

How Is Fashion Going: Structured Literature Review for Circular Economy in Fashion and Textile Industry

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Abstract: In a time of global warming, sustainability claims are prevalent in the fashion and textile industry. Fashion industry is experiencing a shift from a linear economy to a circular economy. The circular economy shift in fashion textiles, however, has very many dilemmas due to the close connection with its value chain. This paper will take the form of a literature review to discuss the methods used in transforming the circular economy in fashion and textiles and the dilemmas it faces, as well as the social issues arising from the transformation, from the design to the distribution to the recycling of a fashion item.

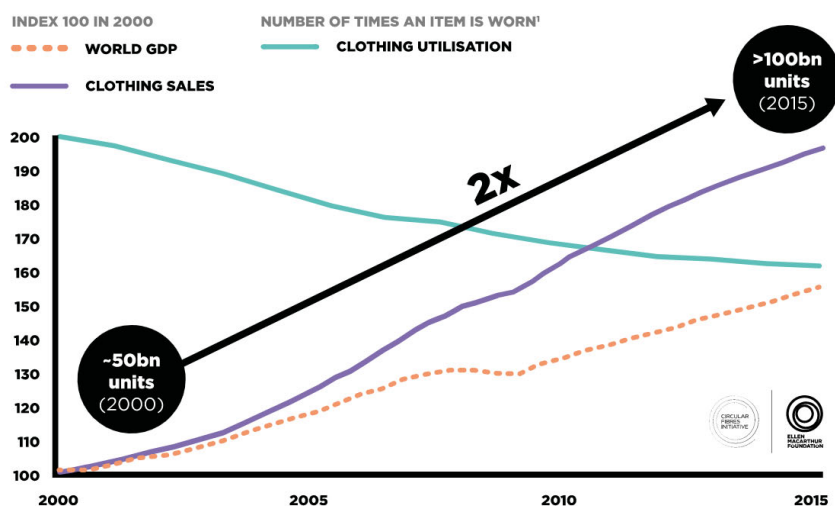
Keywords: Circular economy, Fashion and textile industries, Sustainability and fashion.

1. Introduction

As one of the four essential factors of human life, clothing has been a significant factor in the history of human development. From the distant 18th century or earlier, fashion began to become a synonym for clothing. No matter noble or common people, women or men, everyone started to pursue popular clothing. And from the twentieth century onward, economics and profits began to drive the fashion industry. The fashion industry realized that the supply of popular apparel was not fast enough to keep up with consumer demand, and therefore fast fashion was born. In such a trend, consumers

quickly changed their closet every spring and summer, fall and winter, depending on the seasonal fashion. As new fashionable clothes emerge, outdated clothes are constantly being obsoleted by consumers. In a report released in 2019, the United Nations stated that the apparel industry is the second largest polluting industry all over the world after the oil industry. "It takes approximately 7,500 liters of water to produce a pair of jeans, the same as one person drinking for seven years." (United Nations, 2019)[1] As a result, sustainability has emerged as a major label for the apparel and fashion industry in the 21st century. (Moorhouse and Moorhouse, 2017)[2]

FIGURE 1: GROWTH OF CLOTHING SALES AND DECLINE IN CLOTHING UTILISATION SINCE 2000



Source: Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005–2015); World Bank, World development indicators – GD (2017)

Figure 1. Growth of clothing sales and decline in clothing utilization since 2000 (Ellen MacArthur Foundation, 2021)[3]

In the global sustainable development process, the concept of circular economy is of central importance in guiding the sustainable development of the fashion industry. The concept of Circular Economy (CE) was proposed by Kenneth Boulding originally in 1966 (Boulding, 1966)[4], and later applied by the European Union in the Circular Economy Action Plan (CEAP) as well (European Commission, 2015 -

2022)[5]. The European Commission approved its first circular economy action plan in 2015 and has continued to improve and launch new circular economy plans in the eight years since 2015. Between 2021 and 2022, the European Commission has gradually updated its proposals for the textile and fashion industry in detail.

- 2021 - 2022  **Planned adoption date for several initiatives under the action plan, including:**
- legislative proposal for substantiating green claims made by companies - [find out more](#)
 - legislative proposal empowering consumers in the green transition - [find out more](#)
 - EU strategy for sustainable textiles - [find out more](#)
 - a sustainable products policy initiative including a revision of the Ecodesign Directive - [find out more](#)
 - review of requirements on packaging and packaging waste in the EU - [find out more](#)
 - update of EU rules on industrial emissions - [find out more](#)

Figure 2. 2015 – 2022 Circular economy action plan (European Commission, 2022)[6]

Before the Circular Economy was introduced, Fashion and textile industry has been applying the linear economy system, which is “take-make-use-throwaway” (Ki et al., 2021)[7], for a very long period. After the concept of Circular Economy has been proposed in the fashion industry, fashion industry and companies started to shift their business from linear economy to circular economy, which is “take-make-use-reuse” (Ki et al., 2021)[8], and apply the circular economy model to the apparel’s whole lifetime. However, the transitioning from linear economy to circular economy is disruptive. The transformation of the circular economy involves every stakeholder in the value chain of the fashion industry: designers, suppliers, fashion companies, consumers... Whether it is the design of fashion products, the retail model, or the recycling of fashion clothes, the transformation of the economic system is a completely new change for the fashion industry. (Jacometti, 2019; Shirvanimoghaddam et al., 2020) [9-10]

Here, I develop a structured literature review to discuss the different approaches in the transition to circular economy in the fashion and textile industry, the challenges presented in the implementation of the approaches, and the social issues arising from the transition to circular economy. The database I mainly used for finding literatures is the Web of Science, as it focus more on journal articles than other database like google scholar, and it has stronger searching mechanism to filter out the relevant articles I need. And to search for some policies, proposals, books, etc., I will use Google and Google scholar as supplementary databases as they include wider source of information. As European Commission has launched the CEAP in 2015 and continue to renew it until now (European Commission, 2015 - 2022) [11], the dates for literature review should be the same: 2015 – 2022 to keep our discussion current and relevant to the Circular Economy Action Plan.

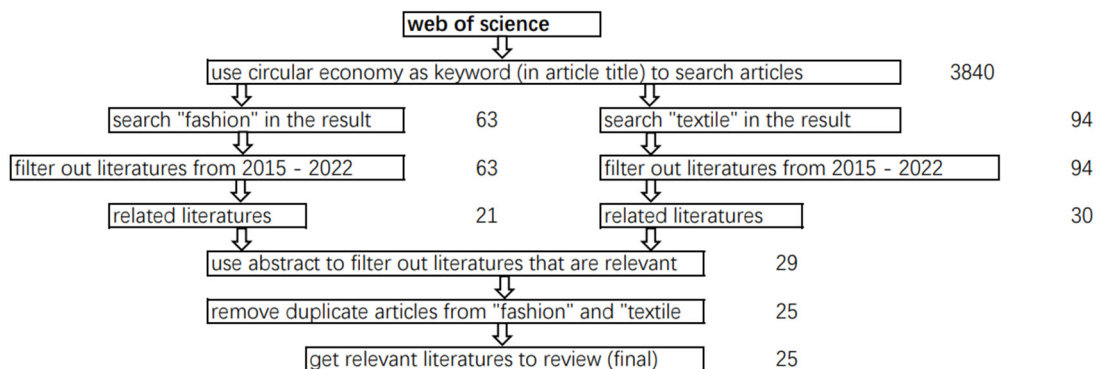


Figure 3. My literature searching logic

I used the Web of Science to filter out literatures to review and organized them with different keywords. Where the literatures are relevant to our topic and the data and literature citations are reliable, I will select literatures that cover different research methods, different research perspectives and different formats for review. Because it can provide me with different perspectives throughout each step of the lifetime of a fashion product and facilitate me to observe the transformation process of the circular economy of the fashion and textile industry sector from multiple perspectives.

2. Approach and Difficulties to Reach Circular Economy in Fashion and Textile Industry

The circular economy of the fashion and textile industry refers to the extension of the life of textiles through using sustainable or recyclable materials, changing the linear economic system of "make - use - waste" in the textile industry into a circular system of "make - use - recycle - reuse" and minimizing textile waste. The circular economy in the fashion and textile industry involves many steps along the entire chain of fashion goods, from being made to being sold and sold afterwards. The discussion about different

approaches and difficulties of reaching Circular Economy in fashion and textile industry will be conducted along the sequence in which a fashion item is made and brought to market.

3. Start from Design

According to Essi Karell, the recycling of fashion goods depends greatly on the design process of the fashion product, especially in the case of apparel. While the sorting process prior to recycling is mainly about selecting the material and fibers used in the garment, the design process is an important step in determining the material and structure of the garment. (Karell and Niinimäki, 2019) [12] Ellen MacArthur Foundation, in its report *A new textiles economy: Redesigning fashion's future*, published in 2017, also suggested that to follow the principles of the circular economy of fashion and textile industry and build a new textile economy, it is necessary to fundamentally change the way clothing is designed. The designer of a fashion item can make the garment by choosing a material that can be easily recycled, so that the fashion item can be more easily recycled and reinvested after it has been used and discarded by the consumer. They also mentioned in the report that starting with the design approach, the fashion and textile industry chain needs to be fully coordinated so that fashion goods can re-enter the economic cycle after they have been used by consumers. However, the disconnection between the industrial processes of the fashion and textile industries is one of the dilemmas of the fashion industry's attempts to achieve a circular economy through the design process. (Ellen MacArthur Foundation, 2017) [13]

Except for the disconnection between fashion industrial process, the limit right of designer is also a big challenge for "design for recycle". Essi Karell's paper published in *The Design Journal* has done research by conducting interview with five industry experts and found out the dilemmas of the circular economy attempt in the designer's perspective. (Karell and Niinimäki, 2019) [14]

One of the designers interviewed said that in the fashion merchandising process, the designer's power is often limited to making suggestions rather than making final material decisions. Although designers can suggest new materials for sustainability, the final choice of which material to use is made by the product manager. Before considering the sustainability of raw materials, product managers often consider factors that are more directly related to the company's financial interests, such as comfort, popularity and profitability of the material. Therefore, it is less likely that designers will drive sustainability in fashion products (especially in companies with larger size). In addition to this, the designer also mentioned that consumers today have higher expectations for the look and feel of fashion goods and that the only way to achieve high quality in fashion goods is to use fiber blends as clothing materials, which are not suited for recycling and reuse. In other words, products that are suitable for recycling are often not of good quality, and customers are willing to pay more for products that feel and look better than those that are environmentally friendly and of poor quality. (Karell and Niinimäki, 2019) [15]

4. Collection, Sorting, Recycling, And Reuse

"The sorting, re-use and recycling of textile products will

be key to achieving such goals (Circular Economy)", says FashionUnited in its report for 2021. (FashionUnited, 2021) [16] Currently, the most important step in the application of a circular economy plan for the fashion textile industry is the recycling of used textiles. The recycling of textiles is divided into four broad steps: collection of waste textiles, sorting of textiles, recycling of textiles and reuse of the recycled textiles. The transition to a circular economy in the fashion textile industry is facilitated when consumer waste is recycled and put back into use in the fashion textile industry or used in the production of textile by-products. (dos Santos and de Souza Campos, 2021) [17]

Clube conducted research on a denim manufacturing company based in Vietnam. In the context of an industry that promotes a sustainable fashion economy, this company achieves company-wide sustainability (both social and environmental) by incorporating resources from disadvantaged groups in the community and enhancing the sustainability of its production materials. The denim company employs disadvantaged members of the local community (people with disabilities) and uses waste textile materials from the core production line of the factory to further process them into textile by-products such as bags and mats. They maximize the recycling of waste material from the production line and put it into the production of by-products, achieving a certain degree of circular economy shift within the company. (Clube and Tennant, 2022)[18]

Although waste materials can be recycled and reused to a greater extent at the company level, at the industry level there are barriers to the implementation of the four steps of collection, sorting, recycling and reuse. In their book *Towards a Nordic textile strategy: collection, sorting, reuse and recycling of textiles*, David Palm et al. provide an insight into the textile waste recycling systems in the Nordic countries. In their book they address the difficulties in the collection and sorting steps. They argue that the collection of textile waste requires a higher degree of cleanliness and dryness than normal waste and that the cost of incineration of textile waste is much higher than normal waste, which makes the recycling of textile waste less favorable for the collector. As for the sorting techniques for reusing textiles, Palm answers with "virtually non-existing". (Palm et al., 2014)[19]

Currently textile waste is sorted mainly by hand, and sorters assess the usability of textiles only by their observation and touching, which is clearly not accurate or sophisticated. Karell believes that although automated fiber recognition by machine is likely to be the sorting solution of the future, it will not replace manual sorting. (Karell and Niinimäki, 2019)[20]

In 2020, Riba presented in his research a textile sorting method applying infrared spectral analysis that can be used for the automatic sensing and sorting of waste textiles with 100% sorting accuracy and without prior treatment of textile waste. (Riba et al., 2020)[21] This method of analysis with infrared spectroscopy was also mentioned in Palm's book published in 2014, when the authors of the book agreed that the analysis technique of infrared spectroscopy might be effective in the coming years, but only for sorting and screening of recyclable textiles. (Palm et al., 2014)[22]

5. Second-hand Fashion Market: The Reuse of Unwanted Textiles

The emerging second-hand market is seen as a practice that

can effectively transition to circular economy in fashion and textile industries.

Zhou points out in his research that fashion apparels often still have residual value for modern consumers when they are discarded. With today's fast-changing fashion trends, consumers always have more fashion items in their wardrobes than they actually need, resulting in many discarded clothes that have actually only been worn two or three times by consumers. The second-hand clothing market, which recycles, cleans and re-sells such clothes, can effectively extend the life of a fashion item, thus positively influencing the sustainability of the fashion and textile industry. (Zhou et al., 2020)[23]

However, the fashion industry has mixed views on the sustainability of the second-hand market.

Machado and Ta, AH took a consumer perspective and conducted in-depth interviews in his study with a number of consumers who buy second-hand clothing. He found that consumers who buy second-hand fashion clothing are positively motivated in their consumption process and create a virtuous cycle in their buying habits.(Dutra Machado et al., 2019; Ta et al., 2022)[24]

D'Adamo's in-depth research into the second-hand market has found that the tendency to recycle in the second-hand clothing market may have the reverse effect of influencing fashion companies to proactively adopt a circular economy business model, thereby impacting the entire clothing value chain, including manufacturers, distributors, and end users. And thus making the fashion and textile industry more sustainable. (D'Adamo et al., n.d.) [25]However, such a positive impact would require significant changes in the apparel supply chain and cooperation between them. At the same time, he pointed out that as second-hand clothing is often sourced from fast-fashion brands, the fact that the pricing of second-hand clothing are similar to the prices of new clothing from fast-fashion brands could pose a threat to fast-fashion companies.(D'Adamo et al., n.d.)[26] In this way, the second-hand market may exacerbate sustainability problems through a sharp increase in the number of similar clothing products, and vicious competition may further shorten the life cycle of textiles. When the second-hand market poses a threat to fast-fashion brands, there is a risk that fast-fashion brands will enhance their competitiveness by greenwashing, which would undoubtedly be the consumption and marketing issue of the fashion textile industry. (Norris, 2019; Farahani et al., n.d.)[27]

6. What the Fashionable Circular Economy Needs to Be Aware of: Social Issues

While the circular economy is a positive industry objective in the fashion and textile industry, it can still have an unfair impact on international employment. Repp has studied the employment impact of the shift to a circular economy in fashion using quantitative industry research on a global scale. His findings suggest that as the fashion and textile industry gradually transforms into a circular economy, the focus of work in the fashion goods value chain changes. Jobs in the textile reuse and recycling industry will increase, while jobs in landfill and incineration activities for waste textiles will decrease.(Repp et al., 2021)[28] In addition to this, Repp, Stegeman and Mitchell and James all indicate in their research that employment will also be negatively affected in

the labor-intensive production of fashion goods, which tend to be in low- and mid-income countries from outside the EU. Similarly, employment in second-hand retailing increases because of the shift towards sustainability in fashion, often in developed or developing countries within and outside the EU. In the shift to a circular economy in the fashion textile sector, countries with better developed economies benefit, while countries with already underdeveloped economies bear the negative effects of the industry shift. (Mitchell and James, 2015; Repp et al., 2021; Netherlands et al., n.d.)[29-31]This is an issue of social equity in the fashion textile sector where circular economies are widely concerned.

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