Sustainable Design: Circular Economy in Fashion and Textiles

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Abstract: Fashion is widely considered the second most destructive industry after oil, to the environment. An EU initiative called the European Clothing Action Plan has been launched to significantly improve by 2019 the sustainability of textiles across their life cycle from design to end of use. Textile waste ending up in landfills has become a huge concern globally. If every brand along the clothing supply chain begin to implement eco-friendly practices, the textile and fashion industries will become significantly more sustainable. Up to 95% of textiles land filled, each year could be recycled. (pure waste.org)

With an increasing concern amongst consumers about the social and environmental impact of their purchases, businesses are beginning to understand the benefits and untapped economic potential of efficient use of waste.

Keywords: Fashion, Sustainable, Waste, Circular Economy, Textiles

1. Introduction
This paper will explore sustainable design practices in relation to zero waste fashion and the benefits that can be gained from implementing a circular economy, not only to the environment but also highlighting the potential to create a multibillion dollar industry. It will assess how the fashion industry can adopt a collaborative approach to design and production in order to accelerate sustainable design and innovation across the entire industry. This paper will focus on how industry and education can develop a more symbiotic relationship that will lead the fashion industry to a sustainable future.

The European Clothing Action Plan launched in May 2016 has set out to encourage industry, scientists and creatives to reinvent how we design and produce products, rethink how we use and consume products and redefine reuse and recycling of these products. (wrap.org.uk, 2016)
Integrating a more circular economy as well as reducing waste and negative environmental impact, will address the issue of depleting resources, as well as create new business growth opportunities and economies that are more competitive.

“Our current path is unsustainable and it’s time to start realising the benefits of innovation, job creation and economic development that a circular economy can create” (Shumpert, 2016)

2. Methodology

For this paper, a search of literature in the area of circular economy in fashion and textiles has been made. Most of the resulting literature, although thought provoking, is very quickly out of date in respect of information and statistics, because of the rapid changing of the industry particularly in the last three years.

As a result of this issue established Internet search engines were used to collect up to date information as well as electronic library searches for up to date and relevant reports and journals.

Because of the broad range of the subject, we will try to bring some clarity to one area of what is a complex topic, focusing on recycling and re manufacturing.

We have also established two social enterprises. Certified made in the UK is a design and manufacturing organisation, which helps businesses, improve sustainability. Made with Love is a global charitable recycling initiative that will help the fashion and clothing industry to reduce its negative environmental impact and help people in need around the world.

3. Findings

3.1 Luxury

Luxury group Kering has taken the initiative to improve sustainability throughout all its brands and set targets to achieve this.

- **Stella McCartney** launched a shoe collection made from a biodegradable bio-plastic and recycled plastic. APINAT represents on average 15% of all the companies shoe sales (Kering report 2015, p19). In November 2015 Stella revealed that 53% of womenswear and 45% of men’s wear collections were now sustainable (Rosily, 2016)
- **Gucci** introduced 100% biodegradable shoes made out of APINAT and began encouraging the use of recycled plastic for shoe heels. Biodegradable rubber is used in the brands boots resulting in more than 40% of soles made with alternative plastic. (Kering report 2015 ,p19)
- Cashmere a fabric known for its luxury needed a change in how it was being produced both socially and environmentally. Kering introduced an innovative approach to “turn off-cuts back into high quality yarn without the use of harmful chemicals and dyes”.

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This regenerated cashmere was introduced into Gucci collections in 2014 and 2015 and Stella McCartney in 2016. A total of 11 tonnes of wool scraps were reused to create regenerated cashmere (p56).

- Balenciaga since 2011 has recycled 3.1 tonnes of fabric. They launched the Second Life fabric initiative in 2014 to find new uses for its unused fabrics sent to workshops. Employing people in work integration programmes 1500 metres of fabric has now been reused. (P55)

- Bottega Venetta & Gucci both set up programmes to reuse waste leather scraps into shoe production or cuttings into organic fertiliser. Hermes Petit H label uses all pre-consumer waste leather. (P55)

Other Luxury brands taking steps towards a more circular economy are Viktor and Rolf. The 2016 Haute Couture collection was designed using all fabrics from previous collections and weaving them into new garments. Couture embellishments were created using beads and buttons collected from previous work.

Figure 1 Viktor and Rolf Haute Couture 2016 made from fabrics from past collections

Maison Martin Margiela Artisinal collections by John Galliano used up cycled materials including shells, broken mirrors, end fabrics and costume jewellery, ‘true to a deep commitment to the extraordinary possibilities of the Maison’s Atelier and the Art of Haute Couture’. (Di Boscio 2015)

“It’s actually a man’s coat, which I then draped” explained John Galliano to Vogue of a red evening gown he designed for his first collection for the fashion house (Moorhouse,D.2015)
Vivienne Westwood designed a gown using fabric made from recycled plastic bottles that was worn by Lily Cole for the Oscar Awards in 2016. With approximately 36 million viewers, the Oscars Red carpet is an excellent platform for sustainable designers to promote their designs as both ethical and stylish. The Made in Africa project created by Westwood in collaboration with the Ethical Fashion Initiative of the International Trade Centre, a joint agency established by the United Nations and the World Bank, has been a massive success. In five years of joint work, the project has employed 1500 craftsmen in Kenya, receiving wages higher than the local average in addition to gaining skills, which can later be passed on. (Kohrer, 2016)

For the Met Gala in 2016 Emma Watson wore a dress designed by Calvin Klein made from recycled plastic bottles in collaboration with Livia Firth’s Green Carpet Challenge. Watson said, “Being able to repurpose this waste and incorporate it into my gown for the Met Gala proves the power that creativity, technology and fashion can have by working together.”(Moorhouse,D.2016) Nu-life fabric, a fabric developed in Italy, is made from recycled plastic bottles and a mix of recycled polyester fibres, produced using non-toxic dyes. It is designed to guarantee easy disposal and is 100% recyclable at its end of life.

Figure 2. Emma Watson in at the Met Gala in a dress made from fabric made from recycled plastic bottles.

3.2 Denim
**Mud Jeans** is a unique company, which focuses on a circular model. Jeans are leased to customers for a monthly fee and then returned when no longer needed. Discarded jeans are shredded and blended with virgin cotton to make new denim fabric. Returned jeans may also be upcycled and sold as a unique vintage pair with the name of the former owner printed inside, giving a more personal meaning to the purchase. Buttons are personalised so that the owner removes them and reuses them.

![Figure 3. The circular design model for MUD Jeans](image)

In May 2016 **Levi Strauss and Evrnu** designed the first pair of jeans made using post-consumer cotton waste. The process converts consumer waste into renewable fibres and uses 98% less water than virgin cotton products. “As technologies such as Evrnu evolve over time, there will be greater opportunities to accelerate the pace of change towards a closed loop apparel industry” (Dillinger, 2016)

**G Star Raw for the Oceans**, the world’s first denim collection made from ocean plastic. Pharrell Williams collaborated with G Star Raw to design a trailblazing denim collection also made using recycled ocean plastic produced by Eco-friendly textiles company Bionic Yarn, of which he is Creative Director.

“Working with G-Star Raw was an obvious choice, because they have a legacy of pushing boundaries of fashion and denim forward,” says Williams, Creative Director of Bionic Yarn (Dezeen, 2016)

An illustrated squid is used as the motif for the range and features on some items, along with positive slogans and messages explaining the ideas around the collection. Bionic Yarn has also brought about attention to a difficult issue that needs addressing.
3.3 Wool

**Reverso** – is a sustainable business collaboration between 3 textile mills; Green Line, Nuova Fratelli Boretti and Lanifico Stelloni, offering completely honest and traceable “Made in Italy” range of production. Using a 100% transparent method of production, pre-consumer waste fabric and fibres (mostly wool) are collected and re-manufactured into new material.

Brands and retailers interested in integrating this system into their business model can reuse their own textile waste as raw material. This process has the potential to create an almost zero waste cycle of sourcing for brands that implement it. Not only is it a more economical production method, the greater connection with textile mills from creating a circular economy is an opportunity for brands to have more involvement with the design of the fabrics resulting in greater exclusivity and improved innovation. Reverso partnered with Gucci to collaborate on cashmere for AW2015 menswear.

**Wool and the Gang** and **Katie Jones** are two UK based sustainable knitwear brands who incorporate wool yarn made using shredded cotton textile waste, such as old t-shirts to design eco-friendly knitwear. Both brands have showcased their collections at London Fashion Week and through sustainable design are also addressing the issue of animal welfare in the wool industry by designing vegan friendly knitwear.
3.4 Sportswear

Several sportswear brands are forging ahead with innovative ways to close the loop on production. Since 2010, more than 3 billion plastic bottles have been diverted from landfill to make Nike products. The company’s ColourDry technology, which dyes fabric using zero water, has saved more than 20 million litres of water and the brands Reuse a shoe program has recycled approximately 30 million pairs of shoes. Nike is rapidly moving towards zero waste. Nike Grind premium recycled and regenerated materials are produced from original materials and products. Nike Grind materials are used in 71% of Nike footwear and apparel products, apparel trims, soccer kits and Flyknit yarns. Nike’s original goal was to “create a shoe that delivers peak performance for athletes while reducing manufacturing waste in the process. Little did they know they were creating a revolution in sustainable design”. (Nike, 2013) Flyknit technology improved design and functionality produces 60% less waste than traditional cut and sew methods. Since 2012, the technology has reduced nearly 3.5 million pounds of waste (Nike.com, 2016)

Collaborating with Parley for the Oceans Adidas developed a product made with 95% recycled ocean plastic recovered near the Maldives. In 2017, the brand aims to produce 1 million pairs of the trainers from 11 million plastic bottles. At a Parley for the Oceans event held at United Nations, Adidas unveiled the World’s first sneakers made entirely from ocean plastic. In a poignant reminder of the importance and urgency of nature conservation, the nets used for the upper part of the shoes were retrieved from an illegal poaching vessel off the coast of West Africa. (Moorhouse, 2016) According to the Food and Agriculture organisation of the United Nations, an average of 640,000 tonnes of fishing nets remain in the oceans every year. A new version of Adidas trainers has now been launched which combines the recycled plastic uppers with soles 3D printed from ocean plastic. The ultimate goal for Adidas is to eliminate virgin plastic from its supply chain. A concept shoe is being developed from Biosteel fibre, which replicates natural silk and is completely biodegradable. This concept represents premium innovation “moving beyond closed –loop and into infinite loop – or no loop at all” (Dezeen, 2016)
Davy J is a new swimwear brand that aims to prove that it is possible to design great competitive products that are sustainably produced. The project supports a circular economy using 100% regenerated nylon yarn from consumer waste including waste fishing nets. For every tonne of waste net collected there is enough nylon generated to create more than 10,000 swimsuits. They are also creating a closed loop resource system where at the end of life they are returned to be recycled. (thersa.org, 2016)

3.5 Education

“For far too long the design community has viewed political, social and environmental concerns as being beyond its remit. This status quo has been upheld by a design education system primarily concerned with training future designers for the business of designing and selling ‘stuff’” (Chick, 2011)

Education is an important factor in creating a truly sustainable fashion industry by teaching young designers to design with low waste and consideration to the product lifecycle. The importance of Sustainability in fashion and textiles is a considerably recent issue and a lot of the specialist sustainable degree courses have been established in the last 10 years.

"The education space is possibly one of the greatest places for possibility to be guided and developed into the change that we need in the world,”(Williams, 2016)

In my role as a lecturer and researcher, specialising in ethical and sustainable fashion, I undertook a practice led research project to integrate sustainable design thinking in higher education by devising and teaching a module on zero-waste fashion design. My proposed outcome was to provide students with the focus to design with zero or minimal waste and with the clothing end of life stage in mind. Where previously students were often aware of the roles of designer and pattern maker as individuals, zero-waste fashion design showed them a more holistic approach to designing and creating garments.
Whilst zero waste fashion design has been a niche market for many years, new demands for more sustainable practices in the fashion industry and low waste production pushes thus to the forefront of new design innovation.

The results from 20 BA Fashion Design students at Level 5 (2nd year) were exciting and creative, providing them with an outlet to ‘think outside the box’. Methods included embellishing cut off waste pieces into the design of the garment, weaving and knitting waste fabrics to form garments, zero waste pattern cutting, using ethical fabrics, up-cycling and embroidering pieces of waste fabric together to make whole pattern pieces.

Young designers need to be given the opportunity at undergraduate level to experiment with new ways of producing and designing more sustainably. A shared platform formed between Birmingham City University and University of Applied Sciences and Arts, Hanover, to share information and links about zero waste and closed loop fashion design.

“Zero waste fashion design addresses inefficiency in fabric use by reframing fabric waste as an opportunity to explore the magic of fashion; just like all fashion, zero waste fashion celebrates experimentation and the discovery of new forms” (Rissanen, 2016)

Collaboration with industry greatly enhances the message we need to instil in design students that this approach towards a circular economy needs to be embedded in their design practice. The recent LCFxKering talk held at the London College of Fashion was opened by LCF Pro-Vice Chancellor Frances Corner, who introduced the partnership, explaining that it has been significant in supporting LCF’s ‘aim of embedding sustainability into every aspect of teaching, from fashion business to design and communication.’ She went on to describe some of the challenges the fashion industry will face in the future, both social and environmental, and how, through the Kering partnership, LCF students are better equipped to face these challenges. (Rosily, 2016)
4. Discussion

What emerges from this research is an unpredictable however exciting future for the fashion and textile industry. Considered steps are being made: some brands are making great strides to close the loop and reaping the benefits of this. However elsewhere in the industry as Fletcher (2014) suggests there is “great timidity and somewhat reluctance” to see a future with a modern sustainable business model, that is embedded at the design stage. Without young design talent and creative imagination we risk being unable to move past traditional production and into a more preferred course of action.

Celebrity endorsement has been a major influence in the prevalence of sustainable design within the mainstream fashion industry. A significant number of celebrities are not just using their name to promote a brand but instead becoming involved as designers, advocates and entrepreneurs. Actress Emma Watson is a UN Women, Goodwill Ambassador, ethical fashion activist and often wears sustainable fashion at high profile red carpet events. The Green Carpet Challenge launched by Livia Firth is in itself an initiative to engage celebrities to wear Ecological fashion on the red carpet and raise awareness of sustainability. Music artist, Producer and Entrepreneur, Pharrell Williams is the Creative Director and co-founder of sustainable textile company Bionic Yarn, most notably collaborating with G Star to design and launch the Raw for the Oceans collections. Pharrell has previously spoken of using his influence to convert fashion brands to sustainable textiles. Will I am first pitched his idea to Coca Cola about designing products made from recycled plastic bottles and aluminium cans. It then took two years to get the deal done and in 2015 an Ekocycle concession store launched in Luxury department store Harrods, London. (Howarth, 2015)

![Ekocycle store in Harrods, London, products made from recycled plastics and aluminium cans in collaboration with Coca Cola.](image)

While sustainable fashion has often been considered a consumer led movement which brands have been pressured to act on, it is important that businesses demonstrate social responsibility through a collaborative approach with textile innovation and fashion designers to successfully design
sustainable products with minimal waste. With constant news updates as a result of technology and the overriding competitiveness of social media, brands need to design and launch unique products that attract attention. There are vast opportunities for innovation, with many brands achieving world firsts as a result of sustainable design. The positive impact adds lasting value in brand identity and instills consumer confidence at a time when more people are buying into brands that address global issues and make a difference.

From a design, perspective there is increased opportunity to tell a story through the clothes. Designers are often inspired through nature and incorporating sustainable design provides added meaning for both designer and wearer rather than from a purely aesthetic context. There is a trend arising with swimwear and surf wear companies using recycled ocean plastic in products, which aligns brands with a global environmental issue that is directly related to the product they are designing, providing increased marketing and communication opportunities, enforcing yet again that sustainability is a good commercial decision.

Another trend in sustainable design is brands offering free repairs to reinforce that they design high quality products that have been made to last and show superior levels of craftsmanship.

Both of the above waste reducing concepts provide increased economic value, which will become a driving force for a sustainable future, but businesses are just beginning to acknowledge, perhaps because of lack of resources and knowledge of how to implement this.

“Taking waste policy further can bring significant growth and job creation, reduced greenhouse gas emissions, direct savings linked with better waste management practices and a better environment”. (EU Commission, 2015)

Bruno Pieters founder of the transparent sustainable company Honest By discusses 3D printers being part of the fashion industry in the future. He has already produced a small collection of accessories. The filaments used in the 3D printing process are biodegradable, recycled and can be later shredded to turn into new filaments. Some printers will be able to turn household trash into filaments. (Kohrer, 2016). This is all a very new idea but if we continue to develop this technology, it will solve problems of waste.

Many solutions to the problem of waste and sustainability in fashion and textiles already exist as outlined in this paper, and are being ignored or delayed and consumers and brands need to step up and take control.

“Designing for a circular economy is complex. Gone are the days of ‘sustainable’ or ‘eco’ design, when a simple change of material to a recycled alternative would give a project environmental credibility. Now, in order to understand all the facets of the problem, we need to talk to each of the stakeholders involved in the lifecycle of a particular product”

(RSA, 2016)

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