



Brazilian potential for circular fashion through strengthening local production



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Abstract

Textile and garment industry ranks among the world's dirtiest sectors. The long-term success of the sector will depend on the control of social and environmental resources in the entire product life cycle. The "circular economy" (CE) concept is fast becoming a new model for resilient growth. However, CE continues to be understood largely as a waste management and recycling strategy, but the economic opportunities are far broader and more diverse. The success of the CE in developing countries will be critical to global efforts to ensure sustainable growth. Brazil's textile and garment industry is the largest complete textile chain in the West and ranks among the world's top producers of textiles and apparel. This sector is also the second largest generator of manufacturing jobs in Brazil. On the other hand, of the 8 million workers that are estimated, 6.5 are irregular ones. The objective of this paper was to provide a comprehensive review of research efforts encompassing aspects of CE as value network, local production, economic benefits and Brazilian fashion market. By this, it is expected to bring new contributions to neglected issues, the manufacturing base as CE strategy and the social performance. The two main contributions of this research are to highlight Brazilian focus and to find how circular approaches align with and support the already existing domestic industrial and social development strategies.

Keywords Textile · Fashion · Brazil · Circular economy · Supply chain · Local manufacture · Sustainability

1 Introduction

The linear system of production was originated in England between the eighteenth and nineteenth centuries (during the period of the first industrial revolution), with textile production. Such movement generated an important economic and social development [1]. Since then, the global population has increased more than sevenfold, from approximately one billion inhabitants in 1804 to 7.3 billion in 2015, and a further increase to 9.6 billion in 2050 is expected [2]. In other words, it is projected an increase of approximately 30% in a population that already produces 1.6 times that land can absorb in the same period [3].

The traditional manufacturing model and mass consumption are testing physical limits of the globe and threatening the stability of the future [4]. The long-term

success of the textile and fashion industry will depend on the control of social and environmental resources in the entire product lifecycle. The systemic (or cyclical) understanding of damage reduction, originally ascribed to the ecological sciences, proposes that industry should manage the chain as a whole. In the case of textile industry, it begins with the textile fiber, passing through the factory, to the consumer, to the disposal site and to eventual reuse or recycling, closing the cycle.

A circular system is a sustainable alternative to the predominant binary one, which limits industrial activities to the stages of manufacture and consumption [5], whose practices are based on extraction, transformation and discard. The circle model is becoming popular under the concept of "circular economy" (CE), and it is one in which products and materials are recycled, repaired and

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reused rather than thrown away [1, 6, 7]. CE could help meet the material needs of growing populations through drastically lower rates of per capita primary resource use.

More than the material issues, CE is also an accepted concept promising to support sustainable development and alleviate the social problems caused by rapid global economic growth [8]. “Cradle to Cradle” is a certification program managed by the nonprofit “Cradle to Cradle Products Innovation Institute” for firms wanting to transition to the CE. To receive this certification, products are assessed for environmental and social performance across some sustainability categories: material health and material reuse; renewable energy and carbon management; water stewardship; and social fairness [9].

In an extensive review of the CE literature, Lieder and Rashid [8] report that research articles have been allocated to the perspective of resource scarcity; solid waste, landfill, emissions or pollution; or financial aspects such as cost savings, revenue increases or gross domestic product account. Among them, few studies performed with a focus on global regions other than China. These make up about 10% of the investigated CE research articles that more than half have a geographic focus on Europe.

CE continues to be understood primarily as a waste management and recycling strategy, but the economic opportunities are far broader and more diverse. The CE could provide new opportunities for economic diversification, value creation and skills’ development. The success of the CE in developing countries will be critical to global efforts to ensure sustainable growth. In addition, the potential for the CE to contribute to jobs creation and economic development is significant to the lower- and middle-income economies, not least because many CE activities center on local service delivery. While there have been few comprehensive studies of the employment effects of the CE in developing countries, case studies of relevant activities are encouraging [7].

With this research, it is expected to bring new contributions to neglected issues of CE, the manufacturing base as CE strategy and the social performance. This study includes sessions on the impacts of the fashion industry, systemic thinking, globalization, supply chain, the Brazilian sector and data from global challenges through cases of adopting a circular model from Asia and Europe. It is approached that there is potential to develop initiatives of the circular economy in Brazil. However, profoundly changes in the Brazilian market are harder to be adopted. The two main contributions of this research are to highlight Brazilian focus and to find how circular approaches align with and support the already existing domestic industrial and social development strategies [7].

2 Methodology

A comprehensive literature review was made, followed by a critical analysis, according to themes: the impacts of the fashion industry (social and environmental); systemic approach (the importance of systemic thinking in the value chain); globalization (global supply chain); local supply chain; textile and fashion sectors in Brazil and their challenges; global models on challenges and opportunities for the implementation of circular economy.

The systematic review of research articles was carried out to identify the current state of academic insight with regard to the fashion circular economy concept. If accessible, published articles were extracted from the Web of Science (science technology and social sciences database). The keywords were combined with at least one of the following terms: “circular economy,” “supply chain,” “fashion,” “value network,” “sustainability,” “manufacture.” After that, articles were selected according to its subject relevance.

Addition information was getting through reports from entities representing the Brazilian textile and clothing industry and global sustainability. Sustainability reporting may be done through a variety of mechanisms, such as corporate Web sites, reporting integrated with annual financial reporting or sustainability reports [10]. The reports contain details on sustainable supply chain management, design practices, business innovation, consumer engagement and product sustainability.

3 Results and discussion

3.1 The impacts of fashion industry

The fashion market has been quite developed since the eighteenth century. Nowadays, the sector represents a global industry of US\$ 3 trillion and accounts for 2% of the world’s total GDP [11]. It is driven by the population growth, with millions of people lifted out of poverty and a number of countries reaching middle-income status [6, 12]. In addition, the globalization of apparel supply chains led to the development of the “fast fashion” business model, which enables consumers to buy fashion apparel in unprecedented quantities [13]. Consumerism is now based on rapid product acquisition and obsolescence and a continually increasing throughput of resources [5].

Textile manufacturing also demands vast amounts of energy and water. The apparel and footwear industries

generated between 5 and 10% of global pollution in 2016, just the garment industry produced 6.7% of impacts sending 3290 million metric tons of CO₂ (442 kg per capita) and consuming land resources, such as 11.4 kg per capita of fibrous materials and 23,900 L of per capita of water [14]. “Coloring and finishing,” “yarn manufacturing” and “fabric preparation” processes are by far the most energy and water intensive [12, 14]. “Distribution and disposal” accounts for an estimated 3% of the apparel industry’s impact on climate change, excluding final distribution from shop to end-customer [14].

Transportation represents one of the main logistics functions, the fundamental role in the performance of supply chain [15]. Research indicates that the activity accounts for 1% of greenhouse gas emissions during the entire product life cycle and can reach 55% if it focuses only on the operations of companies, excluding consumer behavior [5]. However, each supply chain stage leaves its carbon footprint depending on the mode of transportation, fuel choice and traveled distance [16].

The available databases are not enough satisfactory; however, fashion certainly ranks among the world’s dirtiest sectors [17]. Clothes are made from materials produced by heavily polluting industries; manufacturing processes often involve harsh chemicals and large volumes of water; merchandise travels across global supply chains; unsold and used clothes add to growing piles of waste; and there are many concerns about the quality of the jobs that clothing and textile industry create and their social consequences [17, 18].

The textile and clothing industry is also considered to be one of the most socially challenged in the world. Poor labor standards and conditions permeate global textiles supply chains, especially when referring to textile manufacturing in developing countries, there is widespread knowledge of child labor, poor safety infrastructure, forced labor, as well as low wages and long working hours [12, 19]. The fashion industry has been suffering from a rising trust deficit. Mainly after more than 1100 people died in a garment factory collapse in Bangladesh in 2013, pressure has mounted on Western retailers to be transparent about their supply chain [20].

About 40.3 million people are victims of modern slavery around the world: 71% are women and 24.9 million are in forced labor [21], prisoners in jobs where they have been forced or cheated, which they cannot leave behind [20]; 68% of forced labor victims in the private economy are engaged in economic activities such as agriculture, construction, domestic work and manufacturing [22]. Garments and accessories rank third in the list of products at the risk of having been manufactured through modern slavery, with cotton cultivation being the first one [21].

As the planet’s resources are already overburdened, the projected rise in the industry’s environmental impact could lead to distinct limitations on inputs, leaving it unable to grow at the projected rate and unable to continue under its current operational system [22]. The perspective of resource scarcity and solid waste is the most important issue to most academic authors (as already mentioned) and fashion brands. However, a holistic view is fundamental to sustainable management, as addressed in the next chapter.

3.2 Systemic approach

The fashion industry has evolved into a complex, fragmented, global system, in which thousands of actors are involved [23]. The supply chain management in a systemic way, as proposed by CE concept, is one of the key challenges to the system implementation in the textile and clothing sectors. Apparel has a long and complicated supply chain including resource production and extraction, fiber and yarn manufacturing, textile manufacturing, apparel assembly, packaging, transportation and distribution, consumer use, recycling and ultimate disposal [5, 23].

Sustainable innovation based on green materials, under commitment to be less harmful to the environment and to living beings, has been the starting point for most designers and buyers, as it does not demand changes in their business models and leads to perceived benefits to consumers [5]. However, the influence of the environmental and social problems caused by the whole life cycle of a textile product cannot be solved only at the material level [24]. Organic fibers, for example, are part of the solution, but the future cannot rely only on organic garments while the traditional fashion system still generates hundreds of thousands of tons of waste textile, supplies and goods are transported many kilometers around the world and garments are discarded into landfill at the end of the season [25]. This means that closing the loop on fiber alone is not enough to achieve significant impact reductions [14].

A better understanding of the apparel lifecycle and the system from which it functions can identify potential issues and offer innovative solutions that may not be recognized without a more holistic approach. Shifting the focus to all the design process, including brands, manufactures and clients, products can be designed to influence consumer behavior, induce sustainable consumption and reduce the impact of use [23]. Systematic approaches can highlight those impacts that are not immediately obvious and to avoid shifting impacts from one phase to another.

Aiming at the system evolution, the current sustainability strategies employed by the companies need to be constantly evaluated. They are deficient in three major ways: They do not directly focus on the customer; they do not

recognize the looming threats from rising global over-consumption; and they do not take a holistic approach [24]. In this way, in the holistic approach all elements should work within a systemic thinking, to influence consumer behavior, induce sustainable consumption and reduce impact from use [23].

The lack of control increases and the transparency decreases when there is difficulty in exerting influence, especially over outsourced and raw material processes, because apparel brands do not deal directly with them. That is the disadvantage of a fragmented supply chain [23]. The concept that companies in the fashion industry have a wide array of stakeholders has become increasingly commonplace [25]. It limits the brands action, transferring the supply chain damage control to outsourced providers. Due to the responsibility transferred by the brands to their external suppliers, awareness and preparation of the production workforce became extremely important. Although the importance of systemic thinking is recognized, the next sessions are focusing on the manufacturing phase, with the aim of positively contributing to these complex issues.

3.3 Globalization

According to the supply chain model proposed by Fisher [26], garment is a type of product that can gravitate between functional and innovative. Functional categorization is composed by commodities that require market advantages and minimization of costs through the optimization of supply chain and innovative categorization by high appeal of style and fashion trend, demand-driven products whose life cycle is short and requires high market mediation of companies that work with small amounts of inventory and high reaction capacity.

Different markets demand specific supply systems. Consequently, there are three main strategic sourcing options concerning the supply channels: internal, external (outsourcing) and mixed. The choice among various supply channels involves the strategic choices by firms, varying according to aim performance of price, quality, flexibility and time [27].

There has been a dramatic reorganization in the industry, especially in supply chain management, during the last 30 years [23]. Commercial products have been obtained based on cheapest route [5], especially companies from developed economies, both in Western Europe and in North America, outsourcing labor, raw materials and products from other countries due to low costs. Apparel brands typically subcontract manufacturing of fashion products to suppliers who are usually located in developing nations [27, 28]. As a consequence of the current production and distribution logics, driven mainly by large companies [29],

the sourcing operations have been redirected to emerging countries often characterized by low green regulation and poor social policies [30]. This has left the current fashion production system to be based on traditional practices that are not sustainable.

Moving manufacturing operations affect people, communities, and economies; “where,” “how,” and “by whom” apparel is manufactured has global sustainability implications [31]. Supply chain traceability is a condition for companies to understand the social and environmental impact of their business, enabling them to identify risks, challenges and opportunities to increase operational efficiency [32]. Several brands have already moved toward “radical transparency” in manufacturing, hoping to regain the trust of disillusioned customers; it may include information like product origins and the manufacturing environmental impact [20].

Global supply chain by definition is not easily accessible [33]. For many critics, global supply chain represents the center for unsustainability in fashion, as its great scale and anonymity perpetuate the inability to brands understand the own ecological and social impacts [5]. Outsourcing is a reality in the apparel industry. The strategies employed by companies depend on their characteristics as size, pricing, production scale and business model. The outsourcing may be related to the nonexistent local labor or lower-cost options. However, the emergence of new business models as “on-demand” manufacturing, which decreases the economic risks of fashion collections, is challenging a quick response from supplier systems, demanding strengthening of local outsourcing [34].

3.4 Local supply chain

As already approached, supply chain control is fundamental in other than economic management, also for damage control. Garment manufacture nearshore and onshore take to environmental and social benefits, as well as commercial advantages. Manufacturing closer to consumption, companies becoming more sustainable and less expensive, decreasing overproduction through on-demand systems and minimizing carbon footprint through decreasing transportation [20]. In addition, a local supplier can be sought out on a regular basis, and numerous aspects of the collaborative relationship become self-evident [23].

Local manufacturing enables on-demand production, responding to market demands and trends, in a productive cycle where products are “pulled” into the market based on actual demand rather than “pushed” based on best guesses and forecasts. The consequence of a rise in just-in-time production is reduced levels of overstock and the rising importance of small-batch production cycles [20]. For more than two decades, a quick response

supply chain has been a well-established practice to deal with the market volatile demand in the fashion industry [35]. Many quick response agendas also employ local manufacturers as suppliers; this strategy can ensure a timely inventory supply in response to market changes. Quick response is also environmentally friendly, since required carbon footprint in shipping is much reduced compared to the sourcing scheme from far-away off-shore manufacturers [34].

The logistic process is also strategic to the “reverse logistics,” which can be defined as the process of collecting products and materials used from the first customers to be reused or recycled to generate the original product or other products [36, 37]. Through it, the waste management, whether from industry, commerce or the user, is made feasible. Many of the business models are based on increasing textiles life cycle through repair, reuse, leasing, etc.; in this context, the process viability also depends on local labors near consumer [38]. The discussion of regional supply chains is gaining additional traction in light of innovations in sustainability and closed-loop recycling [20]. Countries with a significant existing manufacturing base may already have the requisite skills and infrastructure to support the circular models at scale [7].

The local supply chain demands a new set of requirements with respect to the sector structure, productivity, operational model, sustainability and supply of a region [20]. For example, the current bulk of production and consumption of the main fiber types is still centered in Asia, especially China, for the US and European apparel markets the existing capacity is limited, their biggest challenge would be the local sourcing raw materials, fabrics and ingredients for mass market apparel. Labor cost is also barrier to many countries, which will depend on high technology to enable local production [20].

One of the key challenges of CE is local production, with a minimum environmental footprint and simultaneously satisfying the demand of global consumers [38]. Considering Brazilian case, it has already a complete textile chain, from fiber production to final retailing [39]. In spite of the need to develop the Brazilian economic potential in several aspects, the barriers to the implementation of CE in the country are internal, and CE could be applied from business, political and consumer engagement [40], not depending on external factors such the deployment of autonomous industries as some developed countries will need [20]. In this way, textile and fashion sectors in Brazil are better described below in order to understand how circular approaches align with and support the already existing domestic industrial and social development strategies as previously proposed.

3.5 Textile and fashion sectors in Brazil and their challenges

Brazil ranks fourth among the largest garment producers and fifth position in textile manufacturing (yarns and fabrics), is self-sufficient in the production of cotton (the most consumed natural fiber) and is the fourth largest producer and consumer of denim [39]. The manufacturing approach assumes that the apparel value chain is a process by which technology is combined with materials and labor and then processed, assembled, distributed and marketed. Furthermore, this approach assumes that upgrading occurs to products that are organizationally related through lead firms in global value chains [41]. Though Brazilian textile and garment industry largely supplies the domestic market, with low significant participation in global production and trade [39], the apparel industry is the main destination for Brazilian textile products. It is characterized by intensive labor and a great diversity in relation to size, specialization segments, productive processes, competition patterns and business strategies [40].

Accompanying the decrease in textile production in the last decade, the garment retailers turned to offer imported products with lower costs, mainly from Asia, which resulted in a sales increasing of 24 times between 2004 and 2014 in the country [42–44]. Brazilian textile production dropped 1.6% in 2018 and apparel production declined 3.7% [45]. The problems around the competitiveness of national textile and clothing industry stem from a number of macroeconomic and structural issues, such as the lack of textile and fashion policies and fiscal incentives, as well as the shortage of skilled labor [43]. Also, the fall of important positions reflects a lack of competitiveness in strategic factors, such as technology, productivity and quality [40].

It is necessary to develop greater capacity for innovation and differentiation, through new business strategies and technological standards for product; quick responses to the market, through the modernization of small enterprises; and through effective policies that increase the articulation with the retail and improve the dynamism and industrial competitiveness [40, 46]. The cost and investment reduction, through tax and credit measures, has been the focus of industrial policy for the sector [46]. However, there are great opportunities to transform Brazilian fashion economy through strategies that involve the qualification of national industry and local labor [44].

Since, according to Amaral et al. [47], there are no practical examples of CE in the Brazilian textile and fashion sectors, government regulation is fundamental to overcome the related barriers. Without established standards, consumers’ responsibility keeps focused on a compromised group, with most consumers still having the option of

choosing unsustainable products [48, 49]. Preliminary studies by “Ellen McArthur Foundation” [50] showed that, through innovation and creation of value, the transition to CE could generate opportunities for the economic, social and natural capital construction in Brazil and the opportunity to differentiate by competitiveness, even in crisis. Brazil is a country with singular market, social and natural characteristics and great for exploring opportunities that benefit from CE.

As a business strategy, the benefits of sustainability are significant for all stakeholders, with possible cost reduction; increasing competitiveness; reducing the risk of environmental accidents; improvement in the health and safety conditions of the workers; improvement in the company’s image with consumers; strengthening reputation in relationships with suppliers, public authorities and investors; expansion of its prospects in the internal and external market; greater access to financing lines; improvement in the relationship with environmental agencies and society, among others [40]. Developing countries are global centers of production, and Brazil is already a driver of consumption. Success in embedding circular principles in industrial growth and infrastructure development strategies can help meet the needs of growing and urbanizing populations while mitigating against a continued rise in primary resource use, associated emissions and environmental pollution [7]. With enough investment, developing countries can overtake developed countries in digital and materials innovation to embed sustainable production and consumption at their economies.

As already mentioned, the presence of a complete manufacture base supports on-demand business models. Brazil is one of the few countries in the world where everything that is needed to produce garments (from fiber to production) is available within its borders, constituting this a strong differential. Brazilian fashion chain is the only one that incorporates all the stages of value in the West [39]. In addition, by reducing the product transport footprint, local clothing production generates jobs near the markets [5], making the performance of the textile and fashion industry strongly influence from a social point of view. The sector is the second largest generator of manufacturing jobs in Brazil [39].

On the other hand, without enough revenue to cover labor costs, many companies eventually fall into informality [51].

From the 8 million workers that are estimated in textile and clothing sector, 6.5 are irregular ones [39]. Irregular workers are therefore more likely to suffer a “decent work deficit,” which denies them access to enabling rights and undermines their relative ability to reap the benefits of economic and social upgrading [52]. The result is that most Brazilian clothing companies are made up of small- and

micro-sized companies, with low productivity capacity and business management deficiencies, especially the sewing services offering, with difficulties in producing large-scale, quality, efficiency and deadlines to meet the demand. [40].

Informality creates a wicked environment that is propitious to inadequate labor conditions. With the society pressure for transparent performance of companies, the initiatives to combat precarious work conditions were intensified in Brazil. Complaints of occurrences with public inspection agencies have led to the expansion of the control against companies that practice labor exploration [40]. Brazil is an interesting and important case because of following its largest textile and clothing sectors, unions with a long history of militancy and innovation and a national government that (between 2003 and 2014) took concerted policy steps to improve the situation of workers [53]. Even so, unions and Brazilian entities have great difficulties in acting with the large masses of subcontracted and domiciled workers, who do not fit into conditions of extreme precariousness. This phenomenon occurs in Brazil for the same reasons as in other countries [53], because the group represents very heterogeneous and invisible work situations, contrary to the lasting and collective character of the categories originally represented by the unions [52].

Another interesting feature is precisely that Brazilian fashion industry is configured by local economy characteristics, different of those ones commercial products that are obtained internationally, based on the most economical production route [5]. As Brazilian textile manufacturing is directed to the domestic market, this should mean that it could be better monitored, as augmented by many authors [5, 33].

It is not possible to improve social conditions of companies without considering their economic performance. As the chain structure does not allow revenue through price increases, the only way for labor-intensive companies to improve working conditions is increasing productivity. Companies that adopt well executed, more efficient organization and small technological changes can magnify significantly its production per worker [51]. Despite the large presence of labor informality in small local sources manufacture services, there are an important number of well-structured medium-sized companies, which in general are the suppliers of the most representative brands and companies of local textile retail [40].

Although the domestic labor standards are well known [53], Brazil does not rank among countries with the highest forced labor occurrences, due to regulatory political mechanisms and the presence of controlling organizations such as NGOs and social movements [20]. Employers’ register, popularly known as the “dirty list of slave labor,” [54] is one of the main instruments of public policy to combat forced labor. It guarantees publicity for cases that exploit

labor in a situation analogous to slavery, transparency and social control; arranges cases of existing infractions; and strengthens the technical area that formulates the list based on pre-established criteria, securing a technical and non-political formulation of the register.

Another legal attitude in force in Brazil is the National Solid Waste Policy, which favors, through effective control, practices of environmental sustainability [55]. Quite current, the law contains important instruments to enable the country to advance in addressing the main environmental, social and economic problems arising from the inadequate management of solid waste: prevention and reduction of waste generation; establishment of shared responsibility for waste generators; creation of important targets that will contribute to the elimination of landfills and to institute planning tools at various levels; in addition, requiring individual Solid Waste Management Plans.

Two paths are possible for developing Brazilian clothing sector. One is the resumption of local market growth, which goes to meet the localism approach as the most sustainable companies to manufacture. Another path is the one proposed by Gereffi [41], within apparel manufacturers from emerging countries (e.g., Brazil) need to follow the value global chain process in order to upgrade. No matter the path, it is imperative that economic recovery be based on more sustainable practices [40]. Even in the global value chains, proactive engagement by multinational companies with suppliers in developing countries, including SMEs and those operating in the informal sector, will be necessary for circular activities to be scaled up in a manner that is inclusive and avoids the displacement of vulnerable workers [7].

The next two years present a moment of opportunity to develop a global vision for the CE aligned with climate action and the broader sustainable development agenda [7]. Attempts to respond to challenges of resource scarcity, environmental impact or economic benefits or combinations of these have been made by governments, industries and societies around the world. The analysis of the key competitiveness factors of the textile and clothing industry in China and Europe is an important reference for a competitive agenda in Brazil and fortifies the idea of the economic relevance of sustainability [46]. Global models, challenges and opportunities are presented in the following.

3.6 Global models

In “The State of Fashion 2019” annual report [20], sustainability is an increasingly importance issue, appearing for the first time on the priority list of interviewed fashion professionals. The topic assumes the central role for the planning and principles of the textile chain. Nowadays, innovation

and sustainability are the core strategies of the European textile industry [40, 46]. The CE is now a core goal of the EU’s 2050 Long-Term Strategy to achieve a climate-neutral Europe and Japan priority for the 2019 G20 summit [7].

The CE is now a main objective of China’s five-year plans [7]. Investments to increase productivity and quality, in addition to the willingness to meet international standards in energy saving and pollution reduction, keep them as one of the industry leaders [40, 46]. China with its staggering population and rapidly developing industry realized its gap between economic development and resulting environmental impacts. As a consequence, the government of China formally accepted the concept of CE as a new development strategy and approved the first law “Circular Economy Promotion Law of the People’s Republic of China” which took effect in January 2009 [8].

However, studies based on CE models in Western Europe have found that most businesses face challenges in issues such as: most of the concepts require a broader consumer mind shift; the lack of profitability or scale; and the need for changes in market practices, including greater control and collaboration throughout the production chain [56]. The consumers are the change agents with greater power of influence, so it is necessary to spread the culture of sustainability among them [57].

About consumers, Franco [12] found that the strongest demand pull, and the most effective one, comes from the key players in the industry itself and not from the consumer side. Although informed consumers do play an important role in fueling demand, and therefore production, there is no evidence of consumer “sustainability consciousness” in her findings. Green consumer behavior for a CE is embedded in the structure of the value chain when circular products are available, perform equally as good or better than their counterparts, are priced well and are part of an intelligent take-back system that is acceptable and convenient for consumers.

Sustainability is not enough to influence the purchase clothes, a low-priority concern over price. This happens because clothing sustainability is very complex and consumers are very diverse in their ethics concerns; as clothes are not an altruistic purchase, sustainability is a low-priority concern when it comes from consumer buying [58]. Sustainability challenges are undeniable, not easy to understand and to communicate. For example, often the consumer is led to think that the use of organic cotton necessarily makes sustainable the product and company, which is not true, because it is not about making a sustainable product phase, but the whole product life cycle, before and after consumption [57].

Beyond the barriers related to culture and market to CE implementation, Kirchher et al. [59] indicate the technology and the need for regulatory policies as

complementary barriers requirements and interrelate all them: A company with no corporate culture in relation to CE will not develop circular projects, since CE products are not offered to the market; in the sequence, the consumers will not be aware and interested in circular designs; following the same logic, cultural barriers can induce barriers that induce more cultural barriers.

As shown by international cases, changes are progressive [33, 40, 46], so the evolution of the discussion and the action for change toward cyclical and as sustainable fashion sector is urgency [6, 40, 60]. Although the Brazilian textile and clothing sector still presents relatively abundant numbers, as Chinese imports gain a greater market share, the very existence of a Brazilian garment industry is jeopardized [53]. This could result in a decrease in income and work, which only contributed to the increase in social inequality. As current Brazilian development policies have no positive effect, the challenge is how to apply comprehensive measures for a fashion industry that depends on a mass of small companies with limited quality and productivity, with fragile management and without efficient business strategies.

This research has purposefully looked into Brazil and the already existing domestic industrial and social development strategies. It was possible to confirm that few CE researches address developing countries, especially Brazil, attention. The fashion industry is an important Brazilian social maintenance tool, which also confirms the need for further studies and actions aimed at the development of labor in the sector and the CE social attention and which, according to the findings, also presents itself as an important stakeholder for the transformation of a linear economy into a circular one. Therefore, the next step is to deeply research Brazilian local supply chain, in order to better understand the local labor dynamic.

4 Conclusions

Sustainability is one of the main challenges of the present since it meets the urgency of minimizing the negative relation between consumption, industrialization, environmental footprint and social impacts. CE is a restorative and regenerative system, dissociating the economic activity from the consumption of finite resources without compromising the economic development. The proposal to implement the CE in Brazil, besides being necessary in face of the need to save the planet physical resources, it has the potential to offer the competitive advantaged that is necessary to recover the fashion economy growth in the country. Brazil has a complete textile industry but in crises. Through innovation and creation of value, the transition to

CE could generate opportunities for the economic, social and natural capital creation.

Therefore, the change for systemic management of the value chain makes urgency including the use of technologies; social and environmental damages control; capacity of human capital; research development; local action; and dissemination of the CE concept to the public. For this, business commitment and political engagement are required, as in other countries around the world that are attempting to respond to challenges of resource scarcity, environmental impact or economic benefits or combinations of these have been made by governments, industries and societies around the world.

Locality is one of the sustainability themes, because through it is possible to have the greater control of the supply chain, to add cultural characteristics to the product, besides to making feasible reverse logistics. As the fashion industry is one of the biggest job creators in Brazil, local fabrication, in addition to reducing the carbon footprint, has the capacity to change the country's social profile, reducing social inequality and improving the economy. At the same time, a skilled and closer workforce offers agility, quality and control. In addition, countries with a significant existing manufacturing base may already have the basic skills and infrastructure to support the CE.

Despite all the difficulties, international models demonstrate that the CE spread, when made by brands and companies, could popularize the concept and contribute to the consumers shift mind in order to incorporate the idea and then initiate a movement of production and consumption based on sustainability. Finally, the expectation was to find growth opportunities in the EC context. Thus, in this preliminary study, difficulties and opportunities related to the implementation of a Circular Fashion Economy in Brazil were observed. From these, it is expected more collaboration to overcome the challenges pointed out in future studies.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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