



Homo Sustentabilis: circular economy and new business models in fashion industry

António D. Marques¹  · Anastasia Marques² · Fernando Ferreira¹

Received: 31 July 2019 / Accepted: 22 January 2020
© Springer Nature Switzerland AG 2020

Abstract

The overconsumption of fashion clothes and accessories is a dramatic reality in the last decades, linked with the world economic growth. Also the life cycle of the fashion items become shorter, ruled by “fast fashion” industry and moved by consumers’ desires (but not needs). The programmed obsolescence is critical for this business strategy, reducing the Product Life Cycle to few weeks. But this short time of cloths usage before disposal is an enormous environmental problem. A behaviour of fashion overconsumption leads to an excessive use of natural resources (mainly fibres and water) and energy, generating millions of tons of textiles wastes every year and requires a transition model for sustainability and circular economy. End-of-life textiles are very complex to treat after disposal by the range of different fibers included, by the different industrial processes done (including dying processes) and by the different clothing accessories (buttons, zips, metallic items, plastics and labels). It is needed new business models, focused in circular economy approaches, where the Homo Sustentabilis has the main role. Corporate Social Responsibility inside the companies can be integrated with the new challenges and opportunities assessed by Industry 4.0 framed by the Fourth Industrial Revolution, responding at the environmental and social demanding of the millennial and Z generations.

Keywords Homo Sustentabilis · Sustainability · Circular economy · Fashion industry

1 Introduction

The production of virgin textile fibers, whatever natural (cotton, flax, hemp, silk or wool and hairs) or artificial/synthetic (PET, polyamide, rayon, elastomer) has an enormous environmental impact and uses large amounts of non-renewable sources. These textile fibers are often of a high quality and purity and can be recycled by several methods. Recycling methods are in many cases more sustainable and environmental interesting than the production of new virgin fibres [7].

Circular economy is a key topic in the last year’s research and political speeches, mainly when the subjects are Sustainability and Next Generations Future. As explains Walter Stahl “a new relationship with our goods and materials

would save resources and energy and create local jobs” [17] will be a critical strategy to our common future. Circular economy business models can assume two main types: first model foster reuse and extend service life through repair, rebuilt, remanufacture, upgrades (e.g. upcycling) and retrofits; second model turn old goods or materials into as-new resources by recycling (upcycling or down-cycling) these materials.

The pyramid model for textile recycling categories [9, 10] helps to understand the huge problem we are facing and leads to the preparation of strategies to reduce this tremendous impact in the future generations. Open recycling of post-consumer textiles and clothing is a necessary process that takes the used products from the pyramid base’s (“used clothing markets”) and prepare

✉ António D. Marques, adinis@det.uminho.pt | ¹Textile Department, Center for Textile Science and Technology – 2C2T, University of Minho, 2C2T, Guimarães, Portugal. ²Greenadn, Lda, Guimarães, Portugal.



it to the “conversion to new products” in the pyramid’s level. Usually open recycling in textile context, refers the industrial process of mechanically or chemically (or both) that is opening and tearing the fabrics to return them to a fibrous form. But is needed to keep in mind the sustainable business models [2] that can create positive impacts or reduce negative impacts in the environment and combined them with design elements [16]. The next generations are reclaiming a very active position of all the politics, businessman and consumers to declare “climate emergency”. Many actions can be taken be the Textile and Clothing (T&C) sector, mainly because this industry is the second more polluting and the *fast fashion* in promoting the overconsumption of fashion products.

Also the Corporate Social Responsibility of the Fashion Industry can play an important role in these achievements. Several economic sectors in Europe are focusing their strategies to change to Circular Economy models, including some important retailers, selling also fashion products [15].

2 Generation Y and Z: main victims of overconsumption

Greta Thunberg, a Swedish activist, started a global movement focused on environmental activism with her “school strike” last year. Last “school global strike” involved more than one hundred nations and millions of young students around the world. In Portugal there were over 20,000 students in 51 cities protesting against the *status quo* regarding environmental policies: “There is no planet B” or “Our

future is on your hands” were some slogans yelled by the Z generation. José Miguel, 18 years, Porto, said “The present policies promotes the profit not the environment and the planet sustainability. We are the next generations and we should have a special role in the transformations that have to occur”. Also Sofia Solayman, 18 years, Faro, stated “Youngers need to be listened mainly because they say we are right. But what we see is no changing in the actions and planed measures from the decision makers. We have to declare the climate emergency”. In Hamburg, Germany, were more than 20,000 young students doing exactly the same and similar protests in Spain or France. All around the world these generations (Y and Z) are claiming and screaming for a new Homo Sustentabilis to assume their responsibilities in our common future (Fig. 1).

Several studies related with sustainability and consumer behavior highlight the gap between perceptions, behavior and attitudes in millennial generation [1, 14] and refers also the obsession for fashion products of this generation [19]. Fashion cycles became shorter due to *fast fashion* players (e.g. Inditex Group, H&M, GAP, etc.) increasing the footprint of Fashion Industry. In fashion industry, consumer frugality, defined as “careful use of resources and avoidance of waste” [5], is not obvious, by the contrary. Low prices and programmed obsolescence of fashion products, joined with a continuous growing of a new large community of new consumers in emerging economies leads to a global overconsumption and to a depletion of natural fibers (cotton ahead) very soon. The climate emergence required and highlighted by these recent social movements demands an immediate transition from economic linear models to circular models [17,

Fig. 1 Students strike 2019 (Greta Thunberg inspiration)



6]. Two principles are essential in this approach: (1) the value of products, materials and resources is retained as long as possible, while the production of waste during the process is minimized; (2) materials contained in the waste which is already produced can be reused as “new raw material”. However, remains very clear that this changes depends on consumer’s choices, the amount and quantity of products they buy, the way how they accept and how are dealing with used products, and their openness to new business models as they are the second-hand markets and sharing businesses (Fig. 2).

Bocken et al. [2] defined Sustainable Business Models (SBM) as those that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organizations and its value-networks create, deliver and capture value or change their value proposition. They have identified eight different categories of SBM’s:

- (1) Maximize material and energy efficiency;
- (2) Create value from “waste”;
- (3) Substitute with renewables and natural processes;
- (4) Deliver functionality rather than ownership;
- (5) Adopt a stewardship role;
- (6) Encourage sufficiency;
- (7) Re-purpose the business for society and environment;
- (8) Develop scale-up solutions.

There are several examples of business cases that can be found in the Textile and Clothing industry corresponding to these eight categories suggested by Bocken et al. But it is required a design for sustainability that can be applied in any industrial system and has five key design elements [16]: Product design; Process design;

Value network design; Relational design; Design of “new” consumption pattern.

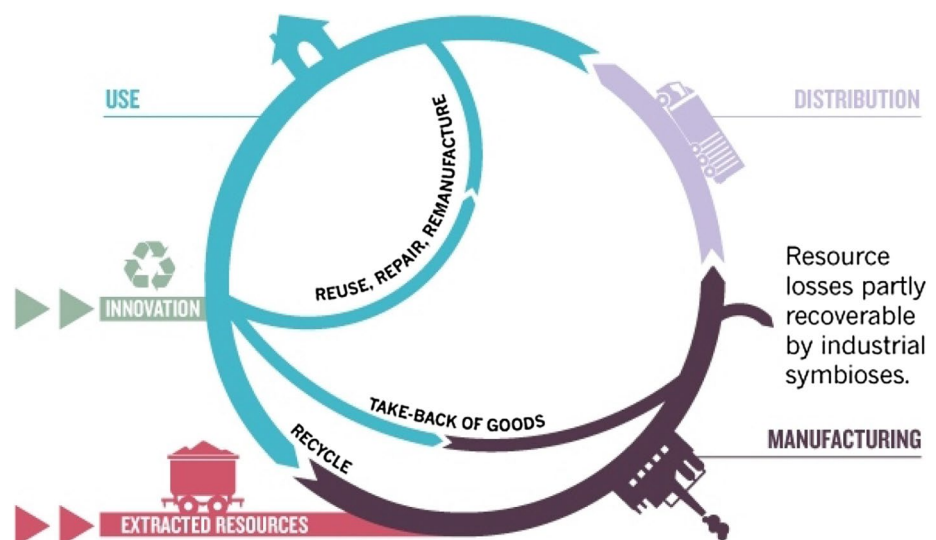
Universities are preparing the next generations of designers and they need to assume and use these elements in their creative processes. In European southern universities this topic of Sustainability, “green design”, slow design and Ecodesign is already integrated in the courses contents [13] but is not largely applied (notorious differences between bachelor and master or PhD courses) or is depending of each professor every year (coordinators can change easily in this new academic units). The curricula are continuously upgraded in Fashion Design courses and incorporates these new approaches, including Industry 4.0, Digital Marketing and Social Media.

3 New European legislation to wastes (textiles and apparel)

Last year, 27 April, the European Parliament approved an amending to the Directive 2008/98/EC defining a new approach to the textiles wastes. By 1 January 2025 all the municipal textiles wastes has to be collected separately and sent to be recycled far away from traditional landfills [8].

Last figures about household wastes produced by the Portuguese families and sent to landfills are increasing continuously. According to APA—Agência Portuguesa do Ambiente, the total of municipal wastes produced in 2017 in Portugal was 5 million tons, corresponding to a daily production of 1.32 kgs per capita. Although the textile wastes sent to landfills in Portugal is not completely known and accurate, and also there are some Portuguese companies collecting textiles wastes [11], it is indicated that in other similar countries the textiles

Fig. 2 Circular economy
Source: Extracted with permission from Nature, 2016



percentage is around 5% of solid wastes by volume and 4% by weight [4]. Others studies in different European countries highlights this common general overview about textiles wastes and disposal and the difficulties to solve this environmental problem [12, 18]. Nowadays, the solutions to treat these streams of textile wastes in end-of-life are mainly: reuse (sharing, repair, resale in second-hand markets); recycling (up-cycling or down-cycling); incineration (energy recovery and thermal power generation or without energy recovery) and land-fill disposal. In the charity collecting business models, these processes includes also footwear and other items like toys or furniture, what creates new difficulties in the sorting process of textile fibers. Many companies around the world that are dealing with these textile and clothing wastes are exporting it to Eastern Europe, Asia or Africa. However, there are an increasing criticism against these business models and solutions [3] because they have not transparency, destroy local businesses and cleaning/hygienic conditions are disregard (Figs. 3, 4). But unfortunately, only around 20% of clothing waste is globally collected for reuse or recycling, remaining 80% to be landfilled or incinerated, resulting in increasing or carbon footprint and loss of energy and raw material.

Some African countries (e.g. Ruanda, Uganda and Tanzania) and other countries in Central America (e.g. Haiti) or Asia (e.g. Philippines) are sending back tons of used clothes from North America and Europe. In USA the per capita fiber consumption was 38 kg with over 18 kg being discarded per year [10]. The pyramid model for textile recycling categories, by volume, presented by Hawley [10] highlights that 48% goes to "Used clothing markets", 29% goes to "Conversion to new products", 17% goes to "Usage to other applications", less than 7% goes to "Landfill and incineration for energy" and 1–2% are "Diamonds" with high value for vintage consumers (Fig. 5).



Fig. 3 Market in Africa of clothes

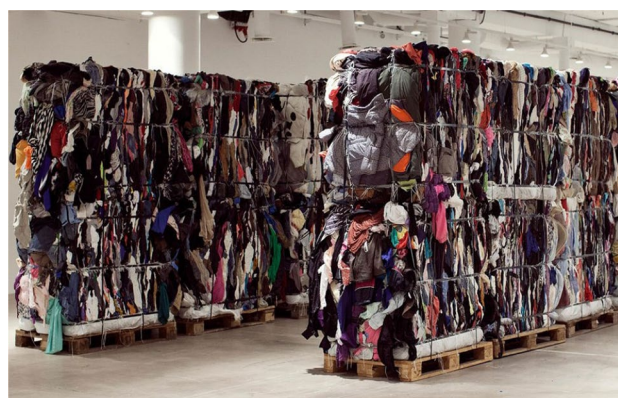


Fig. 4 Batches of clothes ready to trade

4 Results and conclusions

Having in consideration the continuous increase of fibers production (is expected to rise above 100 million tons in the next years), responding to markets demands and economic growth, while the lifespan of fashion products is continuously decreasing, the world will face an enormous environmental problem. Without consumers rethinking their fashion consumption habits, changing their behaviour and attitudes, these trends will only be more dramatic [20].

New business models have to be prepared to address this environmental issue, engaged with the scientific research in several topics: from consumer behaviour (more conscious, committed and active); sustainable design process; advanced fibrous materials, including organic and green fibers; advanced manufacturing processes incorporating recycled materials and saving resources (e.g. water and energy); new technologies and ITC framed by Industry



Fig. 5 Pyramid model for textile recycling categories in USA, by volume

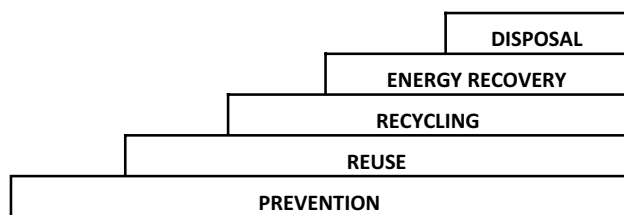


Fig. 6 Hierarchy of wastes, according European Union

4.0; legal and tax regulations (European Commission); and national and municipal policies. Next steps in these topics will guide the future of Textile and Clothing (T&C) industry around the world, including global markets and global producers. Everything in T&C is linked by threads, yarns and fibers. But is necessary to put the new Homo Sustentabilis steps the stairs of “hierarchy of wastes” proposed by the European Union: prevention, reuse, recycling, energy recovery and finally disposal in landfills (Fig. 6).

Acknowledgements The authors gratefully acknowledge the Project UID/CTM/00264/2019 of 2C2T – Centro de Ciência e Tecnologia Têxtil, funded by National Funds through FCT/MCTES.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

References

- Bernardes JP, Ferreira F, Marques AD, Nogueira M (2019) Millennials: is “green” your colour? IOP Conf Ser Mater Sci Eng 459:012019. <https://doi.org/10.1088/1757-899x/459/1/012090>
- Bocken NMP, Short SW, Rana P, Evans S (2014) A literature and practice review to develop sustainable business models archetypes. *J Clean Prod* 65:42–56
- Books A (2013) Stretching global production networks: the international second-hand clothing trade. *Geoforum* 44:10–22
- Daskal S, Ayalon O, Shechter M (2018) The state of municipal solid waste management in Israel. *Waste Manag Res* 36(6):527–534
- DeYoung R (1986) Encouraging environmentally appropriate behavior: the role of intrinsic motivation. *J Environ Syst* 15:281–291
- Ellen MacArthur Foundation (2013) Towards the circular economy: economic and business rationale for an accelerated transition. Report Rethink the Future
- ETP—European Technology Platform (2016) Towards a 4th industrial revolution of textiles and clothing. Lutz Walter Textile ETP, Brussels
- European Commission (2018) Directive of the European parliament and the council, amending directive 2008/98/EC on waste, Brussels
- Hawley JM (2006) Textile recycling: a system perspective. In: Wang Y (ed) Recycling in textiles. CRC Press (The Textile Institute), Cambridge, pp 7–24
- Hawley JM (2009) Understanding and improving textile recycling: a systems perspective. In: Blackburn RS (ed) Sustainable textiles. CRC Press (The Textile Institute), Cambridge, pp 179–199
- Jordão C, Broega C, Puppim R, Marques A (2019) Sustainable entrepreneurship in the reuse of textile waste: H Sarah Trading case study in Portugal. *IOP Conf Ser Mater Sci Eng* 459:012094. <https://doi.org/10.1088/1757-899x/459/1/012094>
- Koszevska M (2018) Circular economy—challenges for the textile and clothing industry. *AUTEX Res J* 18(4):337–347. <https://doi.org/10.1515/aut-2018-0023>
- Marques A, Sousa E, Broega C (2018) Presence of sustainability approaches in fashion design academic curricula: evidences from Southern Europe. In: Proceedings of EDULEARN18 conference, pp 671–676. <https://doi.org/10.21125/edulearn.2018.0254>
- Nadiri I, Van Steenburg E (2018) Me first, then the environment: young millennials as green consumers. *Young Consum* 19(3):280–295. <https://doi.org/10.1108/yc-08-2017-00722>
- Núñez-Cacho P, Molina-Moreno V, Corpas-Iglesias FA, Cortés-García FJ (2018) Family businesses transitioning to a circular economy model: the case of “Mercadona”. *Sustainability* 10:538
- Pal R (2017) Sustainable design and business models in textile and fashion industry. In: Muthu SS (ed) Sustainability in the textile industry. Springer, Singapore, pp 109–138
- Stahel WR (2016) Circular economy. *Nature* 531:435–438
- Traven L, Kegalj I, Sebelja I (2018) Management of municipal solid waste in Croatia: analysis of current practices with performance benchmarking against other European Union member states. *Waste Manag Res* 36(8):663–669. <https://doi.org/10.1177/0734242X18789058>
- Williams KC, Page RA (2011) Marketing to the generations. *J Behav Stud Bus* 3(1):1–17
- Piribauer B, Bartl A (2019) Textile recycling processes, state of the art and current developments: A mini review. *Waste Manag Res* 37(2):111–119. <https://doi.org/10.1177/0734242X18819277>

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.