to present a vision and create a coherent framework for the green transition of the textile ecosystem: by 2030, textile products placed on the EU market shall be long-lived and recyclable, largely made of recycled fibers, free of hazardous substances and produced in respect of social rights [3]. The compliance required by businesses to apply the strategy presents significant challenges. It necessitates a holistic transformation at the supply chain, governmental, and societal levels, encompassing crucial considerations from diverse viewpoints. Given the complexity and multifaceted challenges embedded within the strategy proposed by the European Union, a thorough analysis of the measures that stakeholders, society, and governments must undertake is imperative. Nonetheless, there remains ambiguity regarding the extent and way scholarly literature has examined so far the actions recommended by this strategy.

Therefore, the objective of this study is to analyze the scientific literature on circular and sustainable initiatives in the textile industry through the lens of the European Union's Strategy for Sustainable and Circular Textiles theoretical framework. To achieve this goal, a systematic literature review has been conducted. The article is organized as follows: Sect. 2 provides background information on The European Union's Strategy. Section 3 explains the methodology used in the study. Section 4 presents the results of the content-based analysis of the literature, which are discussed in Sect. 5 together with conclusions, and managerial and policy recommendations.

2 Background: The European Union's Strategy for Sustainable and Circular Textiles

Textiles have significant environmental effects and rank high in terms of their impacts on climate change, water and land use, and raw material consumption. Thus, the EU has flagged textiles as a sector with a high potential for circularity [4]. The definition of 'textile' in this research was sourced from [5]. It is important to note that while 'textile' is often used alongside related terms in the fashion industry, this specific term refers to materials made through weaving, knitting, crocheting, or any other means of fiber or yarn construction. Textiles can be made from natural fibers, such as cotton, silk, and wool, or synthetic fibers, such as polyester and nylon.

The European Union's Strategy for Sustainable and Circular Textiles is specifically designed to address the environmental concerns associated with the production and consumption of this industry. This strategy adheres to the guidelines outlined in the European Green Deal, the new Circular Economy Action Plan, and the Industrial Strategy. The

European Green Deal was introduced in 2019 as a growth strategy to address the challenges faced by the European Union. It aims to establish a society that is both equitable and prosperous, with a modern and competitive economy that is resource efficient. The primary goal is to achieve net-zero greenhouse gas emissions by 2050 while also promoting economic growth and competitiveness without a direct correlation with resource consumption [6]. Considering the importance of the United Nations 2030 Agenda and the Sustainable Development Goals (SDGs) in implementing this strategy, SDGs have also been deemed a critical component of the Textile Strategy. The new Circular Economy Action Plan (CEAP) and new Industrial Strategy recognize textiles as a crucial product value chain, requiring an immediate and significant shift towards sustainable and circular production and consumption [7]. A key aim of these new policy frameworks is to stimulate the development of lead markets for climate-neutral and circular products in the EU and beyond.

The European Union's Strategy for Sustainable and Circular Textiles requires alignment and cooperation from stakeholders at all levels (EU, national, regional, local, and international) and aims to improve industrial competitiveness and encourage innovation in the sector aiming to transform textile production and consumption across their life-cycles through coordinated actions [3]. It comprises four action groups: *Actions under the Ecodesign for Sustainable Products Regulation following its adoption, other actions on sustainable production and consumption, actions on waste challenges, and actions to enable the transition*. The key actions for each group are listed in Table 1.

Table 1. EU Textile Strategy - COM (2022) 141 final [3]

Group code	Action Group	Action Code	Key actions
A1	Eco-design	A1.1	Mandatory Performance requirement
		A1.2	Digital Product Passport
		A1.3	Disclosure of the number of discarded products by large enterprises and their subsequent treatment, and measures on banning the destruction of unsold textiles
		A1.4	Mandatory requirements concerning green public procurement and Member State incentives

(continued)

Table 1. (continued)

Group code	Action Group	Action Code	Key actions
A2	Other actions on sustainable production and consumption	A2.1	Empowering consumers in the green transition and ensuring the reliability of green claims
		A2.2	Review of the Textile Labelling Regulation and considering the introduction of a digital label
		A2.3	Revision of the EU Ecolabel criteria for textiles and footwear
		A2.4	Product Environmental Footprint Category Rules for apparel and footwear
		A2.5	Initiative to address the unintentional release of microplastics from textile products
		A2.6	Review of the Best Available Techniques Reference Document for the Textiles Industry
		A2.7	Enforcing the Corporate Sustainability Due Diligence Directive in the textile sector
A3	Actions on waste challenges	A3.1	Extended Producer Responsibility requirements for textiles with eco-modulation of fees and measures to promote the waste hierarchy for textile waste
		A3.2	Launch of work on the setting of preparing for re-use and recycling targets for textiles
		A3.3	Enforcing the restrictions on exports of textile waste outside the OECD and developing criteria for distinguishing waste from second-hand textile products
A4	Actions to enable the transition	A4.1	Launch of the Transition Pathway for the Textiles Ecosystem

(continued)

Table 1. (continued)

Group code	Action Group	Action Code	Key actions
		A4.2	Guidance on supporting uptake and partnerships for the circular economy between social enterprises and other actors, including in the textile sector
		A4.3	Guidance on circular economy business models featuring the textile sector
		A4.4	2023 - Launch of #ReFashionNow
		A4.5	New European Bauhaus to support sustainable textiles
		A4.6	Horizon Europe calls to support R&D in textiles
		A4.7	Adoption of common industrial technology roadmap on circularity
		A4.8	Criteria for circular manufacturing of apparel under the Taxonomy Regulation
		A4.9	Work on skills for the textiles ecosystem within the European Skills Agenda and the renewed European Alliance for Apprenticeships
		A4.10	Strengthening of market surveillance through cooperation between enforcement authorities and launch of EU Toolbox against counterfeiting

3 Methodology

The objective of the review is to provide a comprehensive analysis of the literature available while ensuring that all relevant materials were considered and evaluated for their pertinence to the study. The methodology applied involved the utilization of a systematic literature review approach based on the identification of specific keywords. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to ensure complete transparency and clarity (Fig. 1).

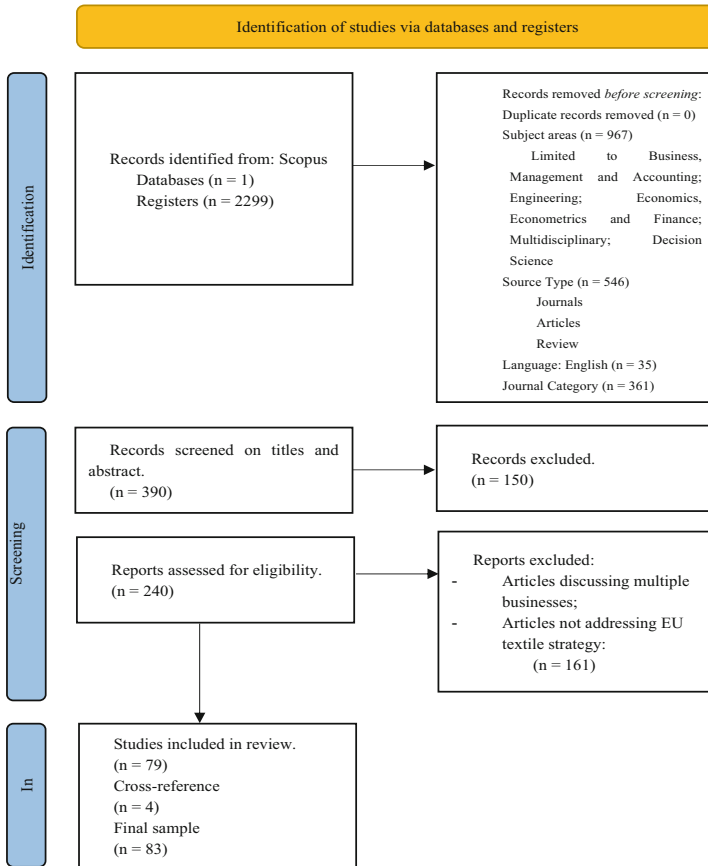


Fig. 1. Prisma flow diagram - literature review

First, two keyword sets were used to locate pertinent research. The first set of bounded papers is linked to circular economy and sustainability in the textile, fashion, clothing, and apparel sectors. To compile the second group of words, a thorough analysis was undertaken to grasp the goals and initiatives outlined in the European Union's Strategy for Sustainable and Circular Textiles. The search was limited to journals written in English and covered the areas of Business, Management and Accounting, Engineering, Economics, Econometrics and Finance, Multidisciplinary, and Decision Science. To narrow down the topic, only journals classified as Q1 according to the SCIMAGO RESEARCH CENTERS classification were included. To provide a detailed account, after an initial search and selection process, a total of 390 articles were identified for screening. The inclusion criteria comprised articles that either demonstrated the benefits or highlighted the ongoing issues associated with the action.

During the screening process, titles and abstracts of each article were read to determine whether they met the inclusion criteria. Articles that did not meet the inclusion criteria were excluded, leaving a final set of 240 articles for full reading. Articles that

discussed multiple businesses or did not address the key actions of the EU textile strategy were excluded. As a result, the set of articles for this research consists of 79. Furthermore, cross-referencing [8] was employed to supplement the final set, which resulted in the inclusion of four additional papers. Consequently, 83 articles were included in this research.

Descriptive-statistical and content-based analyses are employed to analyze the articles under investigation. In order to effectively analyze and discuss the strategy, due to space constraints, one action from each group was selected: digital product passport (A1.2); empowering consumers in the green transition and ensuring the reliability of green claims (A2.1); Extended Producer Responsibility requirements for textiles with eco-modulation of fees and measures to promote the waste hierarchy for textile waste (A3.1); Guidance on circular economy business models featuring the textile sector (A4.3). This approach will allow us to provide a more detailed and comprehensive analysis of each action.

4 Results

4.1 Descriptive Analysis

The subject of consumer empowerment emerges as the dominant theme within the scope of our research. This area of focus is represented by a significant plurality, encompassing 37% of the entire sample, which translates into 31 academic papers. This suggests a strong research interest and academic inclination towards strategies and practices that aim to enhance consumers' role in the sustainable consumption of textiles. Following closely, the concept of Business Models within the textile industry emerged as the second most frequent topic of discussion among the analyzed articles. With 24 papers dedicated to exploring this theme, it accounted for roughly 29% of our sample. This substantial proportion highlights the critical examination and scholarly attention given to evolving business strategies and operational frameworks implemented in the textile sector. The notion of a Digital Product Passport holds the position of the third most prominent topic in our sample, with it being the central subject of 22 papers, constituting 26% of the sample. This indicates a burgeoning interest in the digitalization of product information, which is becoming increasingly relevant in the context of environmental sustainability. Lastly, the area concerning Extended Producer Responsibility (EPR) is addressed in six papers, making up 7% of our total sample. Although it represents a smaller fraction than other themes, its presence in the sample underscores its importance as an emerging area of focus.

4.2 Content-Based Analysis

Action 2.1: Empowering Consumers

The action “A2.1 *Empowering consumers in the green transition and ensuring the reliability of green claims*” aligns with the objectives of the New Consumer Agenda and the Circular Economy Action Plan, both of which are consistent with the European Green Deal. Promoting consumer empowerment is an essential element of the sustainable product policy framework. To achieve this, enhancing consumer participation in the

circular economy is crucial, especially by providing more information on the durability and reparability of specific products before they are purchased. Additionally, strengthening consumer protection against unfair commercial practices that hinder sustainable purchases, such as greenwashing (i.e., deceptive environmental claims), is necessary. By promoting transparency and accountability in product information, consumers can make informed choices that align with their values and that support sustainable practices. According to the EU 2030 textile strategy, implementing clear labeling requirements and standards for eco-friendly products will enable consumers to easily identify and select environmentally responsible options, thus contrasting 'greenwashing' and 'premature obsolescence'. Additionally, providing incentives for businesses to design durable, repairable, and recyclable products will further encourage a shift towards a more circular economy.

The literature has explored Action 2.1 from various perspectives, including consumers' empowerment and participation, increasing awareness at the societal level, and companies' actions regarding claims, obstacles, and barriers. First, many studies have investigated consumers' interests and behaviors during textile purchases. The desire for social prestige through the purchase of sustainable and ethical products now extends beyond fashion trends and is aligned with the heightened value of environmental causes of COVID-19 [9].

While there is evidence that consumers adopt sustainable terminology in fashion, Ritch, 2022 [10] demonstrated that concern for sustainability is limited by the knowledge of sustainability itself. The complexity of the issues surrounding sustainable fashion makes consumers feel overwhelmed. Consumers are less likely to reduce their clothing consumption if they have doubts about the sustainability claims made by fashion companies [11]. It is necessary to conduct studies to comprehend the effectiveness of learning programs in shaping the green behavioral practices of students at various educational levels, ranging from school to university [12]. Consumers' knowledge and awareness of the Circular Economy (CE) are influenced by the government's level of awareness and knowledge [13]. Harris et al. [14], stress the importance of raising awareness about the circular economy concerning recycling. A lack of awareness of recycling leads to low recycling rates and a lack of interest in large-scale investments by governments. Fashion brands need to show their commitment to sustainability to consumers in today's market, despite the continued prevalence of excessive fashion consumption [15]. Moreover, companies must certify and clarify sustainability claims. Retailers should maintain a consistent eco-friendly stance, emphasizing product and service credentials. Managers should establish feedback mechanisms to gauge effectiveness and make adjustments [16].

Action 1.2: Digital Product Passport

It is widely accepted across all stakeholder groups that implementing a Digital Product Passport (DPP) would improve the exchange of information among supply chain businesses, authorities, and consumers. This would enhance transparency and efficiency and assist in monitoring and enforcing regulations. The proposal would allow for gathering market intelligence and refining obligations. Incentives for sustainable products have widespread support. Stricter enforcement, like inspections and audits, is necessary for success. [4]. In a recent multi-stakeholder initiative aimed at enhancing traceability and

transparency within the apparel and footwear industry, the United Nations Economic Commission for Europe (UNECE) revealed that only 34% of the companies surveyed had implemented a traceability system. Among these, merely half could ensure visibility up to Tier 2 of their supply chains as of 2020 [17].

The DPP is a core component of the European Union's Eco-design for Sustainable Products Regulation (ESPR) part of the European Green Deal, underscoring the EU's dedication to a sustainable future [18, 19]. It is designed to enhance sustainability by providing a digital record of a product's lifecycle information, including its environmental footprint, material composition, and compliance with sustainability criteria. This digital passport will make it easier for consumers, businesses, and regulators to access product-specific information related to sustainability, circularity, and legal compliance. The DPP is not intended to be a tracking tool, but it will allow for traceability information when necessary. The system will rely on existing international best practices and allow the integration of new technologies to manage and access product data effectively [19].

Transparency of the whole production process loop is crucial as it increases consumers' trust [20]. Through the utilization of digital technologies and traceability measures such as QR codes, it is possible to enhance the monitoring of operations and support the assertion of a circular and sustainable supply chain. This can be achieved by examining the material composition and implementing processes that are traceable and verifiable [21]. The incorporation of traceability mechanisms within the clothing value chain significantly augments transparency, thereby cultivating consumer trust in the brand and reinforcing confidence in the sustainability credentials of the product [22]. Within the context of public administration, research on public procurement mentioned that traceability could help governments obtain more reliable tenders by preventing cheating, especially when it comes to recycled products [23]. In another study, the author extends the discussion of traceability to encompass the recycling dimension as well [24]. The lack of available and accurate information has been identified as one of the main barriers to the current limited development of textile recycling in the industry [17]. The research carried out by [25], highlights a prevailing hesitancy within the industry to share data, driven by apprehensions regarding its potential impact on competitive dynamics.

So far, discussions about the ideal technology to be used in the Digital Product Passport are ongoing. Some companies address issues by using QR codes on their products. This allows customers to verify product composition, trace suppliers, and access third-party evaluations related to water, energy, and CO₂ consumption [26].

Distributed-ledger technology is considered a key component of the data infrastructure required to achieve transparency [25]. Blockchain and RFID are promising technologies for improving company transparency in the apparel supply chain [27]. These technologies provide customers with product information, from raw material origins to end-of-life product management. Businesses can gain a competitive advantage and achieve sustainable production through these digital technologies. Customer appreciation of these initiatives is crucial for the success of pro-environmental technologies [28].

Action 3.1 - Extended Producer Responsibility Requirements for Textiles

The extended producer responsibility (EPR) for textiles, textile-related, and footwear products aims to ensure a high level of environmental and health protection within the

Union. The primary objectives include creating an economy focused on the collection, sorting, re-use, preparation for re-use, and recycling, particularly fiber-to-fiber recycling. Additionally, the initiative incentivizes producers to design products adhering to circularity principles. Producers of textiles and footwear are required to finance the costs associated with collecting, sorting for re-use, preparing for re-use, recycling, and other treatments of collected used and waste textiles and footwear. This also includes unsold consumer products considered waste that were supplied within Member States after the directive's entry into force, ensuring compliance with the principle of legal certainty and avoiding retroactive obligations. Furthermore, producers must cover the costs of conducting compositional surveys of mixed collected municipal waste, supporting research and development in sorting and recycling technologies, reporting on separate collection, re-use, and other treatments, and providing information to end-users about the impact and sustainable management of textiles [29].

In light of the EU waste legislation's directive to separately gather textile waste by January 1, 2025, several EU Member States have either initiated or are contemplating the implementation of EPR requirements for textiles [3]. There are ongoing efforts to expand the reach of the EU Eco-design Directive 2009/125/EC. The aim is to include circularity concerns for various products beyond the Directive's initial focus on energy-related products. To achieve the goal of making sustainable products the norm [30], waste management practices have primarily focused on end-of-life recycling. Waste management policies should consider upstream and downstream measures to encourage circular product design and establish standards for resource-efficient products that minimize waste during production and after use. The implementation of EPR is essential for defining the responsibilities of all stakeholders along the value chain. [31].

While policy-driven EPR is increasingly being adopted, it is observed that industry-led EPR initiatives are gaining momentum. Several fashion brands have proactively engaged in mitigating the challenge of post-consumer textile waste, concentrating on the value creation possibilities inherent in product take-back schemes, as well as reuse and recycling efforts. This approach not only addresses waste management concerns but also explores the potential for sustainable business practices within the fashion industry [31]. Extended Producer Responsibility legislation is becoming inevitable, and it will require increased efforts in collection and reuse through effective circular systems. In the past, Fast Fashion (FF) retailers have often shifted their waste, either directly or indirectly, to lower-income countries. However, with several countries on the verge of implementing import bans, FF companies must now develop innovative business models that can facilitate the closing of the CE loop through rapid return cycles [32].

Action 4.3 Guidance on Circular Economy Business Models

Circular Business Models (CBMs) suggest a systematic approach for actively involving producers, users, and intermediaries in fostering circular flows across three distinct levels. Firstly, this includes facilitating circular flows within the primary production system. Secondly, CBMs promote internal circularity within the central production system, which can be achieved through the reuse of activities [33]. Such as renting and leasing (business-to-business/business-to-consumer) or sharing (mostly consumer-to-consumer) are important circular business models where the textile products remain in

the ownership of the company running the system, while the customer pays for having access to them [34]. These models offer a more sustainable alternative to traditional linear approaches. PSS business models offer opportunities for product quality improvement, dematerialization possibilities, revenue generation [35], and design for longevity, which in turn allows producers to reduce environmental impact and enhance brand loyalty and image by offering durable, high-quality clothing. Creating high-quality, durable products that withstand the test of time can significantly reduce the need for frequent replacements, leading to less waste [36]. To implement CE strategies through PSS, one needs to manage resources and create service-intensive offerings to replace material-intensive products and change user behavior. However, if the goal is solely to promote economic growth without reducing production and consumption, achieving the desired resource reduction targets and absolute resource decoupling may be difficult [37]. Policymakers play a crucial role in supporting CBMs. Policy interventions that promote desirable business model features, like tax incentives for transactions involving ownership transfer, or that address less appealing aspects, such as subsidizing registration fees for access-based sharing models, can significantly enhance consumer engagement with sharing economies [38]. For companies to successfully implement circular economy initiatives, there needs to be a clear and commonly understood value proposition that aligns with the company's broader strategy [39]. A multi-case study conducted by [40] explored two clothing libraries in Finland and identified specific challenges they faced in implementing their sustainable values. These libraries prioritize offering clothes from sustainable domestic brands, but they face limitations due to the narrow range of clothes that are suitable for lending purposes. A German study revealed challenges such as limited awareness of fashion rental and concerns regarding cost-effectiveness [41]. Winter coats and snowsuits are favored for children's rentals due to their seasonal use. These findings underscore the importance of promoting fashion rental services and reevaluating pricing strategies to enhance perceived value. Pricing and inventory management should account for seasonal demand. Beginning with high-end fashion options for special occasions is recommended. If successful, it would be appropriate to expand to everyday fashion rental as a supplementary service [49]. To explore the potential of PSS for footwear, cultural and hygiene concerns were identified as potential obstacles to the adoption of certain alternative consumption scenarios [42]. Participants in a similar study emphasized the importance of clear terms regarding provider reputation, hygiene, product misuse, and business continuity. Established brands may have an advantage over smaller boutiques in providing these services. Pilot projects are crucial for launching circular business models, fostering organizational learning, and preventing consumer responsibility at the end of the product lifecycle. However, entering the rental market requires significant financial investment and a long time to recover initial capital spent on product purchases [35].

When it lastly comes to barriers, three primary issues are presented: acquiring and retaining customers, managing inventory, and making the business model profitable while still offering competitive rental prices to customers [41]. Companies face significant economic and operational challenges, which include customer purchase behaviors, low margins on second-hand sales and repair services, legal and logistical complexities of online second-hand sales, and the requirement for specialized technologies [35, 43].

5 Discussion and Conclusion

This article examined how researchers have investigated four out of the 24 proposed actions by the European Union, as part of their aim to achieve a sustainable and circular textile industry by 2030. The systematic literature review highlighted that actions 2.1 (promoting consumer empowerment) and 4.3 (circular business models) have been widely discussed, representing roughly 68% of the research sample. In the first case, this research found that while consumers increasingly desire sustainable products, limited knowledge and awareness of sustainability issues act as barriers. Companies are urged to convey their commitment to sustainability clearly and ensure that their claims are certified and unambiguous. Overcoming obstacles to sustainable consumption requires public participation, education about the environmental impact of textile waste, and fostering anti-consumption efforts alongside promoting sustainable consumption awareness. In the second case, this research collected several challenges that prevent the adoption of PSS business models in the textile industry, including customer perceptions, unfamiliarity with rental services, and concerns about product quality and hygiene. Challenges also exist in terms of financial investment, customer purchase behaviors, and low margins on second-hand sales and repair services. Overcoming barriers to circular business models requires companies to shift their orientation, overcome reliance on existing product lineups, and strategically position themselves within the supply chain. It is worth noting that while DPP is a relatively new topic (action 1.2), there has been a significant amount of research and discussion on the implementation of a technology that can effectively trace the supply chain for over a decade. Despite the potential benefits, industry hesitancy to share data, concerns about supply chain competitive dynamics and issues in determining the optimal technology pose challenges to DPP widespread adoption in the textile industry. Lastly, the least investigated action is EPR (action 3.1). Although it has been applied in various industries since 2001, the concept is relatively new for the textile industry. Only Japan has considered fabric disposal as part of the regulation, but not in the entire supply chain [44]. In Europe, several EU Member States are considering or implementing EPR requirements for textiles in response to EU waste legislation directives, and France was the first country to implement an EPR system for textile waste [44]. Implementation of EPR is vital for defining the responsibilities of stakeholders along the value chain. Industry-led EPR initiatives are gaining momentum, with fashion brands actively engaging in post-consumer textile waste management through product take-back schemes, reuse, and recycling efforts. As EPR legislation becomes inevitable, there is a need for increased collection and reuse efforts through effective circular systems.

Thus, it is crucial to highlight the importance of future research regarding the aforementioned actions. In the specific context of Action 1.2, we propose that further investigation into the optimal technology for implementing a Digital Product Passport is necessary, considering that the European Union has not yet determined the most appropriate technology for this purpose. While various alternatives have been explored, a final decision has not yet been reached. Although Action 2.1 has been thoroughly investigated, there are still some open issues to be resolved, including the standardization of information shared with consumers and how to integrate consumers more effectively into the circular economy. It is essential for literature to address these challenges. Action 3.1

warrants consideration of EPR from various perspectives, particularly considering the legislative implementation across all European countries by 2025. Examining the application and extension of EPR to the textile industry, as well as its prior implementation in other product areas, may yield valuable insights and enhance our overall comprehension of the concept. To gain a deeper understanding of Action 4.3, which pertains to business models, it is important to conduct further research on how companies can successfully implement PSS models, facing the discovered challenges while simultaneously achieving profitability.

This research also provides relevant managerial and policy implications. Managers and policymakers can utilize this article for evaluating and comprehending the European Union's strategy. Given the inherent complexity of the proposed strategy, having an article that combines scientific theoretical insights with legislative analysis proves to be immensely valuable. This article has certain limitations. To provide a comprehensive review, we focused on scientific literature and documents provided by the European Union available at the moment for each initiative and legislation. However, we acknowledge that the exclusion of grey literature and policy implication articles may limit the scope of our findings. Moving forward, we plan to expand our research to include a wider range of sources, which will enhance the quality and breadth of our analysis.

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