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Circular Business Strategies in the Portuguese Textile and Clothing Industry

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Abstract: The transition from a linear to a more circular economy has pressured companies from different sectors to implement circular business strategies and redesign their existing business models or even create new ones. The aim of this investigation is to identify the different circular business strategies adopted by Portuguese companies in the textile and clothing industry and evaluate their impact on the sustainability of the business. This article presents a framework of strategies to guide managers in addressing the challenges of moving from fast to more sustainable fashion. This exploratory research is based on a qualitative methodology, relying on semi-structured interviews with the managers of six companies in the textile and clothing sector in Portugal that have implemented circular practices. The primary data collection took place between 20 July and 30 September 2022. The results show that companies have supported their circular economy practices mainly through product life extension strategies (mostly based on durable product design) and resource use reduction strategies, with resource recovery being the most common. The use of personalized product design and clothing repair strategies is still largely unexplored by companies. The findings also suggest that companies have to adapt their way of production and market relationships with consumers in order to accommodate the practices of a circular economy in their businesses. In the future, a quantitative approach could also provide new insights, as well as longitudinal and cross-country comparison studies.

Keywords: circular economy; circular business strategies; textile and clothing industry; Portugal

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1. Introduction

The introduction of the fast fashion concept in the early 1990s [1,2] and the adoption of these practices by the main players in the market [3] led some companies to adopt more sustainable production practices [4,5]. Also, changes in consumer behavior related to the environment (climate change and resource scarcity) and social impacts (poverty, social inequality, and unemployment) have led companies to change the way they operate and design their business models [6,7]. Similarly, environmental concerns, such as resource depletion, excessive textile waste, and unsustainable manufacturing processes [8], have led some companies to move away from the traditional model based on linear production to models that contemplate the introduction of more sustainable practices, such as the circular economy model. The main goal of the new model is to retain the value of the product by allowing for the reduction, reuse, and recycling of all resources involved in the production process for the product [9]. By transforming linear business models into circular ones,

textile companies can improve the sustainability of their operations more effectively and efficiently [10]. Previous studies have found that the transition of the textile and fashion industry to a circular economy is a complex process that requires knowledge and a change of paradigm in the industry [11]. Even so, a recent study by [8] shows that the textile industry is committed to the adoption of more sustainable and environmentally friendly practices that could be implemented at the different stages of the production process, and to which the adoption of advanced technologies could make an important contribution.

As mentioned by [8], the textile industry is one of the most polluting sectors. Despite the potential for recycling that could be introduced in the sector, the vast majority of waste (75%) is discarded and ends up in landfills [8]. In this context, further investigation is required into how circular business strategies could be employed within this sector.

The aim of this article is to illustrate the circular business strategies and practices adopted by different companies in the textile and clothing sector in Portugal and the extent to which they are striving to ensure sustainability. To this end, the strategies and practices are used as a reference for collecting evidence from the Portuguese companies.

This exploratory research is based on a qualitative approach, based on semi-structured interviews with the managers of six companies in the textile and clothing sector in Portugal that use circular economy practices.

Considering the proposed research objective, this article will be structured as follows. The first section presents the circular business strategies and practices. Then, the methodology section follows. Section three analyses and discusses the findings. At the end of the paper, the main conclusions, limitations, and avenues for future research are presented.

2. Circular Business Strategies in the Textile and Clothing Industry

With the aim of reducing the negative environmental impacts of textile and clothing production, several companies have invested in the transition to a circular system by redesigning their business models and adopting sustainable practices [11]. By applying the principles of a circular economy, companies can create a closed-loop system in which resources are constantly being reused and with a reduced impact on the environment.

Pollution is caused by a combination of production and the use of the product by the consumer [12]. Therefore, in order to better understand the environmental impact of each product and the best strategies to reduce the environmental impact, the authors identify two types of impact: one determined by the use of the product and the second determined by the production of the product.

By carefully evaluating the environmental impact of each component, the authors conclude that textiles and apparel fall into the category of products where 80% of the impact is determined by production, and for this reason it has been found that the best solution to combat their impact is to adopt strategies that extend the life cycle of products or reduce waste. According to the authors, companies that produce products that fall into this category should adopt a series of measures, such as competitive price repairs, design of ecological products, modular and more resistant products, and invest in informing consumers about the duration of use for each product [12].

When redesigning business models, companies need to consider the value they want to create and deliver to the consumer by choosing a circular business strategy whose main objective is to extend the life cycle of products (slowing loop) or one whose main objective is to significantly reduce waste by reusing waste (closing loop) [13,14].

Circular business strategies that seek to extend the life cycle of products include the following possibilities [6,9,13–15]: (i) product as a service, (ii) product life extension, and (iii) sharp reduction in the use of resources.

2.1. Product as a Service

In this type of strategy, the consumer is no longer the owner of the product, but its user [16–18]. In other words, the company owns the product and makes it available to the consumer for a pre-defined period of time in exchange for a monetary payment. This type of practice benefits companies because it allows them to develop a closer relationship with their customers (which gives them valuable information about their needs and desires). Also, it allows companies to generate revenue streams in a more stable way over a longer period of time. Further, the companies could reduce their environmental impact by extending the product's life cycle, and, at the same time, reduce resource consumption and waste [19]. Within the textile and clothing industry, there are some examples of this type of practice, as follows:

(i) Clothing subscriptions: Exploiting the potential offered by digital innovation [20], companies offer their consumers the opportunity to subscribe to packages that provide a certain number of items of clothing for a period of time that is agreed upon between the parties [21]. After this period, there is a replacement of the pieces available for use [22].

(ii) Short-term clothing rentals: Companies offer their consumers the opportunity to rent specific items of clothing for special occasions. In such cases, consumers can have access to the products only for a defined period of time, at a lower price than the total purchase would require. In this context, short-term clothing rental services offer an alternative to owning clothing, especially for those items that are rarely worn and for which there is a strong desire not to use them repeatedly [23].

2.2. Product Life Extension

The main objective of this strategy is to maintain the value of the product for as long as possible to ensure that it remains economically useful [6,14]. In order to minimize the environmental impact, companies focus on developing parts that are suitable for multiple life cycles, either by producing highly durable goods or by producing customized products that have a long lifespan [13]. In addition, there are companies that choose to provide value to consumers by selling used goods and repairing obsolete items. Within the textile and clothing industry, there are examples of this type of practice, as follows:

(i) Durable product design: Companies deliver value to the customer by selling high-quality, durable, differentiated, and easily repairable clothing [21]. These strategies are used to extend the useful life of goods and ensure a long service life of products [6].

(ii) Personalized product design: Companies create value for customers by designing personalized clothing. In this type of practice, consumers take on the role of co-designers as they actively participate in the process of customizing the style and fit of the product [13].

(iii) Clothing repair: Companies provide value to customers by offering a repair and restoration service for damaged or outdated clothing. After having been repaired, the product is expected to remain usable, and clothes retain their value in their use [6].

(iv) Second-hand clothing sales: Companies add value by selling used clothing. This practice helps extend the life cycle of products by avoiding premature disposal and allowing garments to have a second life in the hands of another consumer [21].

2.3. Reduction in the Use of Resources

This strategy, also referred to as a circular delivery mode [22], whose central purpose is to dramatically reduce waste by reusing waste (closing loops), includes "resource recovery" and "circular sourcing" [14].

(i) Resource recovery: The primary goal of this practice is to recover the value of resources by recycling, upcycling, or cascade models [13]. Adopting this type of practice allows

for a reduction in the exploitation of natural resources and promotes the creation of highly skilled jobs [14]. This resource recovery can be achieved through: (i) material recycling, where companies create and deliver value to their customers by recycling used textiles and by (ii) upcycling strategies, where companies create and deliver value to their customers by reusing used clothing to make new garments without going through any kind of chemical process [24].

(ii) Circular sources: This type of practice involves replacing traditional raw materials with renewable inputs and an industrial symbiosis [18,25]. The supply chain plays a key role in this type of model, as the outputs of one company can work with the inputs of another, so there is a need for extra effort from all parties involved to create value [17]. Therefore, the management of each stage of the chain must ensure the circularity of all processes [17]. Examples of such a practice include the case of companies that create and deliver value to their customers using clean energy in all their processes, such as wind power, photovoltaics, hydropower, green hydrogen, and biomass, among others. It also encompasses product design using natural, biodegradable, or recycled materials, such as companies that create and deliver value to their consumers by producing garments from natural, biodegradable, and recycled materials [26].

3. Methodology

Due to the exploratory nature of this research and because it allows for a deeper understanding of the phenomenon under study, the research method chosen to answer the research objective was qualitative.

Primary data were collected through semi-structured interviews, supported by a script developed by researchers based on the literature review. Based on the literature review, different subcategories were created to assess the different circular business strategies adopted by the Portuguese companies in the textile and clothing industry, as shown in Table 1.

Table 1. Systematization of the dimensions of the analysis.

Category	Sub-Category
Product as a service	Clothing subscription
	Short-term clothing rental
Product life extension strategy	Durable product design
	Personalized product design
	Clothing repair
	Second-hand clothing repair
Reduction in the use of resources	Resource recovery
	Circular sources

Authors' own elaboration.

The units of analysis were Portuguese companies in the textile and clothing industry, directly related to the production of apparel, and implementing circular economy practices. The selection of the companies to be interviewed followed a process of six different phases, as follows: (i) the analysis of the secondary information obtained through desk research to understand the practices of a circular economy in companies in the textile and clothing industry; (ii) the selection of companies that met the research requirements; (iii) the preparation of a formal request for interviewing; (iv) the random selection of companies to be contacted; (v) sending the request for an interview to the selected companies; and

(vi) the random selection of new companies if the previously identified companies were not available for interview.

Using a saturation sampling method, a total of six companies were interviewed between July 20 and September 30, 2022, as summarized in Table 2. The companies in the sample were small- and medium-sized and geographically distributed throughout the national territory. Prior to the interview, the participants were informed of the research objectives and gave their informed consent to participate in the study.

Table 2. Systematization of the interviews carried out.

Interviewed Companies	Date of the Interview	Length of Interview (in Minutes)
Company A	20 July 2022	52 min
Company B	4 August 2022	48 min
Company C	18 August 2022	37 min
Company D	19 August 2022	31 min
Company E	29 August 2022	36 min
Company F	30 September 2022	39 min

Authors' own elaboration.

After completing and transcribing the interviews, the data were analyzed and interpreted using content analysis [27]. In this type of analysis, the researcher attempts to understand the characteristics, structures, or models at the root of the information collected through the interviews [26,28,29]. MAXQDA software version 24 was used to support data analysis, and the various authors evaluated and checked the results attained.

The anonymity of the participants was ensured throughout the investigation. The names of companies or other information that could lead to their identification were never made public. To ensure anonymity, for the purposes of analysis and the presentation of the results, the different companies were labeled sequentially from "Company A" to "Company F".

4. Results Analysis

The aim of this section is to understand the circular business strategies used by the textile and clothing companies by analyzing each of the practices and their impact on the sustainability of the business as a whole. To make the data more systematic, the three strategies were divided into different practices in each strategy. The product as a service strategy was divided into clothing subscriptions and short-term clothing rentals. The product life extension strategy was divided into durable product design, personalized product design, clothing repair, and second-hand clothing sales. The reduction in the use of resources strategy was divided into resource recovery and circular sources.

4.1. Product as a Service Strategy

Taking into account the theoretical framework previously described, the product as a service strategy can be pursued on the basis of two main dimensions: clothing subscriptions and short-term clothing rentals. Content analysis of the interviews conducted revealed that no practice was identified among the companies in the sample.

4.2. Product Life Extension Strategy

4.2.1. Durable Product Design

All the interviews conducted showed that they have established strategies for the design of sustainable products (Companies A, B, C, D, E, and F). These are pursued through quality strategies in the manufacture of the product, design strategies, and communication to the customer for a conscious and sustainable use of the product.

Quality of the Product

The interviews revealed that for all the participants, the fact that they have chosen to use circular economy practices inevitably forces them to focus on product quality (Companies A, B, C, D, E, and F). As expressed by one of the interviewees, "our clothes are of extremely high quality" (Company A).

All companies emphasized the use of internal quality control procedures, and this care is evident in the selection of quality materials (Companies A, B, C, D, E, and F). As one interviewee said, 'our knitwear is of exceptional quality' (Company A) or 'our product is based on reliable suppliers with fabrics of incredible quality' (Company E).

The manufacturing process is also highly quality-oriented (Companies A and D). In the words of the interviewees, "great care is taken in the production of the garments, which are of a very high quality" (Company A). In the production process, attention is paid to a number of details in order to make the garment as comfortable as possible (Company A).

There are also a number of quality control procedures, including inspections and tests, carried out at different stages of the production process, as explicitly mentioned by five of the six companies interviewed (Companies A, B, C, D, and E).

As might be expected, given the practices described, the high durability of the product is mentioned by all interviewees. As one of the interviewees (Company B) pointed out, this is one of the company's main strategic concerns. In the interviewee's own words, "our concern at the moment is to make sure that the piece lasts and lasts" (interviewee B).

Two of the interviewees also said that the pieces are designed in such a way that they can be passed on from generation to generation (Companies E and F), as was the case in previous generations (Company E). One of the participating companies even says that the products are designed to last for a lifetime (Company E).

Quality of Design

Product durability is not only pursued through quality strategies in the production process, but also through design.

During the interviews, four of the participants mentioned the existence of a strategy to create timeless pieces in terms of design, so they do not become outdated at any point (Companies A, C, D, and E). In some cases, this concern is part of the company's DNA and applies to the entire product portfolio (Companies A, C, and D), while in others, it only applies to part of the product range (Company D).

Some examples of the practices used include design strategies that can be "simple" (Company A), a focus on pieces that can be considered "basic" so that they become timeless (Company A), simple and minimalist cuts (Company E), or the use of patterns that can be easily incorporated into different trends (Company E). In the same direction, some of the companies mention that the company does not make it a priority to follow market trends (Companies D, E, and F). These practices not only contribute to extending the life of the product but also reduce existing waste because, as interviewee D pointed out, if the product does not sell in one year, it can be sold in subsequent years without compromising the perceived value of the product to the customer.

This approach is also reflected in the number of collections launched per year, which was considered quite limited by all the companies interviewed, especially when compared to traditional linear production companies (Company A).

Despite the limited number of collections launched, some companies also indicated their intention to strategically reduce this number in the future (Company C). This decision stems from the perception that some collections/seasons are more expensive to produce, so it would be better to focus on the company's resources on a single collection that is stronger (Company C).

In order to extend the product life cycle, some companies also use design strategies based on product versatility (Companies D, E, and F). According to an example given by one of the interviewees, it is possible to create common design pieces that can be a pullover or a jacket, depending on how the product is used (Company D). This versatility is found in a different way in the practices of Company F, where the design for longevity is carried out in such a way that the garments produced can adapt to the growth of the children.

The combination of these different design and production practices was seen by interviewees as fundamental to the company's circular strategy. In the words of interviewee D, "not having trendy pieces and having pieces of high quality that last for a long time is one of our core pillars".

Raising Awareness of the Right Use of the Product

In order to attain its potential in terms of product life extension, four of the six participants (Companies B, D, E, and F) considered consumer behavior in terms of how the product is treated, and in particular, how the garments are washed or dried.

During the interviews, some practices were found to inform and sensitize consumers to the correct use of the product.

An example of this is Company B, which incorporates a QR code on each garment that links step-by-step information on how to treat the garment to make it last longer, as well as ecological and environmental tips (Company B).

Companies D and F, on the other hand, recognizing that consumers do not usually pay much attention to the information on product use and conservation on garment labels, have created additional communication mechanisms, such as the company newspaper (Company D), a blog (Company D), newsletters (Company F), and social networks (Company F) with tips for consumers on how to care for garments, according to the specific material. The idea, as mentioned in one of the interviews, is to appeal to the care of garments to maximize their useful life (Company F). In addition, this practice also fits in with the company's social concern to encourage its customers to consume sustainably (Company E).

4.2.2. Personalized Product Design and Clothing Repair

The use of personalized product design practices is not very evident among the companies participating in the study. As a matter of fact, there is no evidence of total product customization among the participating companies.

However, there is what some of the participants refer to as the "production of unique pieces", due to the fact that they are made in ateliers (Company E), with all the artwork and allovers being hand-drawn by a designer (Company F), or the involvement of Portuguese artists who work with handicrafts and influence the creative process for each collection (Company F). Although these practices do not really constitute personalized product design, they do contribute to creating a certain perception of the exclusivity of the product in question.

The issue of garment repair was only highlighted by one of the participants, who is working on two projects related to garment recovery (Company F). The aim of the company is to offer its customers the possibility to have their garments repaired and to recover their use value, or to return them to the company for recycling.

4.2.3. Second-Hand Clothing Sales and Clothing Repair

The connection with the practice of selling used clothing is evident in four of the participating companies (companies C, D, E, and F).

However, the service is not yet provided by the company itself. Nevertheless, three of the participating companies are part of a platform that allows their customers to sell

second-hand clothes, giving them credits that can be used with participating brands, including the company itself (Companies C, D, and E).

Company F, for its part, is currently working on a project that will allow its customers to recover the items and then sell them in the secondhand market.

4.3. Reduction in the Use of Resources Strategy

4.3.1. Resource Recovery

In the course of the interviews conducted, all the companies identified the use of various practices that fall within the scope of resource recovery.

All the companies use up-cycling strategies, in which dead stock is used to design and produce new parts, either from the company itself found in two of the cases (Companies A and E) or from other suppliers from whom the company buys (Companies B, C, D, and F), observed in four cases.

As one of the interviewees pointed out, this practice avoids the production of new raw materials, makes use of existing materials, and gives them new value, preventing them from being incinerated at the end of their life with the associated environmental impact (Company B).

However, on the other hand, pursuing this practice involves the challenge of ensuring the correct disposal of parts, from their origin to the moment they arrive at the company, in order to give life to a new part with the desired quality (Company F).

In some cases, mobilizing these resources is the starting point for developing other production activities. As the person in charge of Company B illustrated, once the textile surpluses have been received, the next challenge is to design a product that can be attractive to consumers, based precisely on the characteristics of the surpluses that they have had access to. However, as some participants pointed out, although this strategy is appropriate from an environmental point of view, it poses some constraints from an operational point of view (Companies B and C). In fact, with this type of approach, the garments that the company can produce are limited to the existing fabric. Moreover, when a garment runs out, it may not be possible to restart production as the fabric used may no longer be available (Company B). The same idea was corroborated by the manager of company C, who considers that dead stock practices are positive for small companies, but more difficult to pursue when the business is scaled up. The time spent in warehouses searching for and analyzing fabrics was also highlighted as one of the existing challenges (Company B).

In this context, the link with suppliers was highlighted by several participants as very important, sometimes considered as one of the key partners in the business (Companies C and D).

The practice of up-cycling based on company surpluses is identified in different ways. Company A mentions the use of a strategy that involves introducing small elements of modification (such as embroidery or some other type of alteration) into articles that are not selling, which allows it to differentiate itself from the previous version and make the existing stock profitable. Another strategy is to use remaining fabrics from previous collections, which are reused and incorporated into limited-edition capsule collections (Company E). Company F also said that it is working on a similar closed-loop project involving the reuse of raw materials from previous collections.

The reuse of materials is not only seen as an important part of the companies' approach to the circular economy, but is also recognized by one of the participants as positive in terms of reducing material costs (Company A). At other times, it is also used to create small by-products (e.g., scarves) that are given as gifts to customers (Company D) or used to package garments, thus avoiding the use of other resources for this purpose (Company F).

It is worth noting that one of the participating companies stated that part of its action is to inform its customers of the environmental benefits of the product they have purchased,

with a message on the packaging stating the grams of textile waste saved by purchasing the product in question (Company B).

In addition to reuse, attention is also paid to the use of resources, which should be optimized to avoid waste, as was observed in three of the participants (Companies A, D, and F). According to one of the interviewees, the question of material use is one of the basic criteria when cutting a part of fabric (Company D). Decision making can be facilitated by the use of new technologies, as pointed out by two of the participants, which make it possible to ensure an efficient allocation of different resources and a maximum reuse of waste (Companies A and F). However, one of the participants warned that, despite the emergence of new technologies, many of them require a very high investment with a long pay-back period, compromising their potential (Company A). As the interviewee explained, the technology will be obsolete by the time it is monetized.

4.3.2. Circular Sources

The interviews revealed a concern on the part of the participants to use circular product sources and to produce organic or ecological elements.

Several companies (Companies A, B, C, and D) explicitly stated that they do not use a certain type of material in their production process (e.g., polyester or plastic fabrics). In this context, efforts are made to identify and use more natural materials. When it is not possible to use natural raw materials, companies opt for raw materials that are not derived from oil (Companies D and E).

The care taken with the materials used is evident not only in production but also in packaging, where, for example, the use of plastics in packaging is avoided or recycled materials are used (Companies A, C, D, and F). This concern is also evident in product labelling (Company A).

However, the search for alternative materials leads to an increase in material costs and general production costs, as recognized by four of the six companies studied (Companies A, B, D, and F). As one of the participants pointed out, the supply of raw materials is still very limited, and the prices are often unaffordable (Company F).

The identification of production methods that do not use water was also highlighted by one participant (Company B). This aspect was highlighted by the interviewee as particularly positive, given the geographical location of the company and the scarcity of water in the region. By redesigning the production process, the water resources saved can be redirected to other activities in the region (Company B).

Concerns about using circular sources arise within the companies, but also when looking for suppliers (Company A), where preference is given to suppliers who use more sustainable materials and processes (e.g., dyeing, spinning, weaving, or manufacturing) and who share the same concerns and values as the company (Companies A and F), or even certified suppliers (Company F). However, this identification is not always easy, as there are suppliers on the market who have not yet adopted very sustainable practices (Company B). However, as one of the participants pointed out, it is easier nowadays to monitor the whole supply chain and to identify where pollution is occurring (Company A).

On the other hand, it is interesting to see how the introduction of such practices can change the supply market. As one of the participants points out, one of the suppliers they use only started to adopt more sustainable practices when they started working with the company (Company B).

Many of the participants were very concerned about the environmental impact of transport, which was identified as one of the biggest barriers to sustainability in the textile industry. Finding suppliers who are well-positioned in this area is still perceived as difficult (Company A). In terms of environmental concerns, one respondent said that the company

had switched from air to sea transport to reduce its carbon footprint (Company C). Another company stated that it had not yet started the internationalization process precisely because of the negative environmental impact of this option (Company B).

This circularity is also seen to some extent in the priority given to the use of local and community resources and local production/local suppliers found in three of the six participants (Companies B, D, F), which translates into lower emissions of polluting gases (Company F).

Waste management policies were also identified, both in terms of waste separation and proper packaging (Company A).

Regarding energy, only two companies mentioned practices related to their own energy production (Company A) or investments in renewable energy for the company's facilities (Company F).

Finally, three companies demonstrated their care in various areas, such as certification of using green energy (Company A), and compliance with the main international standards for organic textiles in terms of environmental, social, and occupational health and safety criteria (Companies A and F).

4.4. Results Systematization

The main findings of the study are summarized in Table 3.

Table 3. Synthesis of the results.

		Company A	**Company B**	**Company C**	**Company D**	**Company E**	**Company F**
PASS	CS	No practice identified	No practice identified	No practice identified	No practice identified	No practice identified	No practice identified
	STCR	No practice identified	No practice identified	No practice identified	No practice identified	No practice identified	No practice identified
PLES	DPD	Strong concern for the development of high-quality products.	Strong concern for the development of high-quality products.	Strong concern for the development of high-quality products.	Strong concern for the development of high-quality products.	Strong concern for the development of high-quality products.	Strong concern for the development of high-quality products.
		Concern for creating timeless, long-lasting design.	Awareness-raising for correct product use.	Concern for creating timeless, long-lasting design.	Concern for creating timeless, long-lasting design.	Concern for creating timeless, long-lasting design.	Concern for creating timeless, long-lasting design.
		---	---	---	Awareness-raising for correct product use	Awareness-raising for correct product use.	Awareness-raising for correct product use.
	PPD	There is no full customization of products.	There is no full customization of products.	There is no full customization of products.	There is no full customization of products.	There is no full customization of products.	There is no full customization of products.
		---	---	---	---	Production of pieces with a unique character.	Production of pieces with a unique character.
		---	---	---	---	---	Customer clothing repair facility.
	CR	No practice identified.	No practice identified.	No practice identified.	No practice identified.	No practice identified.	Possibility of repairing customer's clothes.
	SHCS	No practice identified.	No practice identified.	There is no sale of second-hand products.	There is no sale of second-hand products.	There is no sale of second-hand products.	There is no sale of second-hand products.
		---	---	Integration into a platform where customers can sell used products and use the credits they receive to purchase products from the company.	Integration into a platform where customers can sell used products and use the credits they receive to purchase products from the company.	Integration into a platform where customers can sell used products and use the credits they receive to purchase products from the company.	Integration into a platform where customers can sell used products and use the credits they receive to purchase products from the company.
		---	---	---	---	---	Project being developed to enable consumers to sell second-hand goods.

Table 3. *Cont.*

		Company A	Company B	Company C	Company D	Company E	Company F
RURS	RR	Several practices were found. Re-use of dead stocks.	Several practices were found. Re-use of dead stocks.	Several practices were found. Re-use of dead stocks.	Several practices were found. Re-use of dead stocks.	Several practices were found. Re-use of dead stocks.	Several practices were found. Re-use of dead stocks.
	CS	Actions to prioritize the use of organic and ecological materials.	Actions to prioritize the use of organic and ecological materials.	Actions to prioritize the use of organic and ecological materials.	Actions to prioritize the use of organic and ecological materials.	Actions to prioritize the use of organic and ecological materials.	Actions to prioritize the use of organic and ecological materials
		Attention to supplier characteristics. Energy production care.	Production methods to avoid excess water consumption. Attention to supplier characteristics.	---	Attention to supplier characteristics. Priority given to local economy.	---	Attention to supplier characteristics. Energy production care.
		---	Priority given to local economy.	---	---	---	Priority given to local economy.

Authors' own elaboration. Note: PASS—product as a service strategy (CS—clothing subscription, STCR—short-term clothing rental); PLES—product life extension strategy (DPD—durable product design, PPD—personalized product design, CR—clothing repair, SHCS—second-hand clothing Sales); RURS—reduction in the use of resources strategy (RR—resource recovery, CS—circular sources).

5. Discussion

The results obtained show how Portuguese textile and clothing companies have designed their businesses and redesigned their practices to use circular economy strategies. This new approach is also based on the perception they have of consumer behavior, which leads them to the need to offer a sustainable business [6,7]. The use of this circular economy practice is the result of the identification of segments of consumers with different needs that require new production approaches [9], as well as the willingness of the entrepreneurs themselves to pursue a business model based on new approaches that are less harmful to the environment and that influences their decision-making process.

This study shows that the practices adopted by the Portuguese companies are based on slowing looping and closing looping, as previously suggested by [13] and also found in other countries such as Germany [10] or the United Kingdom [30], through strategies that focus on niche markets. The main practices observed are related to the strategy of designing durable products (product life extension strategy approach) and the strategy of reducing the use of resources, either through resource recovery or circular sources practices.

All the companies show a high level of concern for the design of durable products, which is at the heart of their positioning and in which they explicitly intend to act in a different way from the traditional players in linear production models. During this study, it emerged that this aspect is central to their strategy and determines the business model pursued and the way in which several activities are carried out (e.g., production, supply, pricing, and communication strategies). This strategy is highly related to the circular economy framework of slowing looping [6], as companies aim to produce long-lasting products in a concept whose relationship of products with the passage of time is exactly the opposite of fast fashion models.

Other practices related to product life extension strategies are less evident in the companies observed. In fact, practices related to personalized product design, clothing repair, and the sale of second-hand clothing are still rather limited, both in terms of the number of companies using them and the importance they assume.

Recently, some projects have started to be designed to interpret the concept of product life extension strategy in a broader sense and not only limited to their core business, i.e., production.

The strategy of reducing the use of resources is quite present in the circular economy strategies of the Portuguese textile and clothing industry, linked to the use of closing and

narrowing loops [6]. This is evidenced by the fact that all companies have a range of practices in this area. Resource recovery practices seem to be core to the strategy developed by the companies, being at the heart of the activities developed. This is pursued through different approaches, either recycling, up-cycling, or cascade models, according to the dynamics considered more appropriate for each organization.

The premise of exploring the intrinsic value of different resources leads companies to be creative and redesign their sourcing, design, manufacturing, and commercial strategies to unlock the maximum value for their business, using a strategy that could be described as a life extension circular model, according to the framework of [6]. Here, a deeper understanding of market needs and consumer motivations for buying is critical to ensure good alignment between both parties—business and consumer. Communication strategies are also viewed as beneficial. From a managerial point of view, the use of a resource recovery strategy offers high potential in terms of differentiation in the market and also in terms of controlling material costs, although it also poses some new additional challenges for companies, mainly in terms of managing a range of relationships with different stakeholders (mainly potential suppliers) and shapes the potential in terms of scaling up the business. Here, the ability to create a network of partners that makes it possible to support the operations of companies based on fast and reliable transactions will be crucial. The ability to increase the number of suppliers will also be important, by means of increased awareness about the potential of cooperation and the value that the different residues can offer when integrated into new production processes. Several efforts are also found in relation to the identification and use of circular sources, which often require companies to be quite innovative and to continuously search for new approaches. The commitment to the supply chain is found to be important for the pursuit of such approaches, as argued by [17].

Less common, but still visible in companies, is a commitment to clean energy. Possibly due to the investment required and the fact that it does not concern the core business of companies, it has not been a priority in their actions. In terms of strategies, local production should also be highlighted, with the aim of using the region's endogenous resources, developing and creating social value for the community, and reducing environmental impact.

The research carried out found no evidence of practices related to product as a strategy service, contrary to what has been observed in other countries, such as Germany [10] or Sweden [30]. It should be noted that this research aimed to focus on the analysis of companies directly related to the production of clothing. Although the focus of these companies is indeed on production and the resulting sales, this does not exclude them from simultaneously engaging in clothing subscriptions or short-term clothing strategies. However, perhaps because of their vision of the market, and in order not to spread their efforts across approaches with such different logics, they prefer a product-centered approach and do not include the service dimension. This finding may also be explained by cultural issues, both from the company's and the consumer's point of view.

6. Conclusions

The main objective of this article was to identify the circular business strategies and practices adopted by different companies in the textile and clothing sector in Portugal.

In the Portuguese case, these practices mainly involve strategies to extend the life cycle of the product or to recover resources that would otherwise be considered waste by reusing and reintegrating them into the production process.

The strategy of product life extension is pursued primarily through the implementation of a durable design approach, which is supported by the integration of practices focused on the quality of the product and design, in addition to the promotion of awareness regarding the appropriate utilization of the product. The findings also demonstrate that the durable

product design is at the core of the strategic and positioning efforts of the companies. This is also made by means of innovative approaches that allow the companies to unfold the potential value that dead stocks still can offer, with a constant concern about maintaining product quality and the longevity of the product to be offered. The value proposition delivered to the consumer is mainly based on the quality of the products offered, their durability, design, and a certain sense of exclusivity. The strategy followed is targeted at a very specific consumer segment, which is characterized by a high environmental concern, who value different things and also have some purchasing power.

While not as pivotal to their strategy, companies have been found to develop some efforts regarding the use of circular resources, particularly in identifying and using sources of raw materials that are more sustainable and eco-friendlier. These concerns are intrinsic to the company's very concept and are in accordance with the intended positioning.

The findings of this study demonstrate that companies are concerned about sustainability and are proactively engaged in developing practices that ensure sustainability by extending their value creation, whilst simultaneously incorporating environmental and social aspects. This suggests that these companies are not only concerned with ensuring their profitability but are also directing their value creation towards minimizing the environmental and social impacts of their activities. The most significant environmental benefits include the reduction in the extraction of virgin resources and textile waste, in addition to the contribution to environmental campaigns. Nevertheless, some environmental impacts on the activity have been identified, mainly those related to the environmental costs of transport, which persist despite some efforts already made by companies in this domain.

Like all studies, this one has some limitations that should be highlighted, namely the limited number of interviews conducted and the collection of information based on self-report, which potentially could encompass problems of subjectivity in the interpretation and analysis of the interviews. This study, as intended in the research design, focused on manufacturing companies of clothes and the manufacturing of clothes. Despite the added value in terms of research, this was also a limitation of the study.

In future work, it would be positive to extend the research to a larger number of companies, which could be completed through a more quantitative approach. A cross-country comparison would also be worthwhile, as well as a longitudinal study. In addition, it would be positive to conduct a comparative study between companies that use linear and circular models to understand the main differences in the strategies adopted, as well as between companies located in different types of economies, namely developed and developing economies. It would also be worthwhile in the future to assess the role of technology transfer implementation as a key enabler in supporting circular economy strategies, as well as an environmental impact study to assess the benefits of introducing circular models.

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