Sustainable fashion : Design practice and new design tool

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Abstract

This thesis explores how European fashion designers work with sustainability and how the use of eco-design tools can help designers develop more sustainable design strategies.
The research is based on a review of design literature and an exploratory empirical study of fashion designer practices. The study is based on interviews. The results are analyzed through the prism of practice theory (Shove et al., 2012) and more specifically of the three elements - materials, skills, meaning- in the context of fashion design.
Sustainability is implemented in fashion design mainly through the choice of materials and the competences related to sustainability are acquired through experiments, media, encounters and examples from other companies. Designers have highlighted some of their difficulties, notably that of marrying creative freedom with the imperatives of sustainability in a context where there is a lack of time and transparency of information. Eco-design tools could be an answer to these difficulties. However, they are only rarely used in the daily practice of designers.
Based on these observations, a proposal for a new qualitative, universal design tool is formulated. It takes the form of a digital platform aiming to facilitate access to information by relying on the factors of collaboration and inspiration that are very present in the practice of fashion designers.

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1. Introduction

Fashion is a cultural force, it promotes social changes and is often also considered a source of pleasure. However, the fashion industry has many negative social and environmental impacts, including the use of chemicals, water use and pollution, and the exploitation of precarious workers in the Global South. Some of these issues can, however, be addressed during the design phase. This is why it is important to find ways to make fashion design more sustainable.

Against this backdrop, the main research questions of this master thesis are *how sustainable fashion design can be supported, and how sustainable strategies can be implemented into the design phase and the product.* In order to answer these questions, some preliminary interrogations need to be considered: how do fashion designers design and acquire knowledge about sustainability? How do they integrate their sustainability knowledge into the design process? Could the use of ecodesign tools support the designers making (more) sustainable designs?

To answer these questions and formulate a proposal for how to support fashion designers in developing more sustainable designs, a study of (a) how fashion designers design and (b) on the availability and applicability of design tools has been conducted. This research has to some extent drawn on existing literature studies, but since the topic of how to work with sustainability in fashion design has been little explored, a qualitative explorative approach has also been necessary. This empirical study took the form of interviews with ten European fashion designers working in companies that have made a public commitment towards sustainability. The goal of those interviews were to understand how designers work, i.e to understand their practice. That is why the analysis of the empirical research is based on practice theory, paying particular attention to the three elements - materials, meaning, competences - that Shove et al (2012) consider as shaping practices.

The structure of the thesis is as follows : the theoretical and methodological framework and theory will first be explained. This is followed by a chapter that presents the current context of the fashion industry, highlighting its cultural and economic importance, its environmental impact, its social impact, and emphasizing the need for sustainable fashion. The next chapters expand on what designing entails – Practicing fashion design - and then the experience with eco-design tools. Those two chapters are based on a review of the literature as well as on the result of the empirical study of fashion designers' practices. Finally, chapter "A new tools proposition" presents a proposal for how to enhance sustainable fashion design. It has been developed from an analysis of the difficulties and needs of designers, as identified in the literature and in an empirical study. The proposal is to develop a qualitative, universal tool in the form of a digital

platform that will enable designers to gain new knowledge on sustainability issues in fashion. A key feature in this platform is to exemplify how and what sustainable fashion designs are possible. The thesis concludes that the practice of fashion designers is strongly oriented towards the visual and the material aspect of design. The acquisition of new competences is done empirically and sometimes laboriously due to a lack of transparency in the industry and a lack of time to devote to sustainability issues. Even though fashion designers say they are looking for help to implement sustainability strategies in their practice, they rarely use eco-design tools because it is too time consuming and they do not know enough about it. The introduction of a new tool could capitalize on the collaborative work and the inspiration factors that are an integral part of the practice of designers. The limitations of the study and suggestions of further work are discussed at the end of the conclusion.

2. Theory and Methods

2.1 Theory

The theoretical approach taken in this dissertation is Practice Theory. There is no unified Practice Theory with a clear and widely shared definition, but rather a family of theories connected by conceptual similarities where the focus is on the social and the collective and not on individual action (Hargreaves, 2011; Nicolini, 2012). Practice Theory is, therefore, a way of seeing the world as a collection of routines and recurring practices that maintain social structures (Nicolini, 2012; Shove et al., 2012).

A practice is performative, it takes place in a series of activities and tasks, i.e in the "doing" of it. These activities are corporal and routinized and are made possible by material resources (Hargreaves, 2011; Shove et al., 2012; Nicolini, 2012). Further, a practice consists of an interdependence of various elements such as physical activity, mental activity, things, knowledge of context, meaning, know-how, emotions, a common discourse, social conventions, a common understanding, a particular language, etc. all anchored in an activity (Nicolini, 2012; Shove et al., 2012). These activities are shaped and made possible by a structure of rules and meanings that is constantly reproduced by human action (Shove et al., 2012). But these activities are also made possible by material objects and link them to other practices, since the same object can take part in different practices (Shove et al., 2012; Nicolini, 2012). A practice is in fact a pattern filled with a multitude of similar unique actions. And it is this repetition of unique and individual actions that allows for the constant evolution of practices (Shove et al., 2012). Indeed, although practice is readily defined as routinized and recurrent, it leaves enough room for creativity and individual action. It also leaves room for different cultures - or histories - to emerge in order to evolve and express diversity. Each practice is thus influenced by other related or associated previous practices (Shove et al., 2012; Nicolini, 2012).

This thesis will, more specifically, use the three elements that Shove et al. (2012) have identified as central for understanding practice to analyze the empirical data fashion designer practices and how they can be changed. The first element is "materials" which encompasses all the things, technologies, tangible physical entities, objects and what they are made of, tools, infrastructures and peoples' bodies. In short, the set of material things needed for people to be able to 'do things'. The second element is "competences" which consists of skills, know-how, techniques, background knowledge, shared understandings that people have and which influences what they 'say and do'. The third element is "meaning" which are ideas, symbols, aspirations, mental activities or emotions associated with peoples' actions/practices. Shove et al. (2012) indicate that any practice includes these three elements which are connected and interdependent. If they

are disconnected, the practice is transformed or disappears. Furthermore, they indicate that these three elements influence each other and mutually shape each other. As already indicated, the particular components of one practice can live and circulate within different practices making the social arrangement particularly complex. Because the different components are part of several practices, it is pushing the social arrangement to stay in place by making complex any change.

Although developed and introduced to better understand what can change in consumer behaviour towards more environmentally friendly consumption, Practice Theory, and more specifically the vision of Shove et al. (2012), appeared relevant in the context of this thesis aimed at understanding how fashion designers work and practice with sustainability issues. There are several reasons for this. First, as Shove et al. (2007) note, new designs are often not generated by identified problems but by new practices and vice versa. For example, with the rise of Instagram, designers have begun to create clothes and outfits that work well visually on this platform because of the huge impact this social media platform has had in boosting the industry (Ahmed, 2019). Second, they also indicate that not all designers' knowledge is found in academic literature and that designers work with tacit knowledge. Thus using Practice Theory could help make the tacit explicit. Third, this analytical framework, comprising three elements, is relevant for the analysis of the practices of fashion designers, particularly because of the importance given to the material and the symbolic, as fashion is particularly based on these two aspects. Fourth, this framework provides a means for us to tame the complexity of the industry and the way fashion designers work. Moreover, in this thesis rather than focusing on consumer behavior, the practice of designers is questioned, which must also change. So I'm in a position where I design for other designers in order to change their attitude towards sustainability.

2.2 Methods

This is a qualitative study. It is based on a literature review in order to firstly understand the current context of fashion industry (conventional and sustainable); secondly, to establish the role given to the fashion designer in the literature and to investigate the way they work; thirdly, the literature review helped establish an overview of existing research on the use of design tools to enhance the sustainability of fashion.

On the basis of this literature review, questions emerged, which served as a basis for the construction of interviews, conducted with fashion designers from within clothing, accessories, womenswear, menswear, kidswear companies, based in continental Europe. Those companies have made a public commitment towards sustainability. Not all interpret sustainability in the same way and not all are at the same level of

implementation. However, these criteria were established in order to facilitate the interview and to be sure sustainability would be somehow part of their daily practice.

The interviews were conducted by videoconference (Skype, Google meets, etc.) in French and English. They were semi-constructed interviews, the aim being to bring out tacit knowledge and leave the questions to the free interpretation of the interviewee. Handwritten notes were taken but these interviews were also recorded so that they could be listened to again in case of doubt. The interview guide could be found in the appendix A1.

In order to select the participants, a list of potential companies was drawn up on the basis of the abovementioned criteria. In some cases I personally knew designers from these companies and contacted them via their personal messaging (Whatsapp, Messenger, text message, phone) or via their professional email address. When I did not know the designers personally, a LinkedIn search was done and allowed me to get in touch with them. A large amount of people were contacted in a total of 37 companies. A majority of which did not answer. Others refused invoking a lack of time or corporate communication guideline reasons. A complete list of companies and designers contacted but who did not respond positively to the request can be found in the appendix A2.

Ten designers from nine companies accepted to be part of this research. They come from compagnies representing a broad sample of the european fashion industry. See table 1. The interviewees include designers working for luxury as well as more fast-fashion oriented business; small, medium and big companies; companies that have been part of the industry for a very long time and carry a long history as well as to start-ups; companies that are in business with a sustainability mindset since day one and others that adapted their business model to the context. The designers have different positions in the hierarchy, ranging from assistant to manager to founder.

Table 1. List of interviewees

Company	**Position**	**Interview date**	**City**	**Size**	**Personal relation-ship**	**Founded through**
Organic Basics	Head designer	13/11/20	Copenhagen	Medium	Former intern	
Saint Laurent	Design Assistant, tailleur and sportswear	07/11/20	Paris	Big	Friend	
Infantium Victoria	Creative Mastermind / Co-Founder	12/11/20	Brussels	Small	Former teacher	
Gamut	Designer / Co-Founder	10/11/20	Paris	Small	Friend of friend	
Okaïdi	Pants designer	03/12/20	Roubaix	Big		Through a colleague
Luxtra	Founder	07/12/20	London	Small		Email
N'go	Co-founder	02/12/20	Nantes	Small		LinkedIn

Adidas (A)	Head of Design - Collaboration	26/11/20	Nuremberg	Big		LinkedIn
Adidas (B)	Designer bag and accessories - Collaboration	03/12/20	Nuremberg	Big		LinkedIn
Balzac	Style Manager	08/12/20	Paris	Medium		Through her boss

In order to ensure a greater authenticity, the designers were invited to respond as frankly as possible. However, no guarantee can be given that no bias was used (Bryman, 2015).

The analysis of the interviews took place via the framework of Meaning, Material and Competences and in the form of an affinity diagram to identify similarities and/or differences around themes identified during the process.

Image 1. Affinity diagram of the empirical analysis

The combination of the knowledge acquired during the literature review and the collection of empirical data brought out the solution proposed in this thesis.

3. The Fashion Industry Context

This chapter will contextualise the use of fashion within human society and why it matters in a cultural and economical point of view. It will also introduce some of the sustainability issues, environmental and social, which fashion is embedded in. And finally describe the landscape of sustainable practices within the fashion industry.

3.1 Fashion Matters

Many fashion researchers make a clear distinction between "clothing" and "fashion" : "clothing" is associated with the functional and the technical aspects of materials while "fashion" refers to the symbolic aspect that is socially constructed (Connor-Crabb, 2017). Although fashion is formed through the materiality of clothing (Connor-Crabb, 2017), garments often do not only respond to the need for physical protection and modesty, but are most of the time supplemented by the need for the wearer to express his identity: we indicate where we place ourselves in the social structure (Fletcher, 2014). Fashion is embedded in a particular social context and the question of time is essential. Thus, fashion is much more than a product sold at a given moment, it is a process and its use matters (Fletcher, 2016). This question of context and time leads some researchers to broaden the definition beyond clothing, notably to luxury goods, cosmetics, cars and any other consumer object intended to satisfy a need for social distinction (Pan et al., 2015). However, this thesis will focus on one form of fashion, that of clothing. From here on, the terms "clothing" and "fashion" will be used interchangeably.

Let us return for a moment to the symbolic question of clothing and its social function. Fashion is the way we express our way of life, our social status, our tastes, our sense of belonging to a particular community. It is also about our perception of beauty and aesthetics. It is both the expression of each individual's identity and the expression of culture. Clothes are, above all, cultural objects (Pan et al., 2015). Fashion is at the heart of our culture, nourishes our creativity, facilitates the social process and is a source of pleasure (Fletcher, 2016). Dressing each morning is an act of fashion that takes place in a particular social context and responds to our need for identity and social distinction (Fletcher, 2014). It is therefore a cultural force to be cherished while not denying its negative impact on the planet and society (Fletcher, 2016). However, this non-negligible symbolic aspect must be taken into account in our response to sustainability issues to be relevant and accepted (Fletcher, 2014).

One can add that this need to express one's social status is well anchored in the very structure of our brain. Neurobiologist Sébastien Bohler, in the Podcast *"Let's live happily before the end of the world*" and its first episode devoted to fast-fashion, explains why

even though most people acknowledge the enormous impact that fashion has on the planet, it is hard to resist buying new clothes (Bohler in Saltel, 2020). Bohler gives a neurological explanation for this phenomenon; the striatum, which is the part of the human brain that needs social satisfaction, releases some dopamine when it is satisfied which happens when humans buy new things. The brain developed this mechanism to be satisfied in order to get food and sexual partners but this part of the brain is particularly old and therefore it has not been made to resist since it developed at a time when scarcity was the norm. There is no limit on the release of dopamine which is why the cerebral cortex, responsible for the human capacity to reflect on the enormous impact of the fashion consumption and which is much younger, can not resist this call for dopamine. According to neuro-science, the social importance of our clothes is very deeply rooted in us. This observation is particularly interesting because the academic world agrees on the fact that it is not the materiality of fashion that poses a problem but the quantity and rhythm that our consumption has reached in order to please the need of social satisfaction (Fletcher, 2014).

Indeed this consumption turns the fashion industry into an economic giant. Different figures exist for the sector depending on the type of product included in the calculation and the region. The annual turnover of the clothing industry in Europe is estimated at 200 billion € (Visileanu and Carpus, 2012), and 1.5 trillion € worldwide (GFA and BCG, 2017). The figure increases to $ 3 trillion if we include the entire textile industry (Lawless and Medvedev, 2016). Furthermore, the sector is a major employer. Here again the estimated figures differ, ranging from 26 million workers (Fletcher, 2014), 2.3 million of whom are in Europe (Visileanu and Carpus, 2012) to 1/6 of the world's workers (The True Cost, 2015). Other sources provide other estimates, highlighting the complexity of the sector. In Europe there are 170,000 companies working in the fashion industry, 63% of which are SMEs (Visileanu and Carpus, 2012).

As these figures indicate, the clothing industry is an industry of a fairly large size, and therefore likely to have a large negative environmental impact, which is why actions taken in a sustainable direction would have a significant positive impact on the planet (Lawless and Medvedev, 2016). These measures would also have a non-negligible economic impact. Indeed, the Global Fashion Agenda and the Boston Consulting Group (2017) have calculated that $160 billion a year can be earned by addressing social and environmental issues in a serious way. One of the reasons for this gain is that if the current status quo continues, there will be an increase in the prices of raw materials, labor and energy due to the scarcity of resources in the future. However, the GFA and BCG note that according to their optimistic projections, where all companies are reaching the level of leaders on sustainability issues, only $80 billion could be earned. That said, the road toward a more sustainable fashion industry is long because of the increase of the consumption level; in the same report, the GFA and BCG project a

63% growth in clothing consumption by 2030, from 62 million tons to 102 million tons of clothing consumed.

On average, each citizen of the European Union consumes 19.1 kilos of textile products per year, two third of which would be clothing (Wolf et al., 2014). In addition to consuming a significant amount of clothing, the mass of textile waste is also tremendous. In the United Kingdom alone, 2 million tonnes are thrown away each year, 63% of which ends up in landfill, and this figure is increasing every year (Hur and Cassidy, 2019). In the European Union, 54% of the fibres on the market are of natural origin, cotton is predominantly represented, and 46% are synthetic fibres, mostly polyester (Wolf et al., 2014). Roughly three quarters of the clothing market (78%) is filled in by tops, bottoms and underwears.

The clothing sector is one of the consumer sectors that is undergoing the most changes because it is currently a trend-sensitive market (Hur and Cassidy, 2019). The sector is also characterized by one of the longest and most complex industrial chains (Fletcher, 2014). Despite this, retailers compete on speed and fashion houses produce up to 12 collections per year.

The business model of the fashion industry aims at the continuous economic growth of companies by relying on a mechanism of continuous increase in the number of units sold (Fletcher, 2016). Fast-fashion, beyond the notion of speed, is above all a series of practices to promote this continuous growth and therefore favors large scale and a system dominated by logistics (Fletcher, 2014). To achieve this growth objective, no other sector has separated the need to renew things from the physical need or function as much as fashion. The next product is rarely technically or protectively better than the previous one (Fletcher, 2016). We therefore find ourselves subject to a logic of psychological obsolescence where there is a need for novelty in order to express change (Fletcher, 2014).

However, this system can only exist because there are abuses of workers' rights, intensive consumption of resources and excessive pollution, as well as due to the fact that fashion is situated in a society of image and competition around social status (Fletcher, 2016). Thus, we buy to be part of a group, to show our identity and value, as described in the beginning of this chapter. This means that novelty, materialism, marketing and the act of buying are more important than the experience of the garment. In the end, fashion is created for a particular moment and not for its long-term use (Fletcher, 2016).

Thus, fashion is particularly linked to the economic system of growth and consumerism. This excess of consumerism leads to a collective image of fashion view as frivolous, superficial, materialistic, commercial, etc. (Fletcher, 2014; 2016). Fashion is also very

often seen without any limits, creatively speaking, but also in terms of the environment for example. Yet, seeing fashion as limitless is to see it outside its context, which has planetary, environmental and human limits. The context defines fashion, so if it needs an argument to change the fashion system is that to keep fashion in fashion, it should be thought within its context therefore with limits : planetary, environmental and human limits (Fletcher, 2014; 2016).

3.2 Environmental impact of fashion industry

Even though fashion is a cultural force which needs to be preserved and encouraged, it cannot be ignored that the industry has an important negative impact on the planet. The textile and clothing industry is widely recognized as the sector with the greatest environmental impact in the European Union, responsible for 5-10% of this. It encompasses environmental damage in the water, on land and in the atmosphere (Fletcher, 2016; Fletcher, 2014; Wolf et al., 2014; Reitan Andersen and Earley, 2014). It is a sector that is a major consumer of water (Fletcher, 2014) and a major polluter, as evidenced by the chemicals used throughout its value chain. A quarter of the chemicals produced worldwide are used in textiles (Fletcher, 2016). The textile production chain is globalized and complex, and companies can move easily from one region to another in order to lower costs. Therefore keeping track of the environmental impact and acting on it is a challenge (Reitan Andersen and Earley, 2014).

Thus, even though research is advancing and environmental and social innovations are being implemented, fashion is still struggling to create sustainable change (Reitan Andersen and Earley, 2014). And this has to do with fashion company managers reporting that sustainability issues are mostly addressed from a material perspective only, assuming that this is what the outside world perceives (Clancy et al., 2015). Although the environmental impact per garment has decreased as a result of efficiency policies and material improvements, but as consumption continues to increase, these improvements are obsolete and the industry's overall impact continues to grow (Fletcher, 2014; Fletcher 2016).

The following will present here a non-exhaustive overview of a garment's life. A garment's life starts with the *production of the raw materials*. Some sources estimate that this phase is responsible for two thirds of the environmental impact of the industry (GFA and BCG, 2018). Regardless of whether the material is natural or synthetic, any material has its share of environmental problems (Weller, 2007). Natural fibres are mostly cotton fiber (Weller, 2007). It is the material predominantly responsible for eutrophication, ecotoxicity and land use (according to a reading grid from the Life Cycle Assessment) because it is the most widely used fibre but also because of the very nature of its

production (Wolf et al., 2014). Thus, cotton regularly competes with other crops for land use but also for water. Cotton production is water intensive, using 8.5 tons per kilogram of fiber (Roos et al., 2017). In addition, cotton often grows in regions where access to water is regularly threatened, such as India or China (GFA and BCG, 2017). The other major problem with cotton is the use of chemicals (fertilizers, herbicides and insecticides) in its cultivation, often in order to maximize the profitability of the family plot (Weller, 2007). Although cotton occupies only 3% of agricultural land, it uses 16% of the insecticides and 7% of the herbicides used in the world (GFA and BCG, 2017). Faced with this, the main alternative is synthetic fibers with polyester in the lead. But here again, environmental questions are emerging. These synthetic fibers are mostly from fossil origin and the pollution created by the extraction of these hydrocarbons is not negligible, not to mention the release of micro-plastics at each washing and the release of greenhouse gases during incineration (Roos et al., 2017, Wolf et al., 2014, Weller, 2007).

The next phase in a grament's life is *design and development*, which is an essential moment since it is here that choices are made that also influence the environmental impact (Reitan Andersen and Earley, 2014). These choices influence future use and sometimes the programmed obsolescence of the garment (Niinimäki and Hassi, 2019). This question of choice and the role of the designer during this phase will be developed in the next chapter.

The transformation of fibres into textiles, *the production of textiles and clothing* and the finishing of these are not clearly identified as separate steps in the literature exploring the environmental impact of the fashion industry. This is why all of these steps in the transformation of the fiber into a finished garment are treated together in this thesis. These textile production and manufacturing steps have a significant environmental impact for several reasons (Wolf et al., 2014). The first is that a large number of chemicals are used, some sources indicate the astonishing number of 8000 chemicals to transform the raw material into textile (Karaosman et al., 2016). Secondly, the industry is demanding water, especially for dyeing and rinsing after the use of transformation or finishing products. Thus, each ton of fabric pollutes 200 tons of water (Karaosman et al., 2016), this contaminated water is often discharged directly into nearby rivers (GFA and BCG, 2017), which means that a fifth of industrial water pollution comes from the textile industry (20%) (Fletcher, 2016). Moreover, the transformation of raw materials into textiles, as well as from textiles to clothing, also produce a significant amount of waste (Karaosman et al., 2016).

After being produced, clothing is *transported* to be sold in stores. It is estimated that the impact of transport and retailing is less significant compared to other phases (Wolf et al., 2014). Transportation benefits from innovations in other industries and roughly

accounts for only 2% of the environmental impact of the fashion product value chain (GFA and BCG, 2017).

As for *retail*, efforts are concentrated on energy consumption (lights, heating, ventilation, etc.) but this represents only 5% of the value chain's CO_2 emissions (GFA and BCG, 2017).

The *use* of clothing appears to also have a significant environmental impact (Wolf et al., 2014; Fletcher, 2014; Payne, 2011), some even claiming that it is responsible for half of the overall impact of a garment (Lawless and Medvedev, 2016). However, this phase is often neglected by the industry, which considers it to be beyond their control, not very lucrative or due to a lack of technology (GFA and BCG, 2017). These negative environmental impacts of garment use are attributed to laundry and the level of consumption. A rebound effect of the efficiency of the system (producing quickly and at low cost) is, in fact, experienced which has also encouraged the production of lower quality clothing resulting in compulsive purchases. Indeed, the consumption of clothing products has increased considerably since the 1950s, increasing fourfold in the United States for example (Lawless and Medvedev, 2016). Moreover, repairs may not be worth the financial cost as new garments may be cheaper to buy (Niinimäki and Hassi, 2019). Some even speak of disposable clothing (GFA and BCG, 2017). Clothes, according to studies, are kept in the closet for an average of 3 years and 5 months but worn for only 44 days and washed after 2.4 to 3.1 days (Fletcher, 2014). However, even if they are washed only about 20 times, the impact of these washes is enormous, mainly because of the energy consumed by washing machines and dryers (Fletcher, 2014; Reitan Andersen and Earley, 2014; Wolf et al., 2014; GFA and BCG, 2017; Payne, 2011) but also because of the detergents used, which have a particular impact on human toxicity indices and marine ecosystems (Wolf et al., 2014). The most impacting clothes are those requiring more frequent washing or those consumed in large quantities such as tops and underwear (Wolf et al., 2014). Important gains in terms of energy and other benefits could be made by tackling the issue of washing (Fletcher, 2014).

Finally, the *End-of-Life* of a garment is also a problem area in regard to the environment. Worldwide each year 60 billion kg of textiles and footwear are burned or buried (Fletcher, 2016). Only a fifth of clothing waste (20%) is recycled or reused globally, and 18% in the European Union (GFA and BCG, 2017). There is a critical lack of recycling technologies, especially given the complexity of textile products, but fashion company managers also point to economic non-viability and the impression that recycling is not their responsibility (GFA and BCG, 2017). However, if the end of life of garments was properly managed, this could significantly reduce the overall impact of the sector (Wolf et al., 2014).

To conclude, the findings is that each stage of the value chain involves difficulties and has an environmental impact, so the road to achieve full environmental sustainability is long.

3.3 Social impact of fashion industry

In addition to a significant impact on the environment, fashion also has a social impact in two different ways. First, there is the social impact on workers who produce the clothes. Second, there is the impact on consumers. The latter will not be discussed in this subchapter since it has already been mentioned previously, but instead this subchapter mentions some of the social-ethical problems one encounters in the fashion industry.

Fashion production is labour-intensive, while not requiring too much skilled labour and few materials and resources to set up, which has led production to move to developing countries (Karaosman et al., 2016; Lawless and Medvedev, 2016). This happened especially after quotas on the import and export of textile products from some countries were lifted (Multi-fibre Arrangement and Agreement on Textiles and Clothing) (Karaosman et al., 2016; Veillard, 2018). Some of these countries have almost specialized in textile production; for instance, textiles and clothing account for 80% of Bangladesh's exports (GFA and BCG, 2017). On average in Asian countries that produce clothing, one third of manufacturing employees work in textiles. Fashion and textiles are therefore a major employer and could make a difference by establishing fairer working conditions (GFA and BCG, 2017). Working conditions of employees in the fashion industry are known to be problematic for various reasons. Per example, firms looking for low-cost production have opted for countries with cheap labor, thus, wages are generally very low (Lawless and Medvedev, 2016; Iran, 2018; Veillard, 2018). In countries such as India or the Philippines, more than 50% of workers do not receive the minimum wage. One can even add that in half of the producing regions, including Asia, Turkey and Eastern Europe, the minimum wage is not half the living wage. Projections say that in 2030, one third of workers of the fashion industry around the world will still be paid below the minimum wage (GFA and BCG, 2017). The clothing industry is also known to make workers work many overtime hours in countries where legislation already allows particularly long work weeks (Veillard, 2018; GFA and BCG, 2017; Roos et al., 2017; Lawless and Medvedev, 2016). Child labour is also a common practice (Lenzo et al., 2018; Roos et al., 2017; Karaosman et al., 2016). Moreover, women are often in the majority in the apparel, textile and footwear workforce. Thus, they are between 74% and 81% female workers in Cambodia, Vietnam and Thailand (GFA and BCG, 2017). Discrimination against women in the textile industry is numerous (Roos et al., 2017; Veillard, 2018), particularly such related to the gender pay gap. For example, in Pakistan, 87% of women

are paid less than the minimum wage, while this is the case for only 26% of men. The lack of legislation makes women vulnerable (GFA and BCG, 2017).

In addition, textile workers' health and safety is regularly undermined, whether by the dilapidated infrastructure, as evidenced by the terrible accident at Rana Plaza in November 2012 that killed 1127 people (Roos et al., 2017; Lenzo et al., 2018; Veillard, 2018) or by regular exposure to chemicals. The number of physical injuries continues to increase each year (GFA and BCG, 2017). All this can be traced back to the lack of union representation (Veillard, 2018; Roos et al., 2017) but also to non-compliance with the conventions established by the ILO (International Labour Organization) (Lenzo et al., 2018).

The garment production chain is extremely complex, with many suppliers and subsuppliers, especially for the mass market, with the luxury industry controlling more of its supply chain (Karaosman et al., 2016). It is generally so complex that European managers often do not know exactly who produces the clothes and under what conditions, which leads to difficulties when choices regarding production have to be made (Roos et al., 2017, Hur and Cassidy, 2019).

In parallel, globalization has led to more competition, and vice versa, resulting in the relocation of production to countries with low labor costs and non-existent social protections for workers (Lenzo et al., 2018). This competition, on the other hand, does not encourage producer countries to legislate social and wage protections for workers because of fear of losing a significant part of their income (GFA and BCG, 2017). Naturally, a reform in the production chain cannot only be achieved by one person, one company or one country (Lawless and Medvedev, 2016).

At the same time, several initiatives and movements have emerged, fostering a critical engagement with the fashion industry. For instance, working conditions for textile workers are increasingly observed by consumers and have led fashion companies to develop a number of initiatives such as monitoring their suppliers and establishing minimum requirements in terms of labor law (GFA and BCG, 2017, GFA and BCG, 2018). In addition, NGOs have an important role in highlighting problems and putting pressure on companies. For example, in the 1990s, pressure on Nike pushed the sports equipment manufacturer to introduce a code to guarantee minimum rights for workers (Iran, 2018). Other examples include the Fair Wear Foundation, Oxfam and the Clean Clothes Campaign. This being said, Roos et al (2017) also invites us to put all this into perspective. In Asia, the textile industry has also helped lift many workers out of poverty. Therefore, deciding to move production to another location in response to abusive working conditions can also have negative consequences by pushing workers into even more

economically unstable situations because the companies that produce would be forced to lower prices.

3.4 Sustainability context

Currently, we are in a context of extreme stress on the environment. There is a decline in terrestrial and marine ecosystems as well as a significant loss of biodiversity all over the world (Ceschin and Gaziulusoy, 2016). 20% of the world's population alone consumes 80% of the available resources (Lawless and Medvedev, 2016). We are well on the way to ensure that by 2035, when there will be no turning back, the earth's average temperature will be 1.5°C higher than in the pre-industrial era, which will lead, among other things, to a rise in sea levels and the loss of 5% of arable land. One can even add that a scenario at +2°C is not unthinkable, the consequences of this scenario will be even harder to deal with than with the +1.5°C perspective (Schultz, 2015). There is therefore an urgent need for action to limit climate change through technological, social and behavioral, institutional and organizational innovations. Ceschin and Gaziulusoy (2016) call for a radical transformation of the way human society functions.

This calls for the construction of another world is not new. The most decisive attempt was undoubtedly the 1987 Brundtland Report, which was the first international attempt to define what sustainability is. To this day, this definition remains the most commonly shared: *"Sustainability is the development that meets the need of the present without compromising the ability of future generations to meet their own needs"* (Kozlowski et al., 2018). Sustainable development has three pillars: environmental, social and economic (Hur and Cassidy, 2019).

This thesis aligns with this perspective on sustainability but also brings the nuance of Ehrenfeld (2008) who evokes the possibility of having a desirable future on planet Earth: "*Sustainability is the possibility that human and other life will flourish on the Earth forever*". Whatever definition adopted, it always implies considerations based on different scales of values. This is why other interpretations of the world, other frameworks such as Planetary Boundaries, the Ecological Footprint, the Doughnut Economy, or the Circular Economy are satellites of these definitions (Roos et al., 2017). In short, the underlying idea is always to create a world where degradation occurs less rapidly than the time needed for the planet to rebuild itself while meeting the needs of humanity (Roos et al., 2017). To achieve sustainability, Kate Fletcher (2016) invites us to think about a post-growth world where the notion of prosperity is rethought outside of economic growth, a world where the aim is not to maximize consumption but to maximize satisfaction. It calls for an end to the vision of the economy as a system in itself completely independent and without environmental constraints. But rather, to

think of the economy as a subsystem of a larger but finite and non-expanding ecosystem.

But then, how can it be integrated into a design process? It seems, according to the literature, that the changes to achieve a sustainable society must be made at the systemic level, at least that is the general vision founded in the literature. A number of researchers like Gaziulusoy argue in this sense, but all of them also point to the need to create smaller changes at the local level of the product. There will therefore be several places, all necessary and interrelated, where innovation must take place (Ceschin and Gaziulusoy, 2016; Kozlowski et al., 2019; Lawless and Medvedev, 2016). This means, there is not one solution for everything but a multitude of possible approaches, and as a designer one must therefore ask the question "where is the key impact?" (Fletcher, 2014).

Consumer, NGO and media pressure as well as legal boundaries generally have a major influence on the choice of companies to undertake the implementation of changes in order to have a sustainable business (Fletcher, 2014; Iran, 2018). Although often limited in scope due to the fact that production is often not located in the European Union (Wolf et al., 2014), the implementation of environmental legislation by the European Union has generally had a positive influence on the development of innovations in the fashion and textile sector, but rarely have these innovations gone beyond the legal framework (Fletcher, 2014). Recently, and more particularly for ethical issues, initiatives have come from large conglomerates, concerned among other things about their image. These companies respond favourably to the non-binding initiatives, as the UN Global Compact, proposed by the UN or ILO for example (Fletcher, 2014; Karaosman et al., 2016).

3.5 Sustainable fashion, what is going on?

Nevertheless, in the face of these not very positive observations, initiatives have been taken. This subchapter aims to explore sustainable fashion in its current state. It is not an exhaustive representation but it is to understand which is the current tangent observed in fashion in terms of sustainable fashion.

There is no widely shared definition of Sustainable Fashion, but rather characteristics, ideals and processes (Kozlowski et al., 2018). Most academics who have taken on this task refer to the classic definition of sustainable development cited above (Karaosman et al., 2016). One example is Iran (2018): "*Sustainable fashion is clothing that is designed, produced, (re-)used and disposed in a way that is aligned with the concept of sustainable development"*(p.141). Other definitions extract sustainable fashion from the notion of growth, as is the case of Kate Fletcher (2014): *"Sustainability in fashion and textiles fosters*

ecological integrity, social quality and human flourishing through products, actions, relationships and practices of uses" (preface XVIII). The goal of sustainable fashion is to reduce the environmental and social impact of the conventional industry throughout the life of the product (Iran, 2018; Karaosman et al., 2016). But also to create a system where environmental and social responsibility is at the heart of the economy and business model (Kozlowski et al., 2018; Niinimäki and Hassi, 2019).

As indicated above, important steps have been taken in the right direction, but despite this, the overall impact of the sector is not diminishing because the level of consumption continues to grow (Fletcher, 2014; Fletcher, 2016). In fashion, a single response is not enough, there is a need for a diversity of responses (Fletcher, 2014) and it is a joint responsibility of companies, consumers and all other actors (Iran, 2018). However, the solutions currently proposed by the industry, as the use of less impactful materials for example, tend to be extensions of the status quo. Sustainability should not become a new marketing tool, a new trend or seen as a new opportunity for growth. At the moment, the problem is not so much the mastery of methods to make clothes with less social-environmental impact. The problem is that each part of the system is looked at independently, leading to incremental improvements. It is therefore necessary to understand the system as a whole and its global issues such as scale, continued growth and consumption levels, before local resolutions can be addressed (Fletcher, 2014; Fletcher, 2016). Thus, Fletcher cited by Iran (2018) identifies 3 vectors of innovation to achieve sustainable fashion: legislative innovations, technology-based innovations and finally innovations in consumption.

One of the main challenges is to better integrate and balance the commercial aspect with sustainability and the other areas of fashion (Fletcher, 2014). More concretely, we can indicate that all stages of production and use need to be transformed (Iran, 2018) in order, for example, to make clothing both durable but also worn and cared for (Fletcher, 2014). Even more concretely, a LCA (Life Cycle Assessment) study of 2014 commissioned by the European Union proposes 13 actions to be implemented urgently. These actions are mainly focused on reducing the use of chemicals during production, reducing air freight, reducing washing temperatures and tumble dryer use, and improving the efficiency of laundry appliances. Finally, promoting reuse and recycling (Wolf et al., 2014).

But how is sustainability implemented in the field at the moment? Environmental and social issues are becoming a priority for more and more companies (GFA and BCG, 2018). Thus, 70% of companies have put sustainability on their agenda on a permanent basis, believing it to be a necessity in order to be competitive (Kim and Hall, 2015). In the fashion industry, the major changes announced to promote sustainability are eco-materials and ethical issues in production, while not further specified (Niinimäki and

Hassi, 2019). However, despite improvements and a stated willingness, most companies still invest little and have uncoordinated and opportunistic actions (GFA and BCG, 2018). Indeed, in the absence of a legal framework, brands can describe sustainability as they want, so initiatives, marketing campaigns and other capsule collections do not tell consumers what should really be done but what they interpret as sustainable (Wicker, 2020 A). Moreover, within the company itself, the interpretation of what sustainability is depends on the role occupied. Designers tend to be more focused on the environment, while managers will have a more global vision formed around the three pillars of sustainability: environmental, social and economic (Hur and Cassidy, 2019).

To understand better how the fashion industry moves towards sustainability, the Global Fashion Agenda (GFA) in collaboration with the Boston Consulting Group publishes each year an report on the state of sustainability in fashion. This is what the 2017 edition teaches us; European brands are doing better on the environmental dimension, while for American brands it is the social dimension that is highlighted. Also, it is the size of the company, and not its price positioning, that has more influence on the implementation of sustainability policies, except for sustainable-focused brands. However, small and medium-sized companies represent half of the sector. This is because large companies have more resources, both financial and human, to advance these policies. In addition, these large companies would have more control over their supply chain. The large luxury conglomerates receive a good score from the GFA, and this is due to the better working conditions in mainly European production sites. Contrary to what one might think, according to the GFA, fast-fashion companies do more in terms of sustainability than average. Moreover, those sustainable policy answers to the increased interests of consumers for the consequences of their consumption, the demand for sustainable fashion and ethical fashion is growing (Iran, 2018) and a call for more transparency in the value chain is increasingly heard (GFA and BCG, 2017). That said, compared to other sectors such as food, consumer engagement is less important, partly due to the misconception that clothing has less impact on health (Iran, 2018). Yet, if technological advances, including eco-materials, are to work, the level of consumption must change (Niinimäki and Hassi, 2019) and this is where we will gain the most in terms of environmental impact (Iran, 2018).

3.5.1 The place of materials in a sustainable strategy

Materials have a central place in sustainable fashion and are often a starting point for the implementation of a sustainable strategy. The importance of materials is not surprising since the product of the fashion industry is after all a "*material thing*" (Fletcher, 2014).

A first path to achieve sustainability through materials is the choice of less polluting materials. A commonly shared view is that natural materials are good and synthetic materials are bad. But it is more complex than that and each material and fiber has a different key sustainability challenge. And there is no single fiber, regardless of its characteristics, that can transform the industry on its own. This is why, in a sustainability approach, we cannot focus solely on the choice of materials, but the reflection around these materials is still interesting (Fletcher, 2014).

Currently, there is a lack of diversity in the materials used in fashion. A majority of the fibers used are either cotton or polyester (85%), which increases the ecological risks by concentrating the impacts. But material diversity is the key to better share the risks and increase the resilience of the industry. In addition, a greater diversity of materials would allow greater use of local fibres, which would help make the physical as well as the social environment more robust (Fletcher, 2014). Kate Fletcher (2014), indicates that to make this viable, we need to build up large stocks of low-impact fibers so that they are available easily, quickly and in the quantities needed and therefore attractive to the industry.

Another path to achieve sustainability through materials and one of the most popular ways is recycling, which could mitigate the environmental impact of the raw material but the technology is not ready as the materials lose on average three-quarter of their value and at the same time are often more expensive than their non-recycled equivalent (plus 10% for recycled polyester) (GFA and BCG, 2017). Blends of materials, which are very common in clothing, cannot be recycled and are not biodegradable either. Therefore, preference should be given to single-fibre garments (GFA and BCG, 2017; Cao et al., 2015), which is a particularly important challenge for natural fibre garments (Van Rossom, 2020). Natural fibres can currently only be recycled mechanically, but shredding makes the fibres much shorter and therefore there is a decrease in quality (GFA and BCG, 2017). Only nylon and polyester, with chemical recycling, recover a quality comparable to virgin materials. These technologies are beginning to be widely available. Patagonia, a pioneer in the use of recycled polyester, estimates that it saves 75% of energy and emits 40% less CO_2 than conventional polyester.

Moreover, another direction, not contradictory to recycling and often taken by fashion companies, is the use of eco-labels for purchased materials. Eco-labels could be a tool to increase the environmental performance of products, and were even endorsed by the Earth Summit in Rio in 2002 as a way to promote sustainable consumption and production (Wolf et al., 2014; Clancy et al., 2015). Even if these eco-labels do not always guarantee that the product has better environmental or social performance than an unlabelled product, they nevertheless ensure that specific conditions are met (Clancy et al., 2015). Research for this thesis showed no signs of a label covering the entire life cycle

of a product. The focus is usually on environmental criteria in the upstream production chains. It therefore appears that these labels act more as a guide for buyers or an aid to environmental risk management in the supply chain than as a guide for fashion designers in product design (Kozlowski et al., 2018).

Finally, there are, on a regular basis, technological innovations coming to the market, such as waterless dyeing, reusing of treated wastewater, restriction on chemicals during production, forest-based fibers, dry technologies, etc. to name a few (Roos et al., 2017; Karaosman et al., 2016).

3.5.2 Responsibility of companies

Even though companies are seen as primarily there to produce value and material products, its role in society is often much more complex than this mere commercial role. It is a stakeholder in society through its commitments within it, the obligations it has towards workers and often the philanthropy in which it participates. Therefore, business ethics is the social responsibility of a company that encompasses everything outside of financial expectations (Spence, 2014). Thus, companies should be in business to create positive outcomes for all the people on the planet (Esslinger, 2011).

Streubig (2018) invites us, in this context and based on a traditional marketing principle, to have a holistic vision of what the company will add to society; what will be its added value? Sustainability should not only be a principle of risk management (Streubig, 2018), it should be at the heart of the company and be integrated into it on a daily basis (GFA and BCG, 2018). Initiatives aimed at increasing environmental but also social performance have positive effects for everyone and improve the industry as a whole. It is indeed a minimization of the risks taken, but it is also an improvement for the workers and the communities of which they are members and of which the company is a member (GFA and BCG, 2017). At the same time, fashion brands can have a positive impact on their consumers by pushing them to transform their consumption patterns through education, knowledge sharing and corporate communication. Patagonia and Stella McCartney are one example (Kim and Hall, 2015).

However, to have a real positive social impact, companies should not impose their views on their suppliers, but rather work in mutual respect and collaboration with them; this cooperation nevertheless is essential and must take place prior to the design phase (Karaosman et al., 2016). In the fashion sector, there is an increase in the number of Corporate Social Responsibility (CSR) policies that provide for internal programs and audits of the company and its suppliers. Sometimes these initiatives are carried out in collaboration with multi-stakeholder initiatives (Iran, 2018). Organizations such as the

Worldwide Responsible Accredited Production (WRAP) are mandated by companies to conduct audits on working conditions (Cao et al., 2015). Another example is the Fair Wear Foundation, which certifies compliance with the rules of 8 standards based on ILO standards such as living wage, absence of child labor, presence of an employment contract or freedom of association (Iran, 2018). However, CSR policy seems to not always be needed. Some researchers, such as Spence (2014), take a particular look at small companies that would be particularly efficient socially. This is due to the proximity, physical but above all social, that they have with the community in which they are anchored. They are thus part of a program of reciprocity with their neighbors, thus avoiding an "out of sight, out of mind" phenomenon.

Moreover, in addition to these initiatives mentioned above, the humanization, coupled with an ecological ideal, of industries -particularly Western-, would allow, among other things, the respect of the identity and culture of the countries that produce for them. There is thus an underlying ethical question (Esslinger, 2011).

3.5.3 Which strategy could companies and designers adopt?

There is no simple and universal answer to the problems posed by this complex industry. The answer given must be a combination of sustainable products, lower consumption, longer use and re-circulation at the end of life. And all this by combining creativity, awareness, knowledge and adaptability in a holistic approach (Fletcher, 2014; Iran, 2018).

On one hand, most fashion companies are, at the beginning of the transformation process towards a sustainable company, implementing standards and aiming for efficiency in production. They take this path because it is seen as the place where the company can have a direct influence. Currently, answers that focus on production are the most popular in fashion. This tendency to want to regulate everything through technology is not strange in view of the past of the textile and clothing industry. Textiles were at the center of the industrial revolution of the 18th century and never stopped relying on technology to gain efficiency and speed. However, a simplistic view on technological improvement might overlook the importance of cultural and behavioral changes that could have a greater influence. The implementation of CSR policy, on the other hand, is a counter-example where technology is not involved but has been a successful strategy to implement sustainability in the garment supply chain (Fletcher, 2014).

To achieve sustainability, more and more voices are calling for a more radical rethinking of the business model of fashion companies in order to reduce the demand for materials

and promote reuse and recycling (Roos et al., 2017). Not only should supply be rethought, but also demand and value creation should be redesigned (Niinimäki and Hassi, 2019). The most promising options for improvement are those that are consumer-oriented. The social sphere and user behaviour must therefore be given importance when designing sustainability strategies. Especially since some of these improvements do not require major transformations in people's behavior, such as reducing washing temperature, for example. However, in order not to remain "inventions" but to become "innovations" and thus gain public acceptance, innovations must meet market requirements in addition to meeting ecological requirements (Niinimäki and Hassi, 2019). For this reason, regardless of the strategy adopted, aesthetics should not be forgotten. All too often, sustainable clothing has the reputation of being unattractive, yet it needs to be culturally accepted, and render the symbolic function that characterizes fashion (Zafarmand et al., 2003). There is, therefore, a need to integrate the environmental aspect from the beginning of the design phase (Bovea and Pérez-Belis, 2011) as well as to determine the use in order to be able to determine the material qualities (Fletcher, 2014).

Among all the possible design strategies, we will discuss two of them, eco-design and design for life extension and durability, which seem to be relevant for this project since the importance given by the design literature on materials in the practice of designers and the potential positive impact to focus on the use phase. Those two strategies are also the most documented.

Let's start first with *eco-design*, which is an eco-efficiency strategy, implying that we focus our attention on the environmental impact produced during the entire life cycle of the product. The aim of this strategy is to minimize the consumption of natural resources and energy while maximizing the benefits to the consumer (Ceschin and Gaziulusoy, 2016). As stated in the European Ecodesign Directive of 2009, the environment has the same importance as profit, aesthetics, functionality, etc. and must therefore be taken into account from the beginning of the design phase (Ceschin and Gaziulusoy, 2016; Bovea and Pérez-Belis, 2011). The principle is to identify, often through a Life Cycle Assessment (LCA), the phases of the garment's life that have the greatest impact on the environment and to create a specific strategy in this direction (Ceschin and Gaziulusoy, 2016). There are different eco-design strategies, which must be combined in a relevant way in relation to the product, the project and the company. Some of these strategies may also conflict with each other. Each of these strategies has its own guidelines (Vallet et al., 2013). Vallet et al. (2013) refers to the 7 traditional strategies outlined by Brezet and Van Hemet in 1997, the first implementations of which have resulted in significant gains in terms of environmental performance:
- Low impact material
- Reduction of material use

- Optimization of production techniques
- Optimization of distribution system
- Reduction of impact during use
- Optimization of product lifetime
- Optimization of End of Life systems

However, once the efficiency has passed and the "bad" designs have been scrapped, the gains have become marginal and the application of this strategy costly. One of the main criticisms is that the human and social dimension is not taken into account. It is a strategy that has a very technical point of view (Ceschin and Gaziulusoy, 2016) and is not seen as a strategy with a long-term perspective because it does not go far enough in the transformation of the statu quo and does not question the system of excessive consumption (Fletcher, 2014; Niinimäki and Hassi, 2019). But it is also probably for these reasons that it is so popular because it requires little change on the part of consumers and businesses (Niinimäki and Hassi, 2019). For example, the Design for Recycling strategy, which is very popular at the moment, is part of this eco-efficient perspective based on the observation that there is more and more waste and that it can be used (Niinimäki and Hassi, 2019). It is therefore once again a strategy with very limited impact since it focuses on optimizing only a small part of the system (Fletcher, 2014).

The second strategy discussed here is *Design for life extension and durability*. The notion of durability is a key component of sustainability. Indeed, extending the lifespan and use of clothing is the best action from an environmental point of view, particularly for criteria related to carbon, water and waste (Fletcher 2014; Connor-Crabb 2017). Although this strategy goes against the current paradigm, which revolves around the continuous increase in sales and therefore poses the need for a transformation of the idea of economic viability and leads to a rethinking of business models (Connor-Crabb, 2017), this strategy is popular. It is popular because it is associated with established characteristics of what makes a "good" design such as quality and timelessness (Fletcher, 2014). Several aspects are important to create toward the design for life extension and durability. First, since particular attention is given to the use of clothing, implementing this strategy in design requires a sensitivity to the world that begins after purchase, knowledge of materials and uses (Connor-Crabb, 2017; Fletcher, 2014) as well as the ability to create long-lasting aesthetic (Zafarmand et al., 2003). Second, this strategy requires the implementation of life-extension practices such as repair, alteration and versatility of garments. These practices were common in the past when textiles were still a valuable commodity but need to be reimplemented in the contemporary habits (Connor-Crabb, 2017; Fletcher, 2014). Third, the choice of materials is crucial since they must be relevant to the expected life span of a garment (note: a wedding dress does not have the same life span as a coat, for example) (Fletcher, 2014). However, this strategy is not always successful, since a garment that lasts does not prevent its replacement or the

desire to buy a new piece. The logic behind consumption is rarely to replace a damaged equivalent garment but to have a new garment. Clothing that defies obsolescence is rarely the result of planning. There is therefore a difference between a long-lasting garment and a garment that lasts which one actually keeps and wears. The difference is the emotion and the meaning put into it. This emotion is precisely what is complicated to design and plan for (Fletcher, 2014).

This chapter located the topic of this thesis, how the implementation of sustainable fashion can be supported, in a broader social-cultural context, showed social and ethical issues connected to design, production and use of fashion. It provided an overview over environmental problems the industry encounters, while presenting some of the most prominent environmental design strategies. It became clear that the fashion industry is a complex system in which various interests between consumer, producer and intermediaries interact; thus, repairing just one aspect always needs to be put into a broader perspective of social and environmental innovation. The next chapter will go into more depth on the fashion design practice through a design literature review and an empirical research.

4. Practicing Fashion Design

The environmental and social crisis we are currently experiencing is a design crisis, it is the result of the way things are built, imagined and consumed (Cao et al., 2015). Clothes, like other objects of our daily lives, are designed to be produced on a large scale and to be consumed en masse, all at low cost and with the aim of increasing sales on a continuous basis. Price determines design, not the other way around (Payne, 2011; Esslinger, 2011; Clancy et al., 2015). There is growing frustration among designers with this paradigm (Lawless and Medvedev, 2016). Even if designers are not alone in making decisions and are often not responsible for the strategic choices made by companies, they do have a responsibility towards sustainability of garments (Esslinger, 2011).

The purpose of this chapter is to better understand the role of the fashion designer and the act of designing. First, drawing on the design literature, emphasis will be given to how designers work and create, then at how designers can influence sustainability, and finally we will discuss the difficulties designers have in integrating sustainability into their work and the help that could be given to them. In a second step, the analysis will be based on interviews which were conducted with European fashion designers from small, medium and larger companies. Not all of them are at the same time in the implementation of sustainability, but all of them work in companies that have publicly marked their commitment to it. Thirdly, a summary subchapter will highlight the key-points from the two previous sections.

4.1 State of the art

4.1.1 How do designers work and create?

This subchapter aims to summarize insights from the design literature on how designers and fashion designers work and create. This subchapter will focus solely on fashion designers. The literature has a bigger focus on the traditional fashion designers but an exploration of the practice of sustainable fashion designers already occured.

Fashion is a sector that relies heavily on knowledge, especially knowledge of the history of clothing, previous collections and the creations of other designers (Yagoubi and Tremblay, 2017). Designers typically work with a lot of examples and inspirational images (Lofthouse, 2006). Fashion design is still seen primarily as a purely visual practice, with fashion designers seeming to be unresponsive to the designer's discourse of problem-solving (Esslinger, 2011). However, the fashion designer does generate symbolic value, but within the framework of a commercial activity. Therefore, one must be creative but also able to sell. The designer regularly finds herself/himself in tension

between these two aspects whose success is not measured in the same way. This tension between creativity and commerciality can be found in both independent and non-independent designers, in small and large companies, in the mid-range and top-of-the-range. Fashion brands itself as different from other industries that produce standardized products because of this place of creativity, the desire to be singular, authentic and creative. And it is because fashion is dominated by the creative aspect that the profession still attracts a lot of futur designers (Yagoubi and Tremblay, 2017).

This tension between the commercial and the creative is also felt in the fact that mass-scale designers and studio designers have different networks, the image of their profession is different too. One is seen as a commercial with an entrepreneurial view that could design and sell a product other than clothing. While for the other, creativity is the essence and he is seen above all as a designer (Yagoubi and Tremblay, 2017). Above all, the mass-market develops few original models but copies a lot of high-end brands (Payne, 2011). In order to ensure this commercial success, within fashion companies, designers regularly work in collaboration with different disciplines such as marketing, development, sales, etc. (Allione et al., 2011). In small businesses, it can even be said that the designer often occupies all of these positions at the same time and therefore has multiple roles (Clancy et al., 2015). In this multiple role, the position of entrepreneur is revealed as a necessity for designers who wish to work independently or be at the head of their business. The intervention of other disciplines therefore requires that compromises are made between the commercial and creative aspects. However, in addition to these compromises, designers are required to make compromises on many other aspects on an ongoing basis, such as materials, cost, quality, usage, etc. The final product is thus the result of compromises (Byggeth and Hochschorner, 2005).

One of the aspects that designers sometimes have to take into account is environmental and social sustainability. But how do designers approach sustainability? Clancy et al. (2015) tell that the academic literature studies the different strategies of sustainable design separately, whereas they are in fact regularly combined and used in parallel to each other. Vallet (2013), although studying industrial designers and not fashion designers indicates that what distinguishes eco-designers from conventional designers is the practice of conducting an initial assessment of the problem oriented towards sustainability and defining a particular strategy to combine an approach directed towards solving this problem. Vallet also tells that these designers, having developed a certain expertise on sustainability issues, rely much more on their acquired knowledge than on the use of particular tools. This expertise is important to develop, because the basic culture of designers often does not allow them to know whether the decisions taken are in the direction of improving environmental performance (Vallet et al.,2013). Similarly, Allione et al. (2011) also indicates that designers, generally speaking not only fashion designers, often have only a partial knowledge of the environmental

performance of the products they develop and therefore make decisions on technical and economic criteria or by comparing, in the context of the choice of materials, traditional materials. Fashion designers report obtaining information and inspiration for new materials mainly in trade fairs and when visiting suppliers (Clancy et al., 2015).

The sustainable strategy which is mostly promoted by designers is the use of sustainable materials and fabrics. This is not surprising since it is relatively easy to implement. Furthermore, they also try to focus on limiting waste in production and employing sustainable manufacturing methods. Designers say they usually have to focus on a few aspects of the garment's life or only part of the environmental or social issues. Thus, for example, craftsmanship and hand-made are often seen as having added value since by working in a socially responsible way, the story behind the garment becomes as important as the garment itself (Lawless and Medvedev, 2016).

In general, designers in large companies spend more time on details of a garment's life, while designers in smaller companies often have more opportunities to act on the entire life cycle of the garment (Lawless and Medvedev, 2016). Yet small firms often struggle because of their small size to have enough clout to influence the companies that supply them with fabrics and other materials and the companies that produce for them. Thus, these small companies rely more on international standards (ISO 140001 or ISO 18001), certifications (Gots, bluesign, etc.) and other characteristics such as "recycled", "ethical production", "low-impact manufacturing" when they are looking for fabrics and suppliers (Lawless and Medvedev, 2016; Niinimäki and Hassi, 2019).

4.1.2 How can designers influence sustainability?

Although the issues of sustainability in the fashion industry are of such importance and complexity, and indeed are beyond the scope of a single person, company or country, the designer is nonetheless central to solving them (Lawless and Medvedev, 2016). In fact, a broad consensus and several studies show that decisions made during the design phase have an impact on the entire life cycle of the garment (Lawless and Medvedev, 2016; Payne, 2011; Hur and Cassidy, 2019; Clancy et al., 2015; Iran, 2018; GFA and BCG, 2017). Thus, 80% of the environmental cost would be determined during this phase (Hur and Cassidy, 2019; Lawless and Medvedev, 2016). In this framework, the designer is no longer there to solve simple problems or have only a role in aesthetics, but tackles complex problems. A greater focus on the process is present, and less on the outcome. Tackling those issues requires collaborative work with other disciplines (Clancy et al., 2015).

But to design in a sustainable way, it also requires to consider the entire life cycle of the product and its environmental and social performance in order to be able to act holistically and avoid treating each problem in isolation (Lawless and Medvedev, 2016; Payne, 2011; Allione et al., 2011). Environmental and social costs must be integrated in the same way as material costs in the decision making process (GFA and BCG, 2017). Similarly, environmental and social issues must be taken into account when considering whether the product is a "good design" or a "bad design" (Reitan Andersen and Earley, 2014). However, the integration of sustainable strategies is only effective if it is done at the beginning of the design process to be sure that it is well anchored in the garment (Iran, 2018; Bovea and Pérez-Belis, 2011; Kozlowski et al., 2018; Byggeth and Hochschorner, 2005). Designers seem to be more familiar with more pragmatic sustainable strategies such as recycling, repair, choice of material. This later makes particularly sense since the choice of material is one of the decisive elements in the environmental cost of a garment (Cao et al., 2015; Allione et al., 2011). However, designers seem less aware of strategies that go beyond their material habits, such as sustainable product-service systems or strategies that are more focused on human well-being (Hur and Cassidy, 2019).

Although, in order to achieve sustainability, designers should also embrace design strategies that go beyond the material aspect, some elements of the life cycle of a garment are underexploited, on which the literature proposes some examples. This is the case of use and temporality, indeed a garment is not a frozen object but an object that takes life while being worn. Therefore those elements should be taken into consideration in the design of clothes (Fletcher, 2014; Fletcher, 2016). Another aspect which is regularly underexploited by designers is the End-of-Life of the garment which requires an upstream preparation of for example, the clothes' needs to be disassembled to be recycled. Finally, the stage least approached by designers is product shipping, often due to a lack of alternative options (Lawless and Medvedev, 2016). If these changes took place in the mass-market or on a large scale, the impact of any transformation, sometimes even small, could potentially be very significant (Payne, 2011).

Beyond these specific questions,, a cultural change in our approach to design and an overhaul of the industrial process are necessary in order to work holistically and to place sustainability at the center of thinking from the very beginning of the process (Esslinger, 2011; Allione et al., 2011). Therefore, society needs to transform the economy so that it is the one in which we keep products in use (Kozlowski et al., 2019), develop business models that take into account the men and women of today and tomorrow and no longer ask "what is the next new thing?" but "What is the next better thing?" (Esslinger, 2011). This requires designers to be more multidisciplinary, collaborative and transparent in their approaches (Kozlowski et al., 2019).

But any change can only be successful if consumers buy into it. That is why it is important to be culturally relevant and continue to create objects that make sense emotionally and socially through the aesthetical choices. And this is the designer's responsibility (Esslinger, 2011). The aesthetics of sustainable fashion is currently often seen as unattractive. But it is a very important element, it should not only attract the buyer before and during the purchase, but the satisfaction should continue after purchase and during use. Aesthetics must be culturally relevant (Zafarmand et al., 2003; Iran, 2018).

4.1.3 What are the difficulties encountered by designers in implementing sustainability and how can they be overcome?

Little research identifying barriers to the implementation of sustainability in fashion design is available (Hur and Cassidy, 2019). Nevertheless, some difficulties but also needs can be identified in the literature. They are stated here without being explained in much detail nor ranked in order of importance, but shall provide the reader with an overview of challenges in the design process.

Lack of knowledge on the part of designers on sustainability issues is a major difficulty (Lawless and Medvedev, 2016; Mareels and Steffan, 2019; Vallet et al., 2013). On top of this, there is a lack of guidance on how to navigate into the possible sustainable design strategies (Vallet et al., 2013; Hur and Cassidy, 2019). In addition, designers feel that there is no consensus on the meaning of sustainability in fashion which makes it difficult for them to act towards a clear shared goal (Hur and Cassidy, 2019). The complexity and the number of the sustainable issues is another major challenge (Vallet et al., 2013; Hur and Cassidy, 2019). This complexity requires a holistic approach where all stages of the clothing life cycle must be considered. This way of working is not usual for designers which often have the habit of working exclusively on the aesthetics and material aspect of the garment (Lawless and Medvedev, 2016; Vallet et al., 2013). Moreover, being in a sustainability process is at odds with industry practices and standards, as the high pace environment and the business model based on high profit through low price can be a major obstacle for designers (Lawless and Medvedev, 2016). Also, the inclusion of environmental and social criteria adds one more criterion to be integrated into an already important compromise process which makes the work heavier (Hur and Cassidy, 2019). Moreover, if the company does not give itself the necessary capacities, particularly in terms of time and money, the task can be very difficult (Hur and Cassidy, 2019; Lawless and Medvedev, 2016; Vallet et al., 2013).

Moreover, the implementation of sustainability requires a change in consumption habits and designers are not very optimistic about their ability to influence this transformation

(Kozlowski et al., 2018; Lawless and Medvedev, 2016). In addition to this, designers believe they lack adequate technologies to achieve sustainability (Lawless and Medvedev, 2016) but also particular tools, or at least they are not aware of them (Hur and Cassidy, 2019; Kozlowski et al., 2018). The use of tools is developed in the next chapter. Another difficulty for many designers is the access of information, the analysis of it and thus the choice resulting from it, particularly of materials (Kozlowski et al., 2018; Byggeth and Hochschorner, 2005). Similarly, finding suitable suppliers with relevant available materials -in terms of price, aesthetics, possible options, etc.- is indicated as a difficulty for designers (Kozlowski et al., 2018; Hur and Cassidy, 2019; Lawless and Medvedev, 2016). Finally, many small firms feel that their size is too small to allow them to have a voice heard by the various stakeholders to effect change and that, furthermore, the minimum quantities required by suppliers of fabrics and other materials often exceed what these companies need (Lawless and Medvedev, 2016; Kozlowski et al., 2018).

In order to achieve sustainable fashion, a change of designer's and the whole industry's mindset is therefore required. These issues are not only value chain and sourcing issues but also designer issues. The very description of the profile of designers must integrate sustainability and not only the visual aspect (Clancy et al., 2015). For this purpose, a clear and comprehensible definition of what sustainability in fashion means is needed (Hur and Cassidy, 2019). This definition is also necessary in order to be able to build adequate training programs that designers need to integrate these complex issues and holistic thinking into their practices (Earley, 2017; Mareels and Steffan, 2019) and make relevant choices, particularly in the choice of materials (Clancy et al., 2015). And thus, help to build the strong knowledge on sustainability that designers need to have (Hur and Cassidy, 2019). The integration of sustainability in fashion schools and education curricula can be seen as an opportunity to implement the sustainability mindset in a long-term way (Lawless and Medvedev, 2016; Moorhouse and Moorhouse, 2017). Also, to help designers in their efforts, a series of practical, understandable and fashionable solutions could be implemented. In the same way, specific tools and processes could be widely disseminated (Hur and Cassidy, 2019). But, it is obvious that designers cannot do everything alone; all stakeholders, including consumers, must be involved. The transition to sustainable fashion requires collaboration between different disciplines. Also, designers from smaller structures already collaborate regularly to develop their practices and overcome the problem of minimum quantities. We can therefore see that collaboration is the key (Lawless and Medvedev, 2016; Hur and Cassidy, 2019; Clancy et al., 2015; Kozlowski et al., 2018).

In addition, there is a need for clear goals within each organization (Clancy et al., 2015; Hur and Cassidy, 2019) and that more research on consumer behaviour from the academic world is needed because it is important for effective change (Hur and Cassidy,

2019). Finally, designers are asking for more examples of good practice in terms of sustainability (Hur and Cassidy, 2019).

4.2 Field Perspective

As a result of the literature review, some questions have emerged and others stay unanswered. These questions formed the basis of interviews with fashion designers (see "*Methodology*" for more details on the selection of participants). The details about companies and the position of designers can be found in table 2. Those interviews helped answering the research questions : how fashion designers design and acquire knowledge about sustainability? What is the design process? How do they integrate their sustainability knowledge into the design process?

In order to identify the characteristics of sustainable fashion design practice, the data collected is analyzed using the three elements of Shove et al. (2012) have identified as constituting practice : Meaning, Competences and Materials (see chapter 2 for more details). In what follows, I have added the conditions under which these designers work because this has influence on the dynamic interplay between these three elements. I have also included a section on "other observations", because those do not necessarily fit into the three elements of Shove et al.'s framework (2012).

Table 2. Designer's position and company details

Company	**Position**	**Interview date**	**City**	**Size**	**Personal relation-ship**	**Founded through**
Organic Basics	Head designer	13/11/20	Copenhagen	Medium	Former intern	
Saint Laurent	Design assistant, tailleur and sportswear	07/11/20	Paris	Big	Friend	
Infantium Victoria	Creative mastermind / Co-founder	12/11/20	Brussels	Small	Former teacher	
Gamut	Designer / Co-founder	10/11/20	Paris	Small	Friend of friend	
Okaïdi	Pants designer	03/12/20	Roubaix	Big		Through a colleague
Luxtra	Founder	07/12/20	London	Small		Email
N'go	Co-founder	02/12/20	Nantes	Small		LinkedIn
Adidas (A)	Head of design - Collaboration	26/11/20	Nuremberg	Big		LinkedIn
Adidas (B)	Designer bag and accessories - Collaboration	03/12/20	Nuremberg	Big		LinkedIn
Balzac	Style manager	08/12/20	Paris	Medium		Through her boss

4.2.1 Conditions of working

All of the people interviewed indicated that they were part of a team, with the exception of Luxtra. These teams may represent the entire company (Infantium Victoria; N'go) or only part of the company, in this case the design team (Organic Basics; Okaïdi; Balzac) or one of the design teams, as is the case at Adidas. These teams of designers have a certain level of hierarchy, but they all emphasise the fact that, despite the hierarchy, they never work alone but in collaboration with other team's members. Gamut, on the other hand, positions itself a little differently since they have chosen to appear as a collective of designers and as a working community without hierarchy.

Some of the interviewees emphasized the spatial organization in which they worked. Thus, at Infantium Victoria, Luxtra and Adidas teleworking is part of their spatial organization. The others either indicated that they work at the office (Organic Basics; Saint-Laurent; Gamut) or did not mention their place of work.

The question of prices and budgets were aspects of the designer's work contexts that came up many times during the interviews. With the exception of Saint Laurent where designers are only slightly concerned about prices and budgets and compromises related to price rarely have to be made, price and budget considerations take up more or less space in the other companies. At Adidas, they indicate that because their team is positioned in the luxury niche -collaboration with other brands or with artists, the issue of price is less present than in other teams of the company. This questioning about budgeting also occurs at Infantium Victoria, which sometimes says that it has had to give up certain productions for budgetary reasons, even though the interviewee specifies that she does not negotiate prices. Prices are what they are to ensure a living wage for clothing and material's producers. However, several interviewees expressed that the price of sustainable materials and budgetary constraints are often a challenge or difficulty for designers (Adidas; Balzac; Gamut; Okaïdi).

Moreover, the larger the company is -Adidas, Saint Laurent, Okaïdi, the more the complexity of their organization seems to challenge the implementation of sustainable strategies. The processes are long, fragmented and involve varying numbers of stakeholders (Saint Laurent; Adidas A). In this type of company Okaïdi's designer states that it is imperative that the management has the will to have a sustainable approach.

Finally, it should be noted that each company works in different timeframes. Thus, Balzac creates one collection per month. At Infantium Victoria, it's two collections per year. At Adidas, the team working for the collaborations works one year ahead of time while the rest of the company works two years ahead of time on the release of the collections. The shorter-time frame compared to other departments of the company can

be seen as a challenge to implement sustainable strategies and innovations, they do not have the possibility to think beyond the choice of materials to these issues.

4.2.2 What is the meaning of designing?

From the interviews, constatation can be made that designers attribute a great meaning to seeking innovation. The designer from Balzac explains that being a designer means being constantly looking for solutions, improvements and innovations. She refers to this constant mental activity as a creative radar which is hardly palpable, but it is present at every moment, both during professional and personal time. Likewise, at Luxtra, even though she acknowledges that there are many things she does not know, explains that she is always looking for new knowledge. As Adidas' designer (B) is always looking to the future. He sees himself as part of a generation of designers who are at the crossroads of wanting to create nice things and creating sustainable stuff. For him, sustainability is part of today's designer's mindset.

The mindset of designers when creating new designs can be very pragmatic like the will to respect the DNA and values of a brand (N'go; Adidas A; Balzac) or the will to bring something new (Okaïdi; Adidas B). But mental activity can also be less pragmatic. Gamut's designers create with a lot of spontaneity, leave room for chance and poetry and want to be sincere in their approach. At Adidas, the team working with collaborations insists on meaning of the design. While at Balzac, the approach gives space to instinct, to life around the pre-establish creative structure, to fun and seeks to make all the elements of a garment or accessory work and make the feeling "*click, it's cool*" happen. And that is why, the freedom of work is valued inside organizations (Adidas B; Balzac).

Being sustainable in fashion means that creativity needs to be redefined (Infantium Victoria) and that a more holistic approach is needed and that more attention is paid to each element (Organic Basics). Being sustainable also means to question everything, ask for a lot of information and redefine, among other things, the way of sourcing (Infantium Victoria; N'go). Picking the battles is both a necessity and a difficulty (Organic Basics; Adidas B). The majority of the designers interviewed consider sustainability to be a commitment : individually, at company level or within their partners in the value chain (Organic Basics; Infantium Victoria; Okaïdi; Luxtra; Adidas). When company's objectives regarding sustainability are reached, there is no turning back. Thus at Infantium Victoria and at Balzac, they indicate making increasingly clear-cut choices. At Organic Basics and N'go they note, however, that they are never 100% certain that the decisions made are the right ones, but that they are the best ones at the time, and that each new decision brings with it new questions. Designers recognize that it is sometimes

hard to work this way (Adidas B), that it takes a lot of energy (Saint Laurent) and it is sometimes overwhelming (Luxtra) but it is also fun (Infantium Victoria).

The majority of the interviewees express the awareness of working in a particularly polluting industry that can never be completely sustainable because it will always have an impact on surroundings. They therefore express their way of working as "more sustainable" or "sustainably minded" and try to minimize their impact and do better (Organic Basics; Infantium Victoria; Gamut; N'go; Adidas).

Some designers express why they are in this industry. There is, for example, the desire to create a virtuous circle around an entrepreneurial project as at N'go, to put aesthetically pleasing positive products on the market as at Infantium Victoria or to influence the industry by setting an example not only through the creation of clothing but also through the business model as it is the case at Organic Basics. Others, such as Gamut are committed to a more social dimension of sustainability by questioning the gender issue and promoting queer causes, but also with a willingness as designers to emancipate themselves from the big brands.

Most of the designers interviewed indicate that the aesthetic dimension is an important if not primordial meaning (Organic Basics; Saint Laurent; Infantium Victoria; Luxtra; Adidas; Balzac). The image and the impact of this image on the brand community is particularly emphasized by Gamut and Balzac Paris. These two brands also address the difficulty of having to reconcile the creative aspect of design with environmental responsibility. These remarks on the importance of image and aesthetics show just how fundamental this dimension is in fashion design.

Several interviewees emphasized the great meaning given to the importance of having a human and trusting relationship with their suppliers (Infantium Victoria; Luxtra; N'Go; Balzac). At Organic Basics, they insist on sharing common values with suppliers and on the collaborative work that is done with suppliers who are experts in their field. Finally, it is important for designers that suppliers play their game and understand what the company wants (Infantium Victoria; N'go; Balzac). This human relationship with suppliers is more evident among designers working in small and medium-sized companies.

4.2.3 Which competences do designers have?

The interviewees occupy different positions in their design teams, ranging from assistant stylist, to stylist and manager. In general, each one has his own field of expertise and competences -accessories, womenswear tailoring, children, boys clothing, bags, etc. And

as indicated in the literature (Clancy et al., 2015), designers-entrepreneurs as Infantium Victoria, Gamut and Luxtra also have, in parallel, other responsibilities such as marketing, communication, finance, etc.

The creative processes described by the interviewed designers are generally a shared competence and are very similar with the exception of Gamut and Organic Basics. Although the creative processes may differ slightly, emphasizing some aspects more than others and some steps may occur at different times, it is, nevertheless, possible to identify a pattern : the process starts with the definition of the desires and sometimes even with the first drawings (Infantium Victoria). Very often themes, universes and/or storytelling are defined. Those themes are further explored, notably through image research -art, film, archives, references, etc., shopping -vintage or new- and sometimes research via trend agences (Okaïdi). Once, the theme is settled, the color and material's choices can be made. All this are often materialized in the form of moodboards. Then, physical drawings or digital simulations are made, which will enable the designers to create a coherent collection. From this point, the development and prototypes are launched. This phase is usually a long one, consisting of many moves back and forth, fittings and modifications until the final decisions are made -colors, variations, cancellations, approvals, etc.- and the presentation and production are done.

At Adidas, Luxtra and N'Go the processes may sightly differ depending on the partnership with the other brands (Adidas) or the freelance designers (Luxtra; N'go). In contrast to many other companies, Gamut uses very little image moodboarding. They use more second hand pieces with which they experiment, or they have very precise ideas and execute them. They work more with ideas, *"obsessions"* or questioning. Upcycling is also becoming more and more important in their design practice.

Whereas at Organic Basics the team of designers works in a rather broad way, having a more holistic process and asking more questions about the whole life cycle of the garment. During the creation of the garments they ask themselves the questions "*what it needs to do*" and "*what we want to do*" in order to determine the non-negotiable aspects of the garment. The goal is to combine functionality, sustainability and solid aesthetical DNA. There is a desire to offer a product that is both physically and aesthetically durable and to encourage "*to practice a sense of personal style instead of following the trends*". However, Organic Basics' designer notes that in order to best respond to the various challenges, a framework for decision would be welcome. It could also be added that some of the designers also develop technical sketches and communicate with the technical teams (Saint Laurent; N'go; Adidas).
On top of this process that could seem to take in account only the creative aspect of the design practice, as highlighted in the literature, the commercial criteria is sometimes integrated into the construction of the collection. It is the case at Okaïdi and Adidas

where the designers receive a brief from marketing and sales to guide them. Another way to meet the commercial expectation is to regularly send out questionnaires to customers to best meet their needs and desires as it is the case at Balzac.

The freedom of creation is not felt the same way in all companies. At Okaïdi, and as Payne (2011) noted, the designer interviewed feels that in this kind of more industrially oriented design, the designer can sometimes feel more re-creator than creator. However, at Saint Laurent, the priorities are the creative freedom of designers and the quality of products and manufacturing -cut, material, style.

Although the literature tells that designers are responsible for 80% of the environmental impact of a product because of their decision (Hur and Cassidy, 2019; Lawless and Medvedev, 2016), what we see in reality, and as Allione (2011) indicates, the designer is only one link in the chain of decisions that could potentially influence the sustainability of their designs. Half of the designers interviewed explicitly say that they collaborate with other departments. Some collaborations with other company's departments have a direct and tangible influence on the product such as development (Saint Laurent; Adidas A), product management and production (Saint Laurent; Okaïdi) or collaboration with the materials and components divisions (Saint Laurent; Adidas A). And some other collaborations have a more informative purpose and therefore have an indirect influence on the products designed such as business (Adidas A), marketing (Okaïdi; Adidas), quality department (Okaïdi) or sustainability/Corporate Social Responsibility departments (Organic Basics; Adidas A; Balzac). Collaboration, thus, appears to be a key competence for realizing the designs. Those collaboration statements are not made by small companies, this is probably due to the size and therefore the limited number of potential stakeholders. In small business, designers occupy more diverse roles as already mentioned above. Nevertheless, this does not mean that no collaborative work is done.

In addition, external collaborations also exist, notably with consultants specializing in environmental matters (Organic Basics; N'go), agents for materials and the use of the network to find these suppliers (Gamut). Finally, collaborations with other brands (Balzac; Adidas) or concept stores (Gamut) also lead to an increase in the number of people involved in product decisions.

Inspiration comes from many different places and each designer has his or her favorite sources. As indicated by Lofthouse (2006), designers typically work with a lot of examples and inspirational images from various platforms such as Instagram, Pinterest, blog, Google Images, museum websites, etc. and movies, art or books containing images or stories. In the same way, the brand's archives are a source of inspiration, particularly in the definition of its visual codes as well as other brands via digital means, magazines or shopping. The acquisition of vintage pieces is also mentioned as a great source of

inspiration. Everyday life, practicality, techniques, clothing codes and materials are also sources of creativity, as are current events, Sustainable Development Goals and trends. More anecdotally, objects or recipes are also a source of ideas. The complete reference of interviewees on inspiration sources could be found in appendix A3. So, although the sources of inspiration in the creative processes are varied, complex and individual, at Infantium Victoria she points to the competences involved when she defines this process as a *"constant collection"*.

Some of the designers interviewed (Infantium Victoria; Adidas A) as well as the literature (Iran, 2018; Bovea and Pérez-Belis, 2011; Kozlowski et al., 2018; Byggeth and Hochschorner, 2005) indicate that the reflection on sustainability must be done from the beginning of the design phase. This calls for having a holistic vision; a view on the whole life cycle of the garment. Aiming to be circular is one of the strategies for implementing sustainability that is cited by both the interviewed designers (Organic Basics; Luxtra; Balzac) and the literature (Lawless and Medvedev, 2016; Payne, 2011; Allione et al., 2011). Moreover, sustainability should not only remain a material issue but also appear in design, customer service, trims as stated by Adidas' designer (B). In this context, making decisions can be hard but designers are more and more aware of what they can and cannot do (Organic Basics), even if some ideas or objectives take time to be implemented (Infantium Victoria). Some companies, such as Okaïdi, have decided that all employees are responsible for eco-responsibility. However, in larger companies as Saint Laurent or Adidas, designers at the bottom of the hierarchy feel that they do not have enough decision-making power to act on these issues and that it is also complicated to turn words into action. The impression of the designers from bigger companies is that in smaller, less profit-oriented companies, it would be easier to implement sustainability strategies (Adidas B). Finally, it is noted that designers would like to have more means, particularly in terms of time, to research and reflect on environmental and social issues in order to develop their competences with regard to sustainability (Organic Basics; Gamut).

The process by which designers acquire competences and knowledge related to sustainability issues is usually empirical, based on tests and experiments, i.e. in doing it (Infantium Victoria; Luxtra; Balzac). In the beginning, this process can be seen as laborious; not knowing where to start and where to look (Saint Laurent; Infantium Victoria). It is a process of searching, digging and verifying information (N'go; Adidas A).

Knowledge related to sustainability comes from a variety of sources, be it through general or specialized media -digital or not, through documentaries, documentation developed by professional associations, conferences or more broadly, and using the words of the interviewed designers, through a lot of "*reading*". In addition, a number of

designers say they are in contact with experts in their disciplines and non-profits and NGOs in order to make informed decisions, but also with suppliers who have expertise in their field. Similarly, encounters, colleagues, partners; people at the bottom of the supply chain; networks of creators such as Anti-Fashion or meetings at trade fairs are important vectors for acquiring new knowledge. These meetings can also take place within the company through collaborations with other departments, generally sustainability. At Adidas specifically, there is a series of learning experiences, presentations, opportunities for coaching, etc. within the company. This learning experience is also lived by other designers via workshops or short classes. Some have also been able to acquire those competences during their higher education. The observation of other brands is also cited as a way of acquiring knowledge but also the observation of working conditions in the conventional industry. Also, the analysis of the technical data sheets of the materials and personal interest in the subject are cited as ways to deepen reflection on sustainability issues. The complete reference of interviewees on the source of knowledge can be found in appendix A4. Some interviewees noted that more importance should be given to the education of designers and consumers (Saint Laurent; Infantium Victoria) and that designers ask for short and intensive courses on the topic (Luxtra; Adidas A) or for coaching support (Luxtra).

In order to make more informed decisions, some companies implement processes such as systematically asking a wide range of questions to their suppliers (Luxtra), developing a carbon footprint (N'go) or environmental labelling (Balzac). In addition, designers from Organic Basics and Balzac feel the need for having precise information on the different elements of the product, so that they can compare and sort when it comes to the choice of materials and designs. However, in this process of making informed decisions, designers often come up against the opacity of the industry. Wage issues and the leather industry are particularly troubling (Infantium Victoria; N'go; Balzac). In addition, there is often a real difficulty in tracing back the supply chain because producers are afraid of being bypassed (Infantium Victoria; N'go) or because the chain of intermediaries is particularly complex as explained by Balzac. There is therefore a need to have someone who knows the field in order to *"crack*" the information (N'go; Balzac) and even to have someone within the company whose role is dedicated to finding information (Okaïdi) as is the case at Adidas.

Designers say they have to constantly search for information (Okaïdi; N'go) even though there is already a lack of time for these tasks (Organic Basics; Gamut; Adidas B). Information is not always easy to find and when it is found or received it is often blurred, vague, imprecise, not complete, etc. as stated by Organic Basics, Infantium Victoria, N'go and Adidas (B). Finally, when information is obtained, the designers do not always have the competences to understand it; especially the chemistry, because as they say "*We are designers not engineers*" (Organic Basics; Infantium Victoria; Gamut).

4.2.4 The material dimensions of sustainable fashion design

During the interviews, the material question was preponderant in the answers to the questions. In keeping with the literature (Lawless and Medvedev, 2016), sustainability is seen primarily from a material perspective (Okaïdi; Adidas; Balzac), either as a starting point for a broader reflection as emphasized by Balzac or because the materiality of the product is seen as the most impacting component of the product (Adidas A).

The material dimensions of design, emphasized by the interviewees, will be described more or less in correspondence to the life cycle of a product, i.e. starting with the research and prototyping phase and ending with the end of life. Some more anecdotal elements will be discussed at the end.

The materialization of an idea (Adidas B) and the testing of new materials (Luxtra) are important steps to ensure the functionality of a design (N'go). But this stage of materialization and prototyping can itself have an environmental impact, which is why in a company like Adidas, they try to avoid over-prototyping and over-development, and make pre-choices, especially on colors, based on a digital support or seek to alter existing prototypes instead of producing a new prototypes.

When designing the construction of the garment, the development of an aesthetic/visual line specific to the brand or collection is an essential element (Organic Basics; Saint Laurent; Infantium Victoria) as well as the quality of the garment and its physical durability (Organic Basics; Saint Laurent). Even though there is a willingness to implement a circularity strategy among some of the designers interviewed, no one, with the exception of Organic Basic, has done so in the construction of the garment. However, there are some companies, like Okaïdi and Balzac that are beginnings to reflect on this strategy.

Different strategies exist with regard to the choice of materials. Some have made the pragmatic choice of only using vegan materials as Infantium Victoria and Luxtra or natural and organic fibers (Infantium Victoria), using locally manufactured materials like Gamut and Balzac or using end-of-stock material (Gamut). However, in-depth reflections also arise when choosing materials and it is generally where case-by-case compromise situations arise (Organic Basics; Infantium Victoria). Thus at Organic Basics the choice is to limit the use of resources not necessary for the performance of the garment, to limit the mix of materials and to improve the product when a better material alternative exists. In addition, the systematic hulling of the product and the analysis of each of its elements is a common practice either so that each element in itself is the best available version (Balzac) or because, in addition to this, all the elements of the product make sense together as the will at Organic Basics.

In very concrete terms, organic cotton, recycled cotton, Better Cotton Initiative certified cotton and recycled synthetic materials -polyester and nylon- are the materials most often used by designers working in companies committed to sustainability. In addition, the finish and chemical treatments of the materials also have an impact. This is why the use of responsible dyes, chrome-free leather treatment, ozone washing and laser finishing of denim are preferred. The complete reference of interviewees on materials used can be found in appendix A5. It is also noted that printing, embroidery, sequins, etc. remain weak points that the brands as Okaïdi wish to improve.

In general, we realize in discussion with designers, that it is a journey that is never finished (Organic Basics; Infantium Victoria; Balzac) but they try to do the best they can at the moment (Luxtra). At Infantium Victoria, she notes there is a need for better materials, more research on them and more materials that are *"positive*" and not just "*less bad*". Material suppliers are found through the designers' network, trade shows as well as through the manufacturers' material library. This last option allows brands, as N'go, with smaller production runs to bypass minimum purchase quantities. Gamut and N'go note that it is sometimes complicated for them to find suppliers of eco-friendly materials and that they would need help in this task. The complete reference of interviewees on source of materials can be found in appendix A6.

As indicated in the literature (Lawless and Medvedev, 2016; Niinimäki and Hassi, 2019), the use of certifications to ensure eco-responsibility is most common among small and medium enterprises as Organic Basics, Infantium Victoria and Gamut. These include Gots, Peta-approved and C2C certifications. The main difficulties are related to: the durability of the responsible materials as emphasized by Luxtra, N'go and Blazac; their availability on the market (N'go; Luxtra); Luxtra and Adidas (A) pointes also the limited options in terms of aesthetics; finally the price and minimum purchase quantities are also part of the difficulties for Luxtra.

The small and medium-sized companies also spontaneously emphasized about the strategy behind the choice of the place of production of clothing and accessories, be it that of local production – at Gamut, Luxtra, Balzac, a fair trade project for N'go or a desire to bring the places where the material is manufactured closer to those where the clothing is produced at Infantium Victoria. In general, designers say they visit production sites (Organic Basics; Infantium Victoria; N'go) either "*regularly*" as Balzac or "*once or twice a year*" as Okaïdi.

Organic Basics and Okaïdi's designers state that the use phase is explored by the designers interviewed through the design of physically and visually durable garments. This phase is also explored by accompanying clients in the care of their clothes by

offering advice on maintenance, tutorials or repairs as proposed by Infantium Victoria and Balzac. However, the designer from Infantium Victoria acknowledges that this is the phase of the clothing life cycle that is the least explored because she believes that her customers do not buy for the sustainable aspect but for the aesthetics. It can be noted, however, that an effort to extend the life of the garment is made through the introduction of a take-back system, with different names depending on the company, and through the resale of second-hand clothes of the brand at lower prices. It is the case for exemple at Infantium Victoria, Okaïdi and Balzac.

Products' end-of-life is often approached through a reflexion around recycling. Several mention the need for implementing a strategy of circularity (Organic Basics; Okaïdi; Luxtra; Adidas; Balzac). Nevertheless, N'go and Adidas emphasized that the complexity of both the technical processes and the products as well as the number of their components makes their recycling particularly complicated. It is therefore not yet implemented and the companies are struggling to find partners (Infantium Victoria), which pushes companies, as Organic Basics, to adopt a pragmatic approach where they design for the current infrastructure in the hope that it will be improved but does not rely on an infrastructure that does not yet exist.

Other initiatives taken throughout the life cycle of the garment include choosing a clean energy supplier (Infantium Victoria; Luxtra), Infantium Victoria also works on optimizing packaging and drastically limiting plastic, some companies as N'go certify the organization as a Bcorp -Bcorp is a label that gives a score to the company based on their social and environmental commitment- for self-assessment purposes, and others companies as Okaïdi ensure products that are reworked from season to season.

4.2.5 Other observations

During the interviews, certain pieces of information seemed interesting but did not fit into the categories set out by Shove et al. (2012), and they are included in this section. These observations pertain to the sustainability visions of the companies, reflections that go beyond fashion, the way products are sold, financial issues and entrepreneurial difficulties.

The way in which designers talk about the sustainability vision of their companies takes two forms. There are, on the one hand, tangible elements and, on the other hand, more abstract, less tangible elements. With regards to the former, the sustainability visions translate in a tangible way are by, not surprisingly, a choice of sustainable or responsible materials - organic cotton, recycled materials, materials from deadstock. These materials are sometimes vegan and very often certified. Emphasis is given to limiting the use of

unnecessary resources in the product or in the development process. The implementation of a strategy of circularity, and therefore recyclability, is a shared objective, as is the design strategy for long-lasting products -visually and physically. It can be noted that Gamut promotes upcycling and unique pieces and that Balzac aims to implement modularity in its clothing. Attention is paid to limiting material paths and packaging. Customers are offered support in the life of the product through maintenance and repair advice and through the implementation of a take-back system. Companies are committed to having a social responsibility towards their suppliers and sometimes promote local production. Finally, it should be noted that some companies monitor their energy consumption and, more broadly, their environmental and social impacts. The complete reference of interviewees on tangible sustainable strategies can be found in appendix A7.

On the other hand, sustainability visions appear in a more abstract way through the Bcorp certification of companies, the desire to rethink fashion beyond the status quo - particularly through consumer education but also through industry education, a willingness to offer clothing outside the conventional system of seasons and trends, sometimes with a charitable purpose. Gamut explores the issue of diversity and gender, while Infantium Victoria claims to develop within a framework of donut economy and Craddle to Craddle. The complete reference of interviewees on abstract sustainable strategies can be found in appendix A8.

However, if we compare the discourse held by the designers and the communication of each company on their website, there are some noticeable differences. See table 3

Table 3. Comparison of sustainability vision as presented in the interview and as presented on the websites

Company	**Sustainability vision presented in the interview**	**Sustainability vision presented in the website**	**Reference**
Organic Basics	Limitation of unnecessary resources Circularity and recyclability as a goal Long-lasting (visual and physical) Fit thinks to fit more people Encourage a sens of personal style Influencing the industry by giving the example Non-seasonal, no-trend Certified third-party Holistic approach	Design to last Sustainable materials (Organic, recycled, certified) "*Factories that care of impact*" Sustainability as a core mission Transparency (on suppliers) Explanation of each material Measure and present the environmental impact of products Organics Basics Fund Low-impact website Local production (Europe) Carbon neutral company CSR report available Bcorp Design for deconstruction Vegan (a part) 1% for the planet	Interview Organic Basics, 2020 A Organic Basics, 2020 B Organic Basics, 2020 C Organic Basics, 2020 D Organic Basics, 2020 E Organic Basics, 2020 F
Saint Laurent	Not known by designers Designer thinks there is some materials guidelines	Traceability guideline for leather and mohair Measure environmental impact through Environmental profit & loss 100% ethical gold	Interview Kering, 2020 A Kering, 2020 B Kering, 2020 C

		Materials sustainability as goal (leather, organic cotton) Chemical management policy Animal welfare standard Carbon neutrality as goal Energy consumption in manufacturing	
Infantium Victoria	Sustainable materials (Organics, naturals, Gots certified, C2C, regenerative) Vegan Take-back system Educating Social responsibility towards suppliers Limitation of the travel of materials Packaging No plastic Energy consumption How to take care of garments (wash and repair) Supply chain transparency	Sustainable materials (Organic Gots certified) Vegan (Peta-approved) Ethical "*Source, produce and distribute sustainably*" Design that last Take-back system Transparency (suppliers, time needed to make the garment and on materials details) How to take care of garments (wash and repair)	Interview Infantium Victoria, 2020 A Infantium Victoria, 2020 B Infantium Victoria, 2020 C
Gamut	Not defined precisely Upcycling (materials or clothes) Sustainable materials (recycled, certified, deadstock) Local production (as close as possible) Unique pieces Question gender, queer, diversity, sens of community Think fashion outside of the status quo Low cancellation	Horizontal model Expression Sharing Solidarity Pleasure Ecological Humanist resistance	Interview Gamut, 2020
Okaïdi	100% eco-friendly as a goal Sustainable materials (Recycled, organic, certified) Long-lasting (physical) Take-back system Non-seasonal (annual and permanent products)	Sustainable materials (Organic, recycled and less impactful finishing) Long-lasting (visual and physical) Take-back system Packaging (plastic reduction) Finance Surfrider foundation	Interview Okaïdi, 2020
Luxtra	Vegan Sustainable materials (recycled, bio-based, organic) Local production (Italy) Responsible production *"Be even more sustainable"* as a goal Bcorp Packaging Energy consumption Carbon neutral shipping, no airplane shipping Charity Circularity as a goal	Bcorp Local production (Italy) Sustainable materials (innovative, organic, recycled, bio-based) Long-lasting Vegan (Peta-approved) "*Sustainable in every aspect of our business*" Fair working condition Supply chain transparency Packaging 1% for the planet	Interview Luxtra, 2020 A Luxtra, 2020 B Luxtra, 2020 C
N'go	Fair production Works with a cooperative of artisans Caritatif goal Sustainable materials (Chrome-free leather, recycled) Solidarity and fair trade brand Measure of carbon emissions Measure of social impact Packaging Bcorp	Bcorp Fair and responsible Valorization of the know-how Social responsibility (school construction) Vegan (a part) Sustainable materials (recycled, chrome-free leather) Take-back system	Interview N'go, 2020 A N'go, 2020 B
Adidas	Sustanability is a commitment Sustainable materials (recycled) No over-prototyping, no over-development Being digital Measure of the environmental impact	*"Balancing economical success with social and environmental aspects"* Learning, Constant improvement Empowering people through sport Holistic approach Measurable goals (greenhouses gaz, climate neutrality, waste reduction, energy consumption, water consumption, chemicals consumption, etc.)	Interviews Adidas, 2020

		Sustainable materials (recycled, sustainable cotton) Packaging Extension of life as a goal (recyclable, circular, regenerative, resell)	
Balzac	Local production (Europe and as close as possible) Sustainable materials (certified) "*Always more responsible*" as a goal Responsible and human production No over-production Take-back system Circularity as goal SDG Questionnaires to clients CSR policy How to take care of garments (wash and repair) Modularity as goal Collaboration with others brands Mesure environmental impact Supply chain transparency	Reduction of environmental impact as goal Limited edition Local production (Europe and as close as possible) Sustainable materials (certified, organic, tencel, chrome-free leather, ...) Recyclable as goal Long-lasting (visual and physical) How to take care of garments (wash and repair) Encourage to consume less Ends their fabrics stocks Supply chain transparency Vegan (a part) "looking for alternative" Minimizing textile waste Take-back system	Interview J Balzac, 2020 A Balzac, 2020 B Balzac, 2020 C Balzac, 2020 D Balzac, 2020 E

For some brands as Infantium Victoria, N'go, Okaïdi and Balzac there are differences in the vocabulary used to express an idea i.e at Balzac during the interview she said that circularity was a goal for the company but on the website they use the word recycling. For some of those brands, the differences are quite small i.e at N'go they measure their carbon emissions or at Infantium Victoria they use renewable energy at the office. Those informations are not on their website, this is probably because this type of information is more related to the very functioning of the organization than to the commercial dimension of a website. See table 4.

Table 4. Informations which are presented only during the interview or only on the website - Vocabulary or small differences.

Company	**What is said during the interview and not on the Website**	**What is said on the website and not during the interview**
Infantium Victoria	Gave a lot on information on the ethical production Education of customer and industry Renewable energy at the office	Transparency on suppliers, time needed to make the garment and on materials details
N'go	Measure of carbon emissions Measure of the social impact	Take-back system
Okaïdi		Effort on plastic reduction in the packaging Finance Surfrider Foundation
Balzac	Next goal is circularity and modularity Questionnaires to clients Development of an holistic CSR vision	

Some parts of the company's vision that were not described in the interviews or on the website are nonetheless concepts of equal weight that the one which are describe during the interview or on the website. For example, the strategy described in the interview to make non-seasonal and trendless clothing at Organic Basics is as important as the exclusive use of sustainable materials highlighted on their website. Or at Luxtra, the willingness to implement a circularity strategy as described in the interview is just as important as making long-lasting products as described on the website. See table 5.

Table 5. Informations which are presented only during the interview or only on the website – Equally important.

Company	What is said during the interview and not on the Website	What is said on the website and not during the interview
Organic Basics	Fit of the garment Solidity No trend, non-seasonal Circularity is a goal	Organic Basics Fund Impact report Measure of the environmental impact Bcorp Suppliers transparency Sustainable materials
Luxtra	Circularity is a goal Shipping reflexion Renewable energy at the office	Long-lasting products Supply chain transparency

At Gamut, the informations on sustainability given during the interview are more explicit and more numerous than the one indicated on the website. This is probably due to the fact that sustainability is not part of the collective's communication axes as emphasized during the interview. Sustainability at Gamut is more implicit. See table 6.

Table 6. Informations which are presented only during the interview or only on the website – More informations given during the interview.

Company	What is said during the interview and not on the Website	What is said on the website and not during the interview
Gamut	Strategy is not defined but sustainable elements are part of their criterias as local production, sustainable materials, upcycling, diversity, etc.	More general ideas in which sustainability is implicit as a horizontal model, solidarity, sharing, humanist resistance, etc.

Very large companies such as Saint Laurent and Adidas give much more information related to their sustainable vision on their website than what is described by the designers in the interviews. At Adidas, the designers' discourse is almost exclusively focused on the material aspect of sustainability, whereas corporate communication is much broader and promotes for example climate neutrality goal, a holistic approach and information related to social sustainability. At Saint Laurent, despite a precise vision communicated by the company on material criteria, traceability, carbon neutrality, etc., the interviewed designer does not know the company's vision and only suspects that criteria for materials must exist. See table 7.

Table 7. Informations which are presented only during the interview or only on the website – More informations given on the company's website.

Company	What is said during the interview and not on the Website	What is said on the website and not during the interview
Saint Laurent	No idea of the sustainability vision of the company	Materials criterias Chemicals management Traceability guidelines Carbon neutrality as goal Energy consumption
Adidas	Focus on the materials used in the product and during the development	Global ideas on sustainability as "constant improvement", "holistic approach", "empowerment of people", ... Materials goals Target for social sustainability Climat neutrality as goal

In general, those differences are linked to the fact that designers are more likely to talk about what concerns their daily practice than a broader vision stated on the company's website. It is also due to the orientation of the interview questions – "how do you work with sustainability?". It is particularly true for big companies, as Saint Laurent and Adidas, where designers have probably less ability to influence the sustainable strategies of the company. Whereas in companies owned by designers, as Infantium Victoria, is part of the designer's practice to define those broader sustainable strategies, they are therefore more willing to speak about it when "how do you work with sustainability?" is asked.

Another interesting observation made by Organic Basics' designer is that he would like to link fashion sustainability issues more systematically with the bigger picture. But understanding these links between macro-problems and micro-solutions is sometimes complicated, help would be needed to illuminate the full picture. This willingness is present because the problems are present beyond the fashion industry and therefore, according to Organic Basics' designer, one should not work in silo but in collaboration with other industries.

Also, emphasis on the means of distribution were made by designers. Some do not focus on the distribution phase and sell via resellers and direct-to-consumer as Infantium Victoria, others have as business model the mass distribution and are part of a central purchasing group as Okaïdi. But some smaller brands, as Gamut and Luxtra highlight the difficulty of being profitable within the reseller system, which is why they prefer the direct-to-consumer model.

It can also be noted the desire to receive financial incentives for their sustainable business via a system of positive taxing (Organic Basics; Infantium Victoria) or grants for young sustainable innovators (Luxtra).

Finally, it can be noted that several young entrepreneurs discussed during the interview the entrepreunarial difficulties, as getting started and competing directly with larger and more established brands (Gamut; N'go). Relate to that, it was also emphasized by Luxtra that designer-entrepreneurs have multiple things to do other than design, which often take precedence over design, and that the commercial issue and the question "how to sell" is constantly present.

4.3 Act of designing – At a glance

The purpose of this section is to highlight the key aspects of both previous subchapters.

In short, the pattern found in the designers' process is to elaborate moodboards of images, materials, universe, vintage, etc.; to transform these ideas into drawings and then to develop them into prototypes that are further developed into the final product. Some also work with upcycling of garments. The creation of clothes and accessories is done respecting the DNA and the values of the brand but also with fun, spontaneity, meaning, clicks and freedom. In their work the fashion designers put great emphasis on creativity. Currently, they see their task as first and foremost focusing on aesthetics and not on problem-solving as it may be the case for other design disciplines. And indeed, aesthetics plays a primary role in clothing design. The designers also note that it is sometimes difficult to combine creative freedom with sustainability, particularly given the time constraints that many of them have met. These designers work within a particular budget framework and with a commercial objective, so tensions between creative freedom, sustainability considerations and the commercial aspect can arise. Each product is therefore the result of a series of compromises.

Most of the interviewed designers work collaboratively within a design team or with other professionals in departments such as marketing, development, sales. However, in small companies, the designer can take on these roles as well.

The work of a designer is based on knowledge - especially of the history of the garment, the technical aspects, other designers, etc. - and they often use examples in their creative processes. Inspiration comes from many different places such as art, movies, books, archives, other brands, everyday life, techniques, materials, news, etc. Being able to constantly access, collect and mobilize this inspiration in new contexts -new garments/accessories- is a key competence. This collection of inspirations means is permanent and supported by the designer's internal creative radar that is constantly looking for novelty. This creative aspect needs to be combined with sustainable criterias.

Different sustainable design strategies exist and are regularly combined by designers and companies to best respond to the problems presented. For example several brands combined a strategy of sustainable materials with a design strategy for long-lasting products and with a strategy of local production. Ideally, according to the literature, the combination of these strategies should have a life cycle perspective with the goal of improving environmental and social performance. However, it appears from the interviews that the most implemented strategies in the interviewees' companies is the use of sustainable materials for all the components of the product, and which materials with a reduced impact compared to conventional materials (i.e. natural, organic, recycled, certified, etc. materials). Finding 'better' materials is a constant journey that never ends. The interviews provide two different explanations for the use of this strategy as a main strategy: first, because the issue of materials is used as a gateway to a transformation towards a (more) sustainable model. Second, because materials are

generally seen as the most impacting element from an environmental point of view. When it comes to the will to implement designs for long-lasting products, the goal appears to be to propose products that are sustainable both physically and visually. Although, there is a widely shared desire amongst the interviewees to implement a circular design strategy including recycling, at the present time the infrastructure is still too complex for these fashion objects. They are often also complex and include a multitude of elements, making recycling difficult. In this desire to implement circularity of products, some companies make an effort to extend the life of products through maintenance advice and repair services. In the same way, take-back systems are frequently made available to customers in order to give a second life to these products. Other strategies relating to the place of production are emphasized by small and medium companies, such as the will to produce locally, in an fair way, or to minimize the distances between the places of production of textiles and that of clothing and accessories. It is noted that these sustainable companies often maintain human and trustworthy links with their suppliers and work in collaboration with them. Finally, one can note that various companies have chosen to be certified by Bcorp, albeit for different reasons, whether to evaluate themselves or to send a message to consumers.

Faced with a multitude of possible strategies, companies appear also to be at a bit of a loss. The literature also points to the need for creating a guide to these strategies. According to the literature, there is a lack of consensus on what sustainable fashion means or should be, which is symptomatic of the complexity of the problem facing the industry. There is a need to work collaboratively with all stakeholders, including consumers and suppliers.

Being sustainable implies going against conventional industrial practices but also going beyond the vision that sustainability is only about the choice of materials. As the interviewed designers pointed out being sustainable means constantly questioning everything, redefining the way of working and asking for a lot of information. There is, indeed, a willingness to make informed choices. Designers add that sustainability is a commitment.

We can see from the interviews and the literature that the most sustainable strategies implemented in the industry are the most pragmatic and related to material issues (materials choices, recycling, repair, etc.). This may be attributed to the designers' tendency to talk more about their daily practices during the interviews and that the interview questions were oriented in this direction, rather than to the compagnies' implementation of more global strategies. However, as several of the interviewees pointed out, sustainable thinking must be present from the very beginning of the design phase. The interviews suggest that the larger and more complex a company is, the less

influence a designer has on sustainability issues, and that is particularly the case if that designer is at the bottom of the hierarchy.

Designers, especially in small and medium-sized companies, use certifications, standards and statements such as "ethical production" or "recycled" to compare their possibilities with traditional materials. However, it is sometimes difficult for them to find suppliers who can meet their criteria (environmental, price, minimum quantities, etc.). Some designers and companies monitor their environmental and/or social impact, but even when monitoring their choices, they say they are never 100% sure that they are the right ones and that the industry can never be completely sustainable. Therefore, we have to be content with minimizing the impact as much as possible and always try to do better. Some designers readily admit that being on a sustainable journey can be hard, energy-consuming and sometimes overwhelming, but it can also bring joy. They add that they would need more financial, human and above all temporal means to carry out their projects. There seems to be a real lack of time among designers. More generally, there is a lack of clear objectives and consumer research when it comes to sustainable fashion. Also, the literature pointed out that designers lack examples of good practices on how to exploit the use-phases of the garment and its end-of-life through design. There is also a need to create consumer acceptance through culturally and aesthetically relevant products.

We can finally add that although some emphasize that designers are responsible and can influence 80% of the environmental impact of a product, this research shows through interviews and literature review that the designer is only one link in a complex chain of stakeholders and decisions. It is a shared and collective responsibility that requires collaborative work.

The literature also indicates that one of the major obstacles to the transformation of the fashion industry towards a more sustainable model is the lack of knowledge among designers on these issues. Indeed, sustainability issues are not part of the basic culture of fashion designers. The designers interviewed here all work in companies that have chosen to move towards this new model; therefore, they appear to have some knowledge. It can be seen that this knowledge was mainly acquired empirically through a sometimes laborious process of experimentation but also through investigations of the media, documentaries, meetings, conferences, experts, suppliers, trade fairs and examples from other companies. Designers note that there is a real lack of transparency in the industry especially around very specific issues such as leather, wages and supply chain. Furthermore, when information is available it is often not very precise, not very relevant or sometimes too technical and therefore difficult to understand. Judging from the interviews, there seems to be a lack of adequate tools to help designers overcome these issues.

5. Using eco-design tools

5.1 State of the Art

5.1.1 General information about design tools

One of the ways to help designers in their tasks related to the implementation of sustainable strategies is the use of eco-design tools, which aim to assist designers in their daily tasks. Generally they are considered very useful because they allow a structured reflection in a systematic way in order not to forget significant elements during the practice of design (Vallet et al., 2013; Byggeth and Hochschorner, 2005). Generally, eco-design tools are considered more useful for identifying a problem than for solving it (Vallet et al., 2013), but they can also be used to identify situations of compromise, between environmental aspects or between environmental aspects mixed with other criteria (Byggeth and Hochschorner, 2005). In addition, design tools can be a pedagogical support within a company or help collaborative work by defining a common objective and language (Vallet et al., 2013).

But what is an Eco-Design Tool? According to Baumann et al. (2002) quoted by Vallet et al. (2013, p.350) "*an eco-design tool stands for any systematic means for dealing with environmental issues during the product development process*". Vallet et al. (2013, p.350) complements this definition with that of Ritzen (2000) who defines design tools as "*an artifacts that support product developers with certain consideration or tasks, typically arranged in software or written guidelines*".

There are several types of design tools that can take various forms such as checklists, guidelines, frameworks, rating and ranking tools, analytical tools, software, etc. (Connor-Crabb, 2017; Vallet et al., 2013). Eco-design tools can be classified into two families, qualitative tools on the one hand and quantitative tools on the other hand (Allione et al., 2011). The qualitative tools are intended to be an aid to orient oneself in the different environmental and social criteria and to make appropriate decisions. They will give general as well as more specific informations regarding materials or, for example, manufacturing processes and suggest good practices. These qualitative tools are primarily used in the design phase. They are for example guidelines, eco-strategies, databases, material libraries, etc. (Allione et al., 2011). Quantitative tools aim to develop a quantified inventory of the social and environmental impacts of a product throughout its life cycle. The origin of these tools can be found in the Life Cycle Assessment (LCA). These tools are generally used during the definition of requirements and after the design phase during the engineering moment (Allione et al., 2011).

Quantitative methods are interesting because they allow precise and measured informed choices that could, therefore, be compared with goals set by environmental policies (Schultz, 2015). Life Cycle Thinking is a phrase used to capture the comprehensiveness of these quantitative methods which include LCA (Life Cycle Assessment), LCC (Life Cycle Cost) and S-LCA (Social Life Cycle Assessment) - which take into account the environmental, economic and social impacts of a product throughout its entire life cycle, from the extraction of the resources needed for its manufacture or use to its end of life when discarded (Lenzo et al., 2018). These methods do not explain how to do eco-design and are not intended to develop innovative solutions, but serve to assess environmental impact and highlight problems that should be taken into consideration (Lofthouse, 2006; Vallet et al., 2013; Hur and Cassidy, 2019). Among these methods, the LCA, with its broad conception of the environment (climate change, land use, water, energy, toxic emissions, eutrophication, etc.) is by far the most widespread (Roos et al., 2017). LCA is, moreover, the method favoured by the European Union. In the "EU Integrated Product policy" it is stated that the LCA is "*the best framework for assessing the potential environmental impacts of products currently available*". The EU "Ecodesign Policy" and the "European Commission Initiative for Product Environmental Footprint" are both based on LCAs (Roos et al., 2017). Quantitative tools are interesting when a detailed view of the environmental -or social in the case of S-LCAs- impact is needed. However, these tools are not appropriate for designers, as they require a large amount of data; data that often is not available during the design process and not always relevant to the product. Moreover, these tools are extremely time-consuming (Lofthouse, 2006; Allione et al., 2011; Bovea and Pérez-Belis, 2011). In summary, LCA-type tools are tools for experts, which is why they are more likely to be implemented in large companies with the necessary technical and human resources than in smaller companies (Vallet et al., 2013). The skills of an expert can also guarantee the relevance of the answers and interpretations.

Qualitative tools aimed at improvement require less expertise but risk being too general (Vallet et al., 2013). Regardless of the type, no tool can replace the human knowledge that will always be needed to evaluate results and situations where a compromise is necessary (Byggeth and Hochschorner, 2005). These qualitative tools and methods are generally quick and easy to use. They can be used early in the design process, especially when environmental properties are obvious, but these tools and methods are less reliable than quantitative methods (Bovea and Pérez-Belis, 2011). The use of guidelines, checklists and other qualitative tools is relatively widespread among designers but still limited in small firms (Kozlowski et al., 2018).

Research indicates that there are a variety of different tools developed within academia and industry, but implementation in industry is not yet strong. There appear to be several reasons for this. The tools are generally considered inadequate; be it in form,

function, level of skills needed, target audience, lack of consideration of the design culture or the fact that environmental issues are only one of a multitude of criteria to be taken into account when developing a design. In addition, there is a general lack of testing of the new tools (Vallet et al., 2013; Lofthouse, 2006; Connor-Crabb, 2017). Connor-Crabb (2017) points out in her doctoral thesis that design tools are particularly appreciated in the academic world even though they are still little used in industry. For her, this is due to the fact that design researchers are often design practitioners themselves and feel the need to produce a tangible object to synthesize their theoretical ideas. Moreover, these researchers are often teachers, and for Connor-Crabb, there is a recognition of the usefulness of these tools in the educational framework to address sustainability issues with students. She also points out that implementing the use of tools in the educational framework is useful since the use of a tool has to be learned. There is a willingness among students to learn more and without time pressure which makes it a good place to initiate the use of design tools and hope that their use in business will continue after graduation.

Selecting the right design tools should be based on the problem to be addressed but also on the skill level of the design team (Connor-Crabb, 2017). Designers are looking for advice and information on how to implement sustainability strategies and are particularly receptive to examples and other sources of inspiration and that are presented in a simple, short and punchy way (Lofthouse, 2006). Online tools have the advantage in this regard: they are often accessible and easy to update, but require more maintenance from developers and therefore require time and funding. Physical objects, such as cards, are quite popular because they can be manipulated and adapted to the situation. On the other hand, they can be easily outdated if the examples are too precise. In addition, this type of physical tool usually requires a second-source of information - website or facilitator in a workshop (Connor-Crabb, 2017).

The literature indicates what a good design tool should include. Particularly, it should be visual; as aesthetics and visual communication are paramount for designers. Design tools must be easy to use so that they can be integrated into everyday design practices. They should contain stimulating informations (Connor-Crabb, 2017; Lofthouse, 2006; Hur and Cassidy, 2019). Design tools should not be time-consuming and should promote examples relevant to the designer's practice; customization is one way to achieve this (Connor-Crabb, 2017; Lofthouse, 2006). In addition, Connor-Crabb (2017) notes other elements, she indicates that design tools must be inexpensive and pragmatic. They must be able to be integrated very early in the design process, have a multi-criteria approach to balance environmental and social criteria with traditional criteria. She also suggests that the different tools can be used in conjunction with each other to meet multiple needs. Finally, in order to have an impact, a life-cycle perspective is necessary (Connor-Crabb, 2017; Byggeth and Hochschorner, 2005).

5.1.2 Design tools in Sustainable fashion

Design tools should be able to guide the designers and help them to see an alternative course of action (Kozlowski et al., 2019). Fashion needs tools for decision making and supply chain improvement (Kozlowski et al., 2018)

Although there are a number of specific tools for fashion design (TED's Ten, Higg Index, Nike makers app, etc.), the academic literature indicates that most designers do not use design tools or are not aware of them (Connor-Crabb, 2017; Hur and Cassidy, 2019; Kozlowski et al., 2018). However, some designers do use environmental impact data to evaluate certain materials. These data would mainly come from books or websites specialized in sustainable fashion (Kozlowski et al., 2018).

A large number of design tools for fashion design have been developed by academics and this development is relatively recent. This could explain the gap between the number of tools proposed and their implementation. There seems to be a gap of knowledge about the practicalities and effectiveness of these design tools in the fashion industry (Connor-Crabb, 2017). Further, designers seem to be demanding easy-to-use and practical tools for their daily activities (Hur and Cassidy, 2019). As for non-fashion-specific tools, fashion designers seem to respond better to qualitative tools while quantitative tools are seen more suited for experts in sustainable production or value chain management in bigger organizations (Kozlowski et al., 2019).

Like non-fashion-specific design tools, Kozlowski et al. (2019) indicate that fashion design tools should not be seen separately but as part of a set of design tools where each complements the others, since each tool a emphasized different approach to sustainability. However, most of them focusing on the environmental dimension of sustainability. Kozlowski et al. (2019), in categorizing the different tools available and facilitate the choice to use one tool over another in the fashion design context, go further than the quantitative-qualitative dichotomy discussed in the previous section. They identify three categories of tools: Assessment tools - Universal tools - Participatory tools.
Assessment tools are mostly developed in industry partnerships and aim at supporting designers in the design and development process by highlighting the potential environmental impacts of the product. Participatory tools use co-design as a framework as they aim to involve the consumer in the design process. Finally, the universal tools aim at providing inspiration. They are often collections of possible strategies, methods, approaches, examples, sources of information, etc. They offer designers a great deal of freedom in terms of being able to pick and choose, but they are sometimes less explicit when it comes to explaining the "how to do".

The most persistant barrier to the use of design tools is designers' lack of awareness of their existence, but even when they are aware of these tools, it is often difficult for them to select the right tool for their practice (Kozlowski et al., 2019; Hur and Cassidy, 2019). It can be added that, in general, the tools are not precise enough to help the designers in addressing specific problems, while at the same time not being generic enough either to be inspirational. Because the current tools do not always seem to meet the needs of the industry and designers (Allione et al., 2011) and because there is no "one-solution-fits-all," there is a need to be able to customize the tools (Connor-Crabb, 2017). Existing tools for sustainable fashion seem too complex, too conceptual, require expert knowledge, are expensive, are not holistic and appear to be designed for large companies (Kozlowski et al., 2018; Kozlowski et al., 2019).

In addition, there is little information on how to 'marry the tools' and use them together. Many different approaches are presented but without helping designers choose which one would be most appropriate. At present, the tools fail to simplify and make the complexity of sustainability accessible and actionable. The use of these tools depends on the level of the designer's knowledge. However, acquiring even minimal knowledge about environmental impact, etc. -in addition to learning how to use the tool itself, takes time, and working sustainably also requires additional time in an industry where it is tight (Kozlowski et al., 2019).

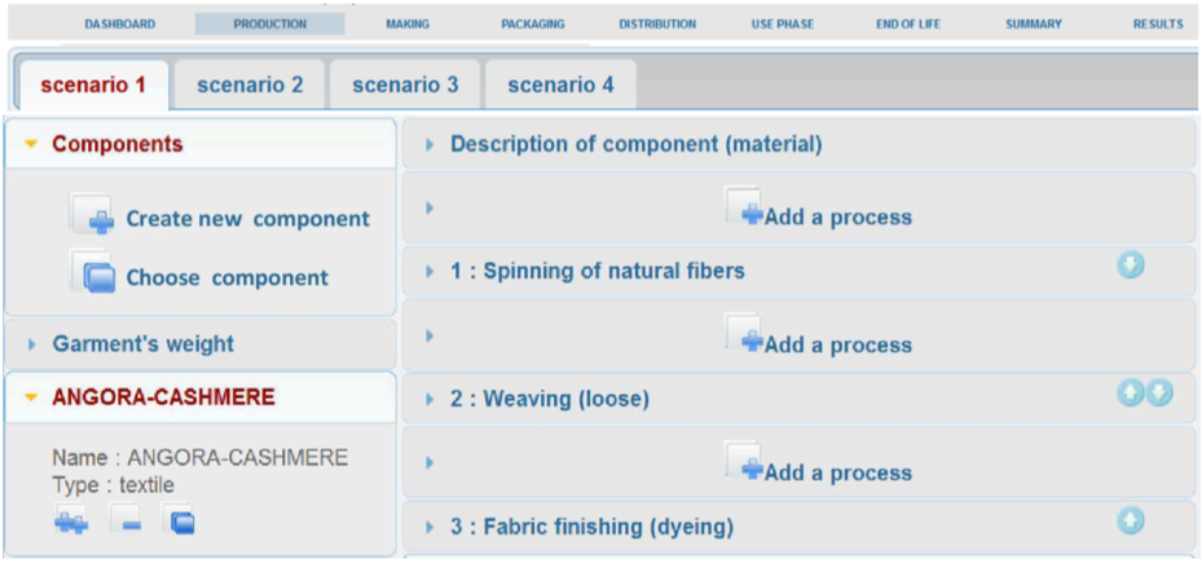
Some of these tools, more specifically assessment tools, are particularly complex and technical and therefore do not speak to designers (Kozlowski et al., 2019). In addition, the complexity of the value chain in the fashion industry is such that many assumptions and simplifications have to be made in environmental assessment calculations, so the result is never an accurate reflection of reality (Roos et al., 2017). Universal and Participatory tools are generally developed within academic projects, developed for small companies, at little or no cost. However, they regularly suffer from a lack of funding and updates (Kozlowski et al., 2019). Further, many of these tools are developed to be used in workshops with a facilitator, which allows for taking the participants' level of knowledge and context into greater consideration. As a result, this type of tools are more adaptable. There is a difficulty in quantifying the effects of using these tools. Which leaves in the literature the unanswered rhethorical questions: how to measure the interest produced by a workshop or more generally by a tool? How do we know that the use of tools transforms the practices of fashion designers? (Connor-Crabb, 2017).

In addition to the above-mentioned elements of what makes a good tool, we can add a few more elements. A good tool must be discipline-specific, the examples need to be relevant (Connor-Crabb, 2017). It must provide practical solutions, it should be able to be integrated into the creative process and stimulate innovation (Hur and Cassidy, 2019). A good tool must act at the transformative level and participate in a transition from the

unsustainable model of the industry to a sustainable model (Kozlowski et al., 2019). A good tool have to establish and clearly communicate its optimal context of use and its limitations (Kozlowski et al., 2019; Connor-Crabb, 2017).

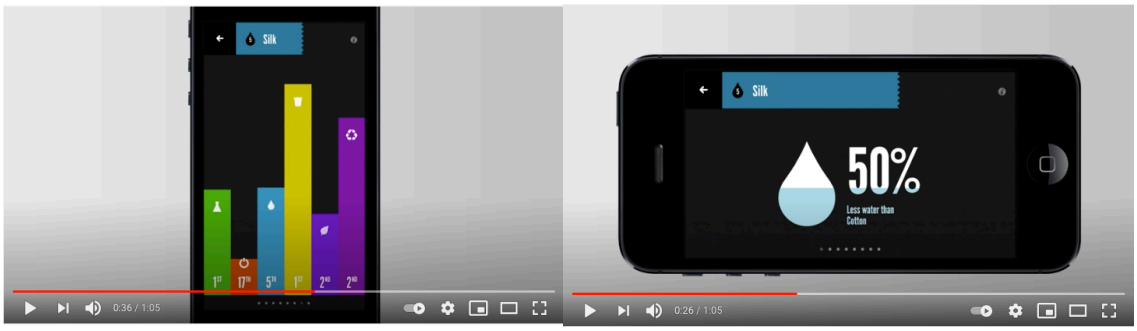
Before exploring in more detail two of these tools – TED's Ten and the Higg Materials Sustainability Index (Higg MSI), which has been chosen because they are fundamentally different in form, purpose, funding, etc.- I propose to discover a few more examples from the academic literature. This list is not exhaustive. Okaïdi, as part of a project to make public the environmental impact of its products, used the *Spin'It* tool to conduct an environmental assessment (Mareels and Steffan, 2019). Spin'it calculates the environmental impact using three indicators: CO_2, water consumption and eutrophication. According to Okaïdi, the advantages of this tool are that it covers the entire life cycle of the product, is ergonomic, covers the major product families, and makes it possible to model several scenarios. On the other hand, it has the disadvantage of not having indicators relevant for certain essential aspects in fashion, such as chemicals. In addition, the coverage of water consumption is only partial and some data cannot be modified to reflect the reality of garment production as transportation.

Image 2. Spin'It dashboard (Cycleco, 2020)



Another example is *MAKING*, which is an app from Nike made in collaboration with the London College of Fashion. It is an assessment tool with the goal is to create more sustainable products through the choice of materials. The app classifies materials according to four impact areas: water, chemistry, energy, waste (GFA and BCG, 2018).

Image 3. The MAKING app (Nike, 2013)



A third example is the universal tool *reDesign Canvas* which also seeks to facilitate a transition to sustainable fashion. It targets design-entrepreneurs by promoting an innovative business model and proposing strategies that engage consumers. The reDesign Canvas, is largely inspired by Osterwalder's Business Model Canvas which can be used to describe how a business can create, deliver and capture value. The basic building blocks of Osterwalder's Business Model Canvas are: key activities, key resources, partner network, value propositions, customer segments, channels, customer relationship, cost structure and revenue streams. In the reDesign Canvas, the business model becomes one of the blocks in itself, the tool also adapts the consumer-related blocks and the other four blocks are relevant elements in the designers work such as sourcing, concept, supply chain and design & material selection. On top of those blocks, a last block, acting as a frame, identifies the different stakeholders. Both canvases define a set of building blocks with different components which are questions that have to be answered by the designer-entrepreneur in order to build the product or company. Those blocks help to visualize in a simple, efficient and dynamic way all components of a new or existing sustainable brand. The format of the reDesign Canvas is a large poster where people are encouraged to draw and write notes on it (Kozlowski et al., 2018). See Image 4.

Fourth, *The Considerate Design Tool* is a qualitative, accessible, self-guided and self-evaluating assessment tool to assess the sustainability impact of a proposed design. It has the form of a spider diagram that visualizes impacts and opportunities and helps to consider tradeoffs (Connor-Crabb, 2017). See Image 5.

Finally, the participatory tool *Ideation Toolkit* aims to encourage sustainable fashion and sustainable consumption by facilitating co-design workshops (Connor-Crabb, 2017). See Image 6

Image 4. The reDesign Canvas (Kozlowski et al., 2018).

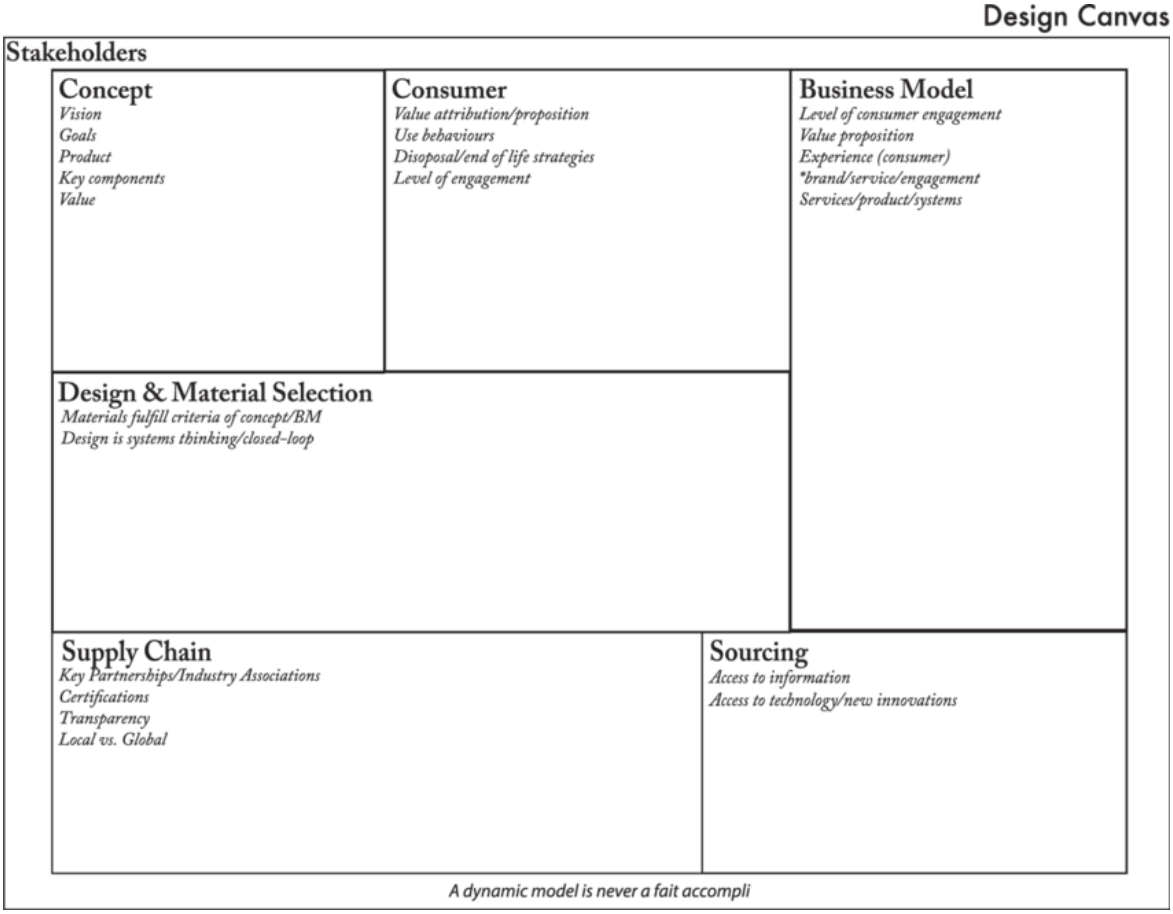


Image 5. The Considerate Design Tool (Connor-Crabb, 2017).

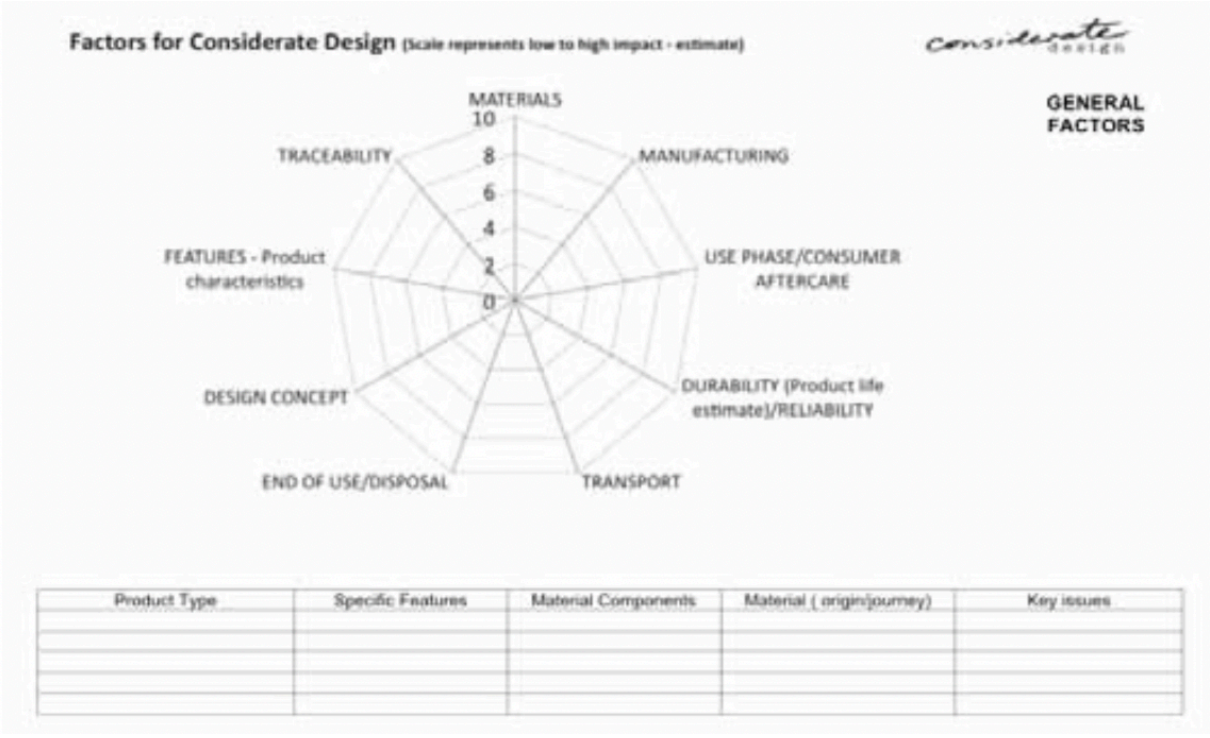


Image 6. Ideation Toolkit (Connor-Crabb, 2017).

5.1.3 Commonly cited tools

To continue this tools presentation, the two tools presented here in more details were chosen for different reasons. They are fundamentally different in form, purpose and funding, etc. The Higg Index, and more specifically the Higg Material Sustainability Index (Higg MSI), is a well-known assessment tool within the industry. That is why it was chosen to exemplify quantitative tools. The other tool, TED's Ten is a qualitative tool. It was chosen because it was developed and is used by the Textile Environment Design (TED) research group specialized in sustainable fashion. This group is prolific in academic articles analyzing its use and I have been led to find this tool regularly in my readings.

Higg Index

The Higg Index is a series of tools, each of which is designed to calculate different aspects of the value chain and is intended to be the most transparent, comprehensive and representative tool in the industry (GFA and BCG, 2018; Higg Index, 2020 A). The Higg Index is a self-assessment tool for facilities and products to calculate both the environmental and the social impact (Roos et al., 2017; GFA and BCG, 2018). It is an initiative of the Sustainable Apparel Coalition (Roos et al., 2017) from which the Higg Index has evolved into a for-profit tech company (Wicker, 2020 B). The Higg Index

covers the needs of the majority of large companies and is extending to small and medium organizations (GFA and BCG, 2018).

It includes 3 modules:

- Brand & Retail tools that assess the performance of operations - social impact, transparency, collaboration with facilities, etc.
- Facility tools - *Higg Facility environmental module* and the *Higg Facility Social & Labor module* - which assesses the environmental and social impact of manufacturing facilities.
- Product tools - *Higg Materials Sustainability Index* and the *Higg product module* - which assesses the environmental impact of apparel, footwear and textile products in order to optimize the choice of materials according to their sustainability.

Plus specifically, the Higg Material Sustainability Index was created to answer the simple question "*What materials have the smallest negative impact on the environment?* " (Wicker, 2020 B). The aim is to measure the potential impact that a product, material or production could have in the textile industry and thus identify opportunities for improvement; in a word to make informed decisions (GFA and BCG, 2018; Cao et al., 2015). This tool is intended for brands, retailers, production facilities, etc. of different sizes and no matter where they are in their process to achieve a sustainable fashion business (GFA and BCG, 2018). The Higg Index also aims to produce a label for the consumer (Roos et al., 2017). The very first version of the Higg MSI (Higg Index 1.0) was based on the Nike Materials Sustainable Index. This first version focused on the environmental issues of products, facilities and brands. The second version, Higg Index 2.0, integrated social and labor issues (Cao et al., 2015).

The Higg MSI is LCA-based, it calculates the average impact of one kilogram of material within five impact areas: Greenhouse gases, water efficiency, eutrophication, fossil abiotic depletion and chemistry. It considers only the way the material is produced, not its sustainability over time, how is it taken care of, nor the link with plastic pollution or end of life (Wicker, 2020 B). This is what is called a "cradle to gate" assessment tool – it focuses on the impact of the raw material to the factory gate where the material is finished. For synthetic textiles the raw material is the pellets and for natural materials it is the fiber itself (Higg Index, 2020 B). After experimentation on the tool, I note however that the Higg MSI seems to take into account the water used to water the cotton, linen, etc. plants.

The Higg MSI uses data from the GaBI database as well as data from literature, manufacturers and trade organizations as data for the assessment. Based on these data, mid-score points are calculated which create a unit of common measurements that can

be added together to give a total score for each material (Higg Index, 2020 B). The Higg MSI is updated twice a year (Higg Index, 2020 B). The methodologies used are methodologies that meet scientific consensus. For example, there is no scientific consensus on how to calculate the environmental impact of microplastics in textiles so it is not taken in account in the score of materials (Higg Index, 2020 B; Wicker, 2020 B). The Higg Index is largely inspired by LCA standards. For example, the biogenic carbon (the carbon that is sequestered in the biomass when plants grow) is calculated separately and is not integrated in the calculation of the final score of each material because in LCA this is not the standard method (Higg Index, 2020 B).

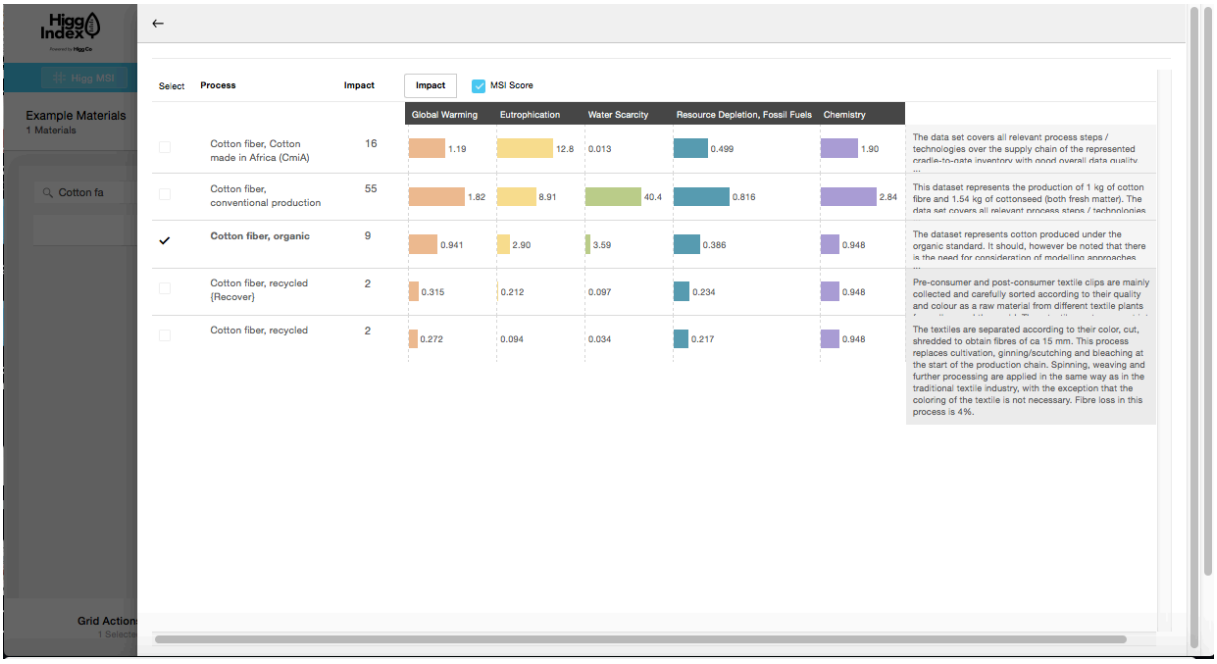
As other quantitative tools, the Higg MSI is quite technical and when observing the case studies of Higg Index's use presented on the Sustainable Apparel Coalition website, it does not seem to be used by designers directly. Indeed, the case studies are developed by sustainability and material managers from the companies studied. Among these study cases, the vast majority of the cases presented are manufacturing facilities and not products and brands (SAC, 2020).

The Higg MSI has its limits which are also often controversial points. An article by Wicker in Ecocult (2020 B) has taken stock of the current debate (as it stands at the end of 2020) about the Higg MSI. The first limitation is that comparing materials that have different functionalities and performances does not make much sense. The Higg Index's organisation encourages to choose the most suitable material for the product and then to find the best version of this material thanks to the Higg MSI.

One of the most challenging limitations of the Higg MSI is that it does not take into account oil extraction in the calculation of the environmental impact of synthetic materials. Another limitation to note is that in the case of natural materials, some data may vary drastically from one farm to another, from one region to another, or depending on the level of precipitation. As a result, the score for natural materials is imprecise. It is also unfortunate that the Higg MSI does not foresee the possibility of regenerative agriculture, which has an immense positive potential for climate change. Furthermore, the Higg MSI does not consider the social impact of materials. For example, the alpaca and silk farms that score very poorly are mostly owned by low-income families and are a family tradition. Finally, one of the major controversies is related to the score given to natural fibers which are presented as particularly impacting. According to the Higg MSI, eight of the ten worst materials are natural while the ten best are synthetic. This classification of fibers seems counter-intuitive for most people. The global average system favours industrially manufactured standardised fibres to the detriment of materials whose production method may be more fluctuating. In a way, says Wicker (2020 B), the Higg MSI keeps us in the status quo of a dependence on polluting fossil fuels. Faced with these criticisms, in November 2020, the Higg Index announced the

withdrawal of the single cumulative score for each material. They also announced that the updated version of the Higg MSI for the spring of 2021 will include the use-phase, the end-of-life and the social impact (Wicker, 2020 B).

Image 7. Cotton assessment on the Higg MSI tools (Higg Index, 2020)



TED's Ten

TED's Ten is a qualitative tool that aims to inspire designers. It is the tangible result of research conducted by the TED (Textile Environment Design) research group at Chelsea College of Art (Connor-Crabb, 2017; Politowicz and Earley, 2013). It was conceived as a tool to instigate change among designers as well as to analyze situations and facilitate workshops (Politowicz and Earley, 2013).

The tool consists of a series of cards that present ten strategies, each explained by a short description and a few examples. The ten strategies are separated between "soft" -conceptual, philosophical, systemic, etc.- and "hard" -eco-efficient materials, dye, construction, technology, etc. (Kozlowski et al., 2018; Connor-Crabb, 2017). This tool evolves and is regularly updated because it receives regular funding and is promoted by a team, so the responsibility for updating it does not rely on an individual (Connor-Crabb, 2017).

TED's Ten is designed to stimulate action and reflection. It is seen as a checklist or a lens through which to see problems (Politowicz and Earley, 2013). The wording is generic so as not to become obsolete too quickly and the information on the cards is minimal, more information can be found through the workshop facilitator or on the TED website. TED's

Ten is often just a pretext for or a discussion activator (Connor-Crabb, 2017). It allows designers to map the topic of sustainability in fashion in order to identify barriers to environmental and social improvement and propose strategies to address them. The "cards" format is a tangible representation of these different strategies (Politowicz and Earley, 2013). Connor-Crabb (2017) notes that small organizations are more often excited by "soft strategies" while large companies are more interested in "hard strategies" that allow them to create a large impact with small changes. The limitation of this type of tool and of the workshop is to quantify changes in mentality and leave with the rhethorical question: how can we be sure that changes occur and in what proportions (Connor-Crabb, 2017)?

Image 8. TED's Ten cards (Connor-Crabb, 2017)

5.2 Field Perspective

When working on their designs designers use different tools. The most widely shared and used tool among interviewed designers is the *Adobe suite* (Illustrator, Photoshop, Indesign, etc.) allowing the designers, among other things, to draw and visualize ideas and technical sketches digitally (Saint Laurent; N'go; Adidas). Others, as Okaïdi, work with *trend agencies* that help the creative processes of designers by developing pre-made moodboards of themes, colors ranges, etc.

When asked about their knowledge of sustainability-focused design tools, the designers had very different responses. Some say they are not aware of eco-design tools (Luxtra; N'go; Adidas B; Balzac). Others, as Organic Basics' and Infantium Victoria's designers, know about some of tools but do not use them, because they either feel that they do not know them in depth enough to use them properly (Organic Basics) or because they feel tools such as Ideo Cards or Design Toolkit are too general and do not provide new knowledge (Infantium Victoria). Nevertheless, in the course of the interviews, it became clear that the designers do use or were interested in some sustainability related design tools. They are mostly qualitative tools to help with the materials choice. Many of these tools have not been identified in the literature review.

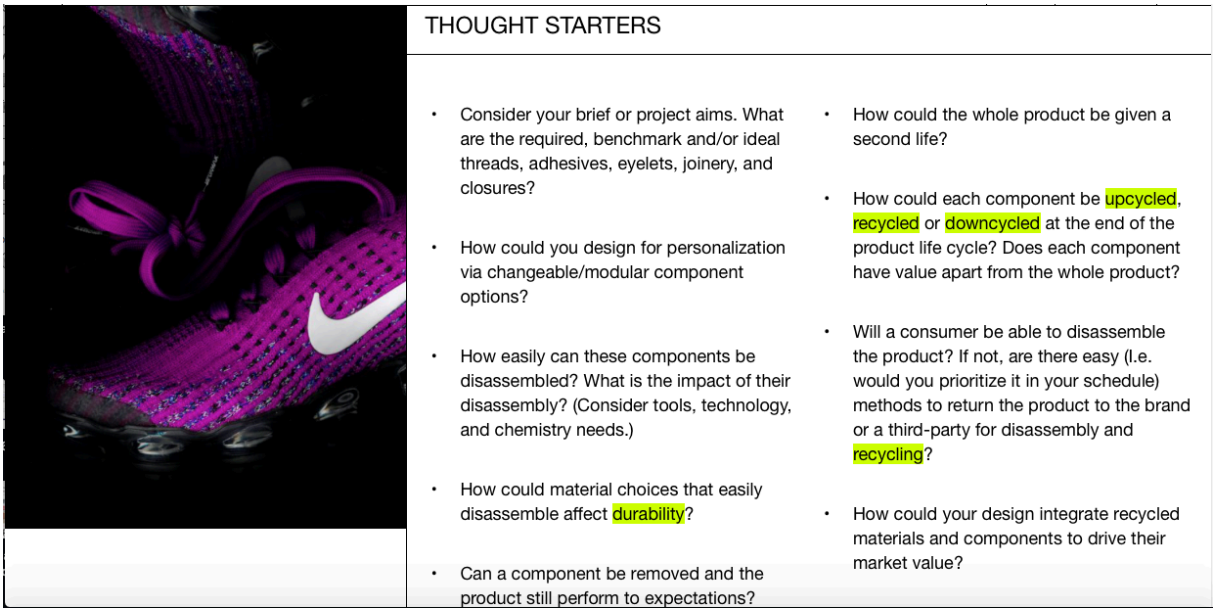
Unfortunately, the designers did not provide in-depth descriptions of what they think about these tools or of how they use them, which precludes a detailed analysis of how these tools affect their practices. Based on their responses it is, however, possible to see that they use a variety of tools to improve their knowledgeability and competences within sustainable design, particularly with regard to making informed choices of fibers and chemicals, i.e. about the materiality of the design.

Regarding the use of the *Higg MSI tool*, the three designers familiar with the tool all have different opinions about it. For example, Luxtra's designer has used it to assess the impact of leather. She found it "*helpful*" and even "*fabulous*", but, nevertheless, does not use it on a regular basis. At Organic Basics, its potential use has been and still is the subject of an ongoing conversation within the company, but other things need to be prioritized. Finally, Infantium Victoria 's designer does not agree at all with the Higg MSI calculation method.

Some of the designers work with *guideline* tools which is, as the name indicates, a written guide either for the design process or for the material choice. The designers at Adidas were interested in this kind of tools, especially the one from Nike (Nike Circular Design Guide, not presented in the literature review but consisting of different lists of questions related to the design of sustainable products that designers should answer (Nike, 2020)). Adidas' designer manager, having previously worked at Nike, found it very good. She is, moreover, quite sure that Adidas also has this type of guideline but it is not used by her team. See Image 9.

At Infantium Victoria, an internal guideline has been developed and is re-evaluated every 6 months. Organic Basics' designer points out that in his team a formalized guideline is not necessary given the small size of the team and the fact that all employees are aware of their criteria, the company's objectives and the questions for which there are not yet satisfactory answers.

Image 9. Nike Circular Design Guide, page on the disassembly principle (Nike, 2020)

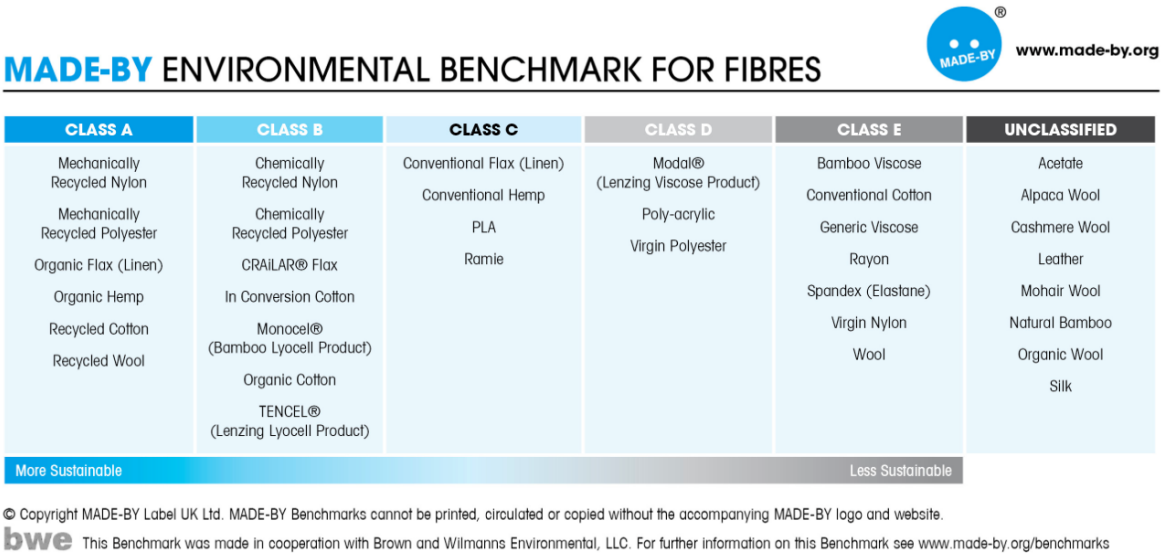


THOUGHT STARTERS

- Consider your brief or project aims. What are the required, benchmark and/or ideal threads, adhesives, eyelets, joinery, and closures?
- How could you design for personalization via changeable/modular component options?
- How easily can these components be disassembled? What is the impact of their disassembly? (Consider tools, technology, and chemistry needs.)
- How could material choices that easily disassemble affect durability?
- Can a component be removed and the product still perform to expectations?
- How could the whole product be given a second life?
- How could each component be upcycled, recycled or downcycled at the end of the product life cycle? Does each component have value apart from the whole product?
- Will a consumer be able to disassemble the product? If not, are there easy (I.e. would you prioritize it in your schedule) methods to return the product to the brand or a third-party for disassembly and recycling?
- How could your design integrate recycled materials and components to drive their market value?

The *Made-By Environmental Benchmark for Fibres* tool which offers a guideline in form of a classification of preferred fibers is used at Luxtra.

Image 10. Made-by Made-By Environmental Benchmark for Fibres (Common Objective, 2018)



MADE-BY ENVIRONMENTAL BENCHMARK FOR FIBRES

MADE-BY® www.made-by.org

CLASS A	CLASS B	CLASS C	CLASS D	CLASS E	UNCLASSIFIED
Mechanically Recycled Nylon	Chemically Recycled Nylon	Conventional Flax (Linen)	Modal® (Lenzing Viscose Product)	Bamboo Viscose	Acetate
Mechanically Recycled Polyester	Chemically Recycled Polyester	Conventional Hemp	Poly-acrylic	Conventional Cotton	Alpaca Wool
Organic Flax (Linen)	CRAiLAR® Flax	PLA	Virgin Polyester	Generic Viscose	Cashmere Wool
Organic Hemp	In Conversion Cotton	Ramie		Rayon	Leather
Recycled Cotton	Monocel® (Bamboo Lyocell Product)			Spandex (Elastane)	Mohair Wool
Recycled Wool	Organic Cotton			Virgin Nylon	Natural Bamboo
	TENCEL® (Lenzing Lyocell Product)			Wool	Organic Wool
					Silk

More Sustainable — Less Sustainable

bwe This Benchmark was made in cooperation with Brown and Wilmanns Environmental, LLC. For further information on this Benchmark see www.made-by.org/benchmarks

In keeping with tools that are positive/negative lists, at Infantium Victoria they are working from a Cradle to Cradle (C2C) perspective, therefore, they use the *C2C positive impact list*, which lists chemicals that are positive for the planet, when selecting chemicals and materials. Although they are not committed to a C2C perspective but finding the chemicals' question particularly complicated to navigate in, Organic Basics wants to develop a tool that helps them make decisions regarding the choice of

chemicals. However, they need time and financial means to be able to make this project succeed.

Another kind of tool is the *materials libraries* as used by Adidas and Okaïdi. Adidas has developed their own library of usable materials that have been identified as good by the company's sustainability team and the design direction team. However this library focuses strongly on materials for footwear, Adidas' accessories designer regrets that the library is not as well supplied and verified when it comes to materials for accessories as it is for footwear. At Okaïdi, they do not own a material library themself but frequently visit external material libraries and showrooms.

Only one of the compagnies use a quantitative tool, it is N'Go. They use the *Impact'Track* tool, which is a social impact measurement tool. N'go uses it to evaluate their humanitarian work, in particular they work on improving the lives of artisans and schools (measures schooling and literacy rates). They emphasized that a third party collects the data in order to be objective.

5.3 Design tools - At a glance

As for the chapter 4, this subchapter will highlight the key aspects of both previous subchapters.

There are different design tools for different environmental and social objectives and strategies. The design tools assist designers in their daily tasks, because they enable systematized reflection, which can help designers identify problem areas and compromise situations. They can be used as a pedagogical support and as an aid to collaborative work.

Eco-design tools can be divided into two main types: qualitative and quantitative tools. Qualitative tools aim to guide designers with regard to different environmental and social criteria. They are quite popular because they are simple, quick and can be used from the very beginning of the design phase. However, they can also be perceived as very generalist. Quantitative tools aim to evaluate the environmental or social impact of a product in a quantified way. They are therefore seen as particularly reliable, especially when they operate from a life cycle perspective. But, these tools are seen as not very appropriate for designers because they require a large amount of data that is sometimes not very accessible and are, on the other hand, quite technical. They are therefore more tools for experts, production, supply chain managers of large companies with the necessary human, time and financial resources.

There are a number of qualitative and quantitative tools developed specifically for improving the sustainability of the fashion industry. These tools are often developed by academics, and sometimes by the industry. Unfortunately, the majority of these tools are not widely known among designers and are, therefore, put to little use. The reason given in the literature for this lack of implementation is the inadequacy of the available tools, both in terms of form, function, level of knowledge required, and their incompatibility with the designers' culture, etc. This 'mismatch' is probably due to a lack of testing. The literature emphasized also that tools can be time-consuming to learn, understand and use. The insight from the interviews conducted show that the tools used are more qualitative tools and seem to be more add-ons than daily aids, with the exception of the Adobe suite, the guidelines and the Adidas' materials library. Designers seem to use more their knowledge and encounters to generate new creative or sustainable ideas and think about the implementation of sustainability than eco-design tools. Nevertheless, there is a recurrent theme in the literature and interviews – designers are asking for information and advice on sustainability issues and a better eco-design tool could answer this demand.

Designers seem particularly receptive to examples, case studies and inspirations. A good tool should, therefore, provide information in a simple, short and punchy way and it should be regularly updated. This requires a continuous budget. Special attention must be paid to the visual aspects of the tool. Also, the tool has to be easy to use so it can be integrated into the daily practice of designers, i.e by stimulating, by including relevant examples and proposing practical solutions. Also, it should be based on a life cycle perspective, integrate several criteria and be inexpensive. A possibility of customization is welcomed, its optimal context of use must be explained and training for designers must be provided. Also, given that most of the tools are currently developed by and/or for large companies, developing a tool aimed at small companies would be relevant. Furthermore, following insights from the literature, the possibility of combining tools appears particularly interesting.

6. A new tool proposition

The literature review and my research has shown that designers need help to be able to implement sustainability strategies. This help could materialize in the form of a yet another design tool. However, it has been found that current tools are not used by designers on a daily basis. A new proposal for a qualitative, universal tool is formulated here in the form of a digital platform designed to provide help for the implementation of sustainable strategies through example, inspiration and pre-made research. This tool is presented in this chapter.

Designers attribute great meaning to creative freedom and aesthetics. It can be a challenge to reconcile these elements with the goal of sustainability. The platform aims at simplifying the sustainability vision for designers, helping them to pick their battles and navigate the sustainability forest. It is important to respond positively to the commitment to work with sustainability while addressing the feelings of loneliness, overwhelmingness and energy-consuming work that designers can sometimes experience.

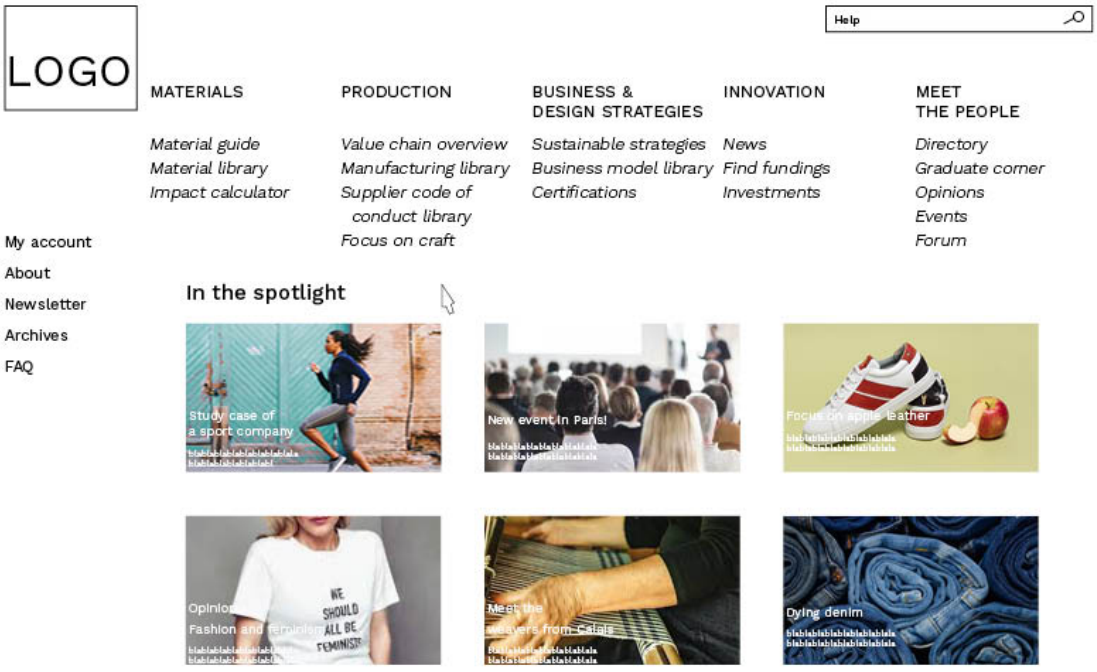
Fashion designers also say that the mindset of their profession, and even more so in the context of sustainable fashion design, is to be in constant search of creativity and innovation. And this entails, notably, questioning everything, all the time. The platform aims to foster this innovation by firstly, challenging designers; secondly, exemplifying the possibilities; thirdly, making information accessible, as, for instance, was the case with the implementation of Nutriscore in the food industry that led manufacturers to improve the quality of the food offered on the market (Test-achat, 2019); and fourthly, encouraging collaboration within the industry. Furthermore, the platform also aims to better integrate social sustainability as a factor of innovation by including it as an essential element in the proposals made on the platform. The platform will take into account the material issues that are prevalent in the design and fashion industry. However, it will be a question of moving away from the all too widespread idea that sustainability is only a question of choice of materials.

The competences necessary for the practice of sustainable fashion design are acquired empirically through processes of experimentation and investigation that can sometimes prove to be laborious. In this context, the platform is interesting because it facilitates the process of acquiring new competences and provides solutions to the problems encountered. Firstly, the proposed platform seeks to provide answers, in a diversified way, to questions such as “how to do and where to start?”. Secondly, the opacity of the industry does not always allow designers, but also developers or production managers, to make informed decisions. Thus, the platform's objectives are to make information accessible, to facilitate informed decision-making and to designers having to avoid

reinventing the wheel each time. This is accomplished by centralizing the necessary information. Thirdly, given that designers cite time as a major challenge for the implementation of sustainability in practice, the platform aims to save time and facilitate work by spoon feeding it. Fourthly, the platform will enable the learning of new competences and knowledge related to sustainability. Fifthly, designers' competences will also be enriched through bridges with academic research on fashion and sustainability issues provided by the platforme. Sixthly, the platform will encourage collaborative work within the industry through the possibilities for exchanging information and building a network for sustainable fashion designers. Finally, it will build on the inspiration factor that is extremely present in the practice of fashion designers to create change by exemplifying possible solutions as much as possible.

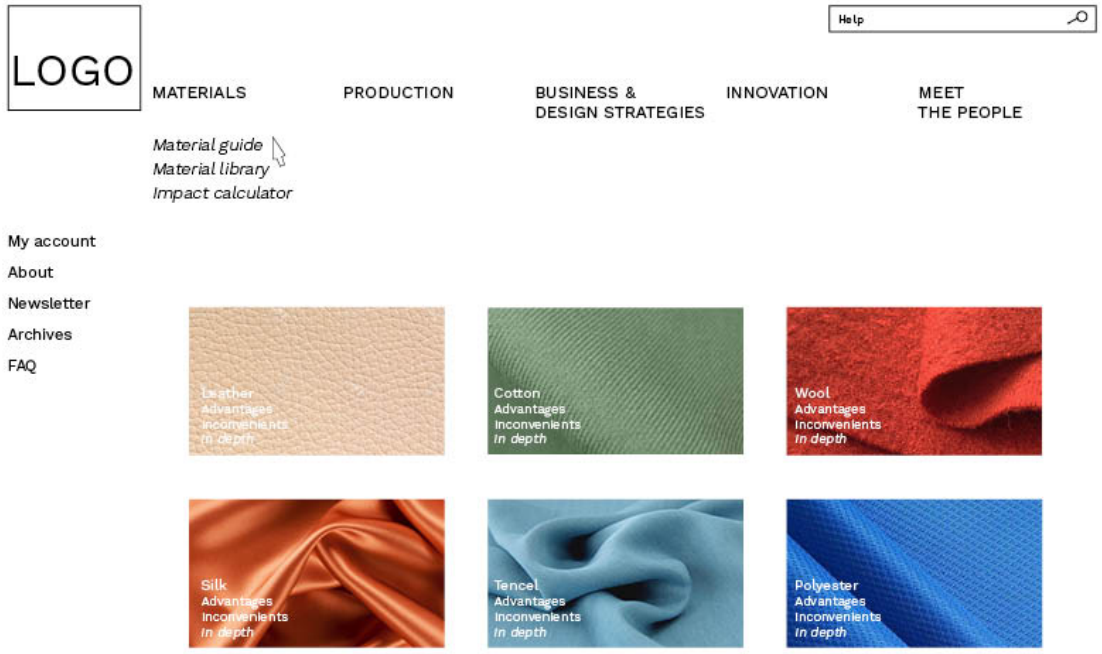
Concretely, the digital platform offers a 360° vision of sustainability questions in fashion through materials, production, business & design strategies, innovation and encounters. The platform has these topics as headlines menus, each with a number of subcategories. A strong emphasis is put on concrete examples and study cases for each of these sections. The three pillars of sustainability - environmental, social and profit – are also addressed.

Image 11. Dashboard of the platform – Project



The first menu's category is *"**Materials**"*. It comprises several subcategories, the first of which takes the form of a *Material Guide*, which provides a general understanding of the advantages and disadvantages of the most common material -as, for instance coton, wool, viscose, etc.- in terms of optimal use and general environmental and social impact so that informed decisions can be made. This category will also present material alternatives as peace silk instead of silk.

Image 12. Material guide – Project



Next, a detailed *Material Library* will be proposed. Each material presented will include as much information as possible: composition, contact information, price, minimal order quantity and the possibility or not to have group purchased, technical information including some solidity test, certifications, environmental impact - LCA inspired, social impact - S-LCA inspired, material's production chain transparency including detailed information of the production place, use criterias on wash and feel on the body for example and the End-of-life. A rating system will have to be set up in order to make the comparison between different materials possible. A search tool will be available to navigate through the library. The search can be done on the basis of different criteria such as material, color, country of production, optimal use, certification, weight of the textile, etc. The library will present fabrics but also supplies such as zips, buttons or pocket lining, finishes, dyes, etc. The construction of a physical library could be a complementary option to the digital version. See Image 13. Finally, the last subcategory is an *Impact Calculator* that calculates the environmental and social impact of the product based on information from the materials library. See Image 14.

Image 13. Material Library - Project

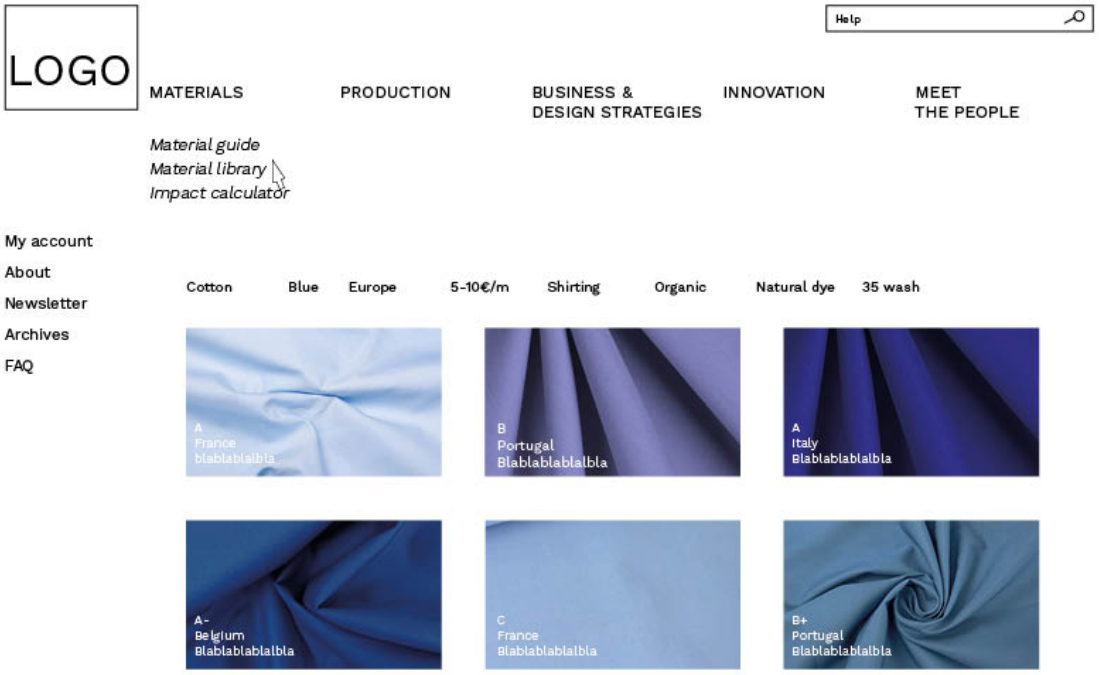
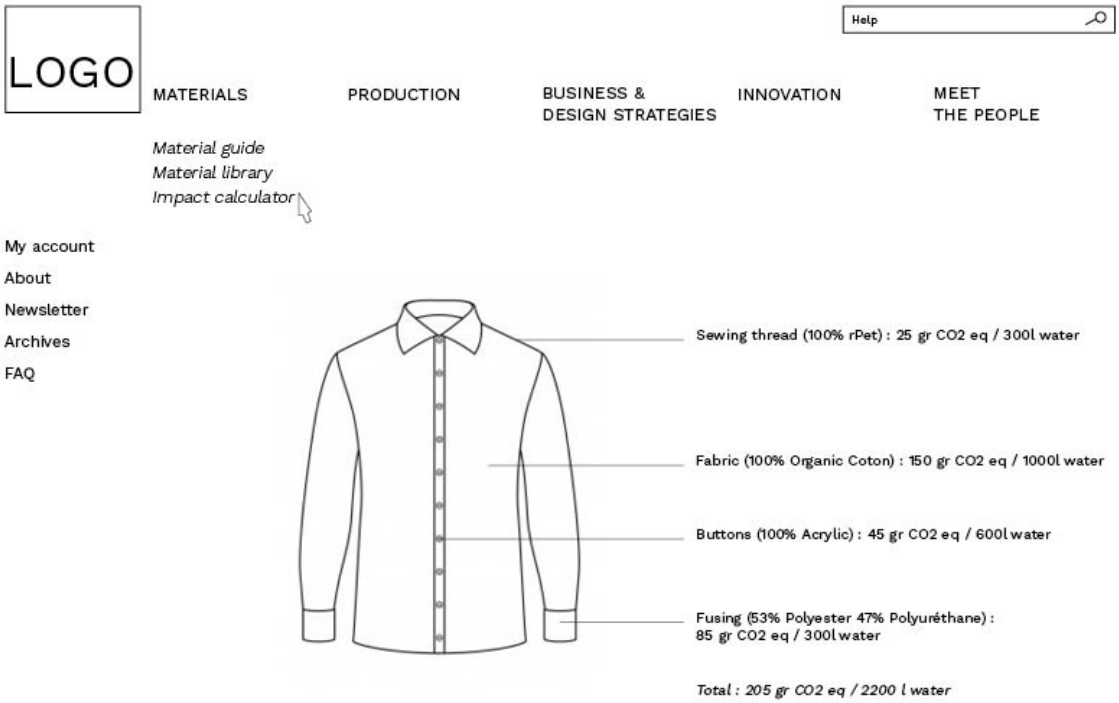
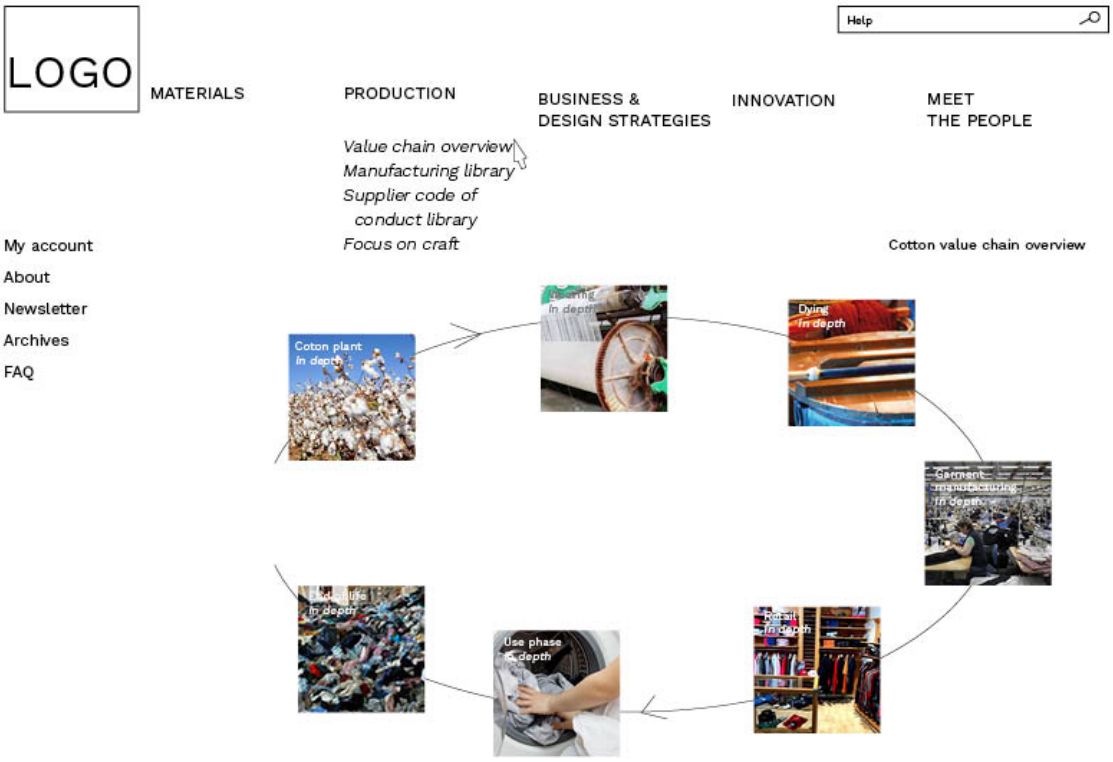


Image 14. Impact calculator – Project



The second Menu's category is ***"Production"*** which also includes several subcategories. It will include a *Value Chain Overview,* which will aim to present the typical value chain of a garment and for each step will identify the various problems related to it. This will allow designers and other members of the industry to understand the issues in stake and can be able to pick their battles. A single person cannot act on every issue but by knowing the sustainability issues of the fashion industry, members would be able to decide on which one they can act or not or acquire specific competences to act on it. Again, there is a desire to enable designers to make informed choices.

Image 15. Value Chain Overview – Project



The next subcategory is a *Manufacturing Library* which is divided into two parts. The first part provides detailed information about each producer of the garments and accessories presented. The information will be their location, certification, number of employees, salaries and social protection in place, type of product that can be produced in their facilities, presence or not of renewable energy, etc. The second part is a presentation of various, contemporary or older, production techniques such as 3D-knit, textile recycling, ozone washing, the production of shoulder pads at the beginning of the twentieth century, etc. The idea of this section is also to propose concrete examples of alternative processes in terms of dyeing, finishing, textile printing, etc. The third subcategory is a *Supplier Code of Conduct Library* which is composed of concrete and real examples of supplier code of conduct but also of study cases presenting alternative

strategies to manage the human side of the supply chain. The last subcategory is a *Focus on Crafts,* European and non-European. This will promote cultural and ancestral techniques while limiting the risk of cultural appropriation. Thus each technique will be presented visually and its symbolism and history will be explained. The contact of these craftspeople will be available. The respect and preservation of cultures is one of the elements of social sustainability. Also the issue of cultural appropriation is an important question among fashion designers, this section, therefore, aims to answer it.

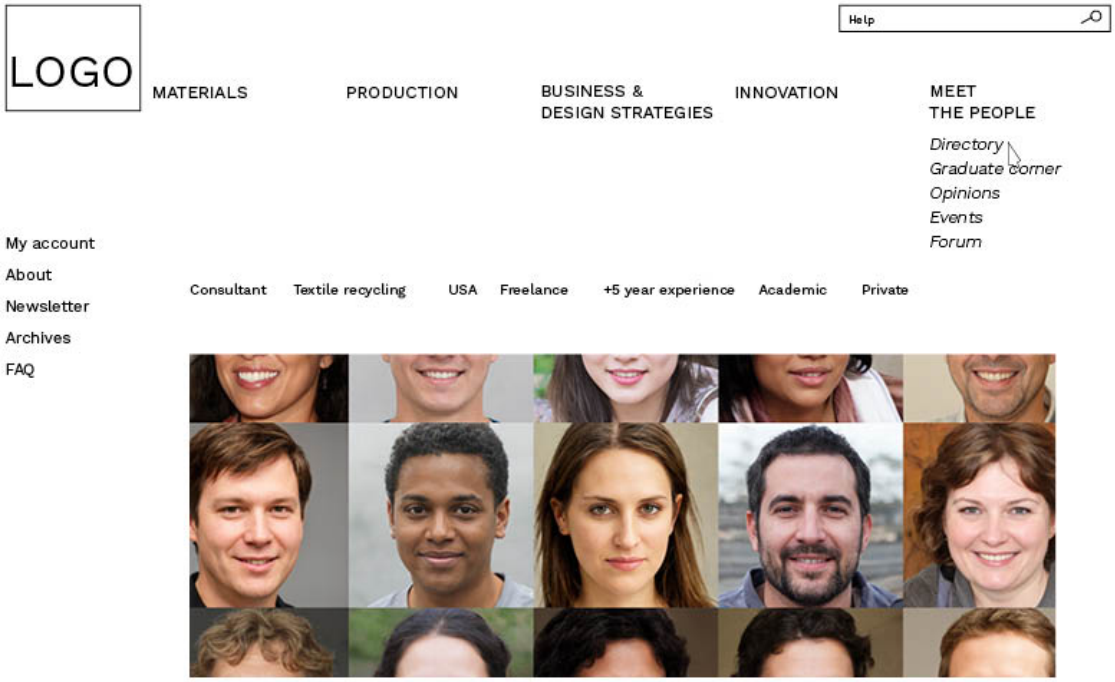
The third menu's category is ***"Business and Design Strategies"*** which will first present the different possible *Sustainable Strategies*. Business related strategies such as circular economy or design strategies such as design for deconstruction, design for recycling, design for long-lasting products, etc. will be presented. These different possible strategies will be explained from a more theoretical angle and through study cases in order to allow to navigate through the jungle of sustainability and to choose the most appropriate strategy for the specific business. Then, a *Business Model Library* will propose examples of different possible sustainable business models. The goal here is to document that companies can achieve sustainability by moving away from a business model exclusively focused on growth and to also inspire young designer-entrepreneurs in the commercial construction of their brand. Finally, a guide to the *Certifications* will be available in order to understand precisely the purpose of each certification, their criteria, their limits, etc. But also to guide designers in the choice to have their products certified or not.

The fourth menu's category is ***"Innovation"***, which aims to inspire and inform by providing information on the latest innovations under development in the form of *News*. These news will come both from the private entrepreneurial world as well as from the academic world. A synthesis of academic research on issues of sustainability, use of garment, materials etc. is needed to build bridges with industry. These bridges are important in order to be able to disseminate scientific research and thus verified and reliable information more widely in society. Another section will explain *How to Find Funding* in order to inform designers and innovators about the different financing possibilities, public or private, available to them when starting an entrepreneurial project. The last subcategory is *Investment* which will connect start-ups and researchers but also craftspeople or farmers looking for funding to start or transform their business with investors looking to invest in projects to transform the fashion industry towards sustainability.

The last menu's category is ***"Meet the people"*** which aims to foster collaboration and exchange of ideas in the fashion industry. The first subcategory is a *Directory* of consultants and experts in their respective fields such as recycling, agriculture, finance, LCA or chemistry. The goal is that designers looking to get in touch with consultants in

a specific field can quickly find them based on criteria such as area of expertise, country of work, nature of the contract, experience, etc.

Image 16. Directory – Project



The second subcategory is the *Graduate Corner*. The idea is to present young graduates in a field related to fashion and sustainability entering the job market. The CV, a presentation and their research would be available. This space would be divided between designers, engineers, business, etc. The third part of this category is an *Opinions* section that invites specialists in their field to discuss in blog posts substantive topics related to fashion and sustainability such as "feminism and fashion" or "cultural appropriation in fashion". The aim of this section is to bring fashion and sustainability to life in a more reflective and philosophical way. Fourthly, physical *Events* could take place in order to get out of the digital world and make a network live. This request has been expressed several times during the interviews, designers feel the need to not only exchange through a digital platform but also to attend conferences and meeting places. Finally, the last subsection would be a *Forum*-type discussion place where platform users could interact. This discussion space, this social network was also requested by several designers during the presentation of the project in the interviews. It would allow the exchange of information, networking, discussion of ideas and also, for example, the group purchase of certain products.

In addition to these five categories, an *About* section will transparently present the platform, the company's vision and the team. A *newsletter* will be developed to announce news, new articles and maintain a link between users and the platform. A *FAQ* and personalized assistance will be proposed to accompany users in the use of the tool. Finally, the *Archives* of the platform will be preserved and made accessible in order to keep track of the evolution of the industry and to evaluate the progress made. The notion of archive being important for fashion designers, it seemed important to meet this need also on this digital platform.

The tool proposed here is qualitative but it uses some quantitative elements inspired by LCA and S-LCA in the library of materials. The digital form allows an increased accessibility for users wherever they work. It also implies an autonomous access to the information and it is a form that allows an easy regular update. The information displayed on the platform is based on use of science to increase the authenticity and legitimacy of the info on the site and to support designers in making informed decisions. Taken together, this could increase the designers' trust in the platform. The designers interviewed insisted on their willingness to find objective and quality information that they could trust. The tool has a holistic perspective of sustainability and the life cycle of the garment. Thus, the aim is to move away from a purely material vision of sustainability in fashion and to provide comprehensive help to users. However, this help is not intended to assist designers in the creative development of collections. The tool aims to bring concrete help through the promotion of practical solutions for the implementation of sustainability strategies in their creative endeavors, in particular by documenting the numerous examples and case studies. The solutions proposed on the platforme take into account different environmental, social and economic criteria and acknowledge that sustainability is only one of the criteria when designing clothes or creating a business. The tool aims to offer a learning experience to its users in a benevolent way in order to be a positive force in the fashion industry landscape.

The platform is intended for different fashion professionals in a company, i.e. not only the designers but also materials managers, sustainability managers, business managers, etc. This multiplicity of targeted profiles also allows designers-entrepreneurs to extend their knowledge beyond the role of designers in order to carry out their entrepreneurial project. This tool is likely to 'fit' better in the more flexible, small and medium sized companies and/or start-ups compared to larger, more complex organizations where changes are likely to take longer. Users will have a personal account allowing them to pinpoint the materials, articles, information, etc. that interest them and keep track of them in their personal space. This will also make it possible to trace users' interests and offer them content that may be of interest to them and to notify them of new features or improvements. Thus, this personal account will allow the tool to be personalized. Each user will be accompanied personally in learning and using the platform so that it

is used in an optimal way. Finally, a regular evaluation of the tool by its users will be necessary in order to guarantee the relevance of the tool and the information offered in the long term.

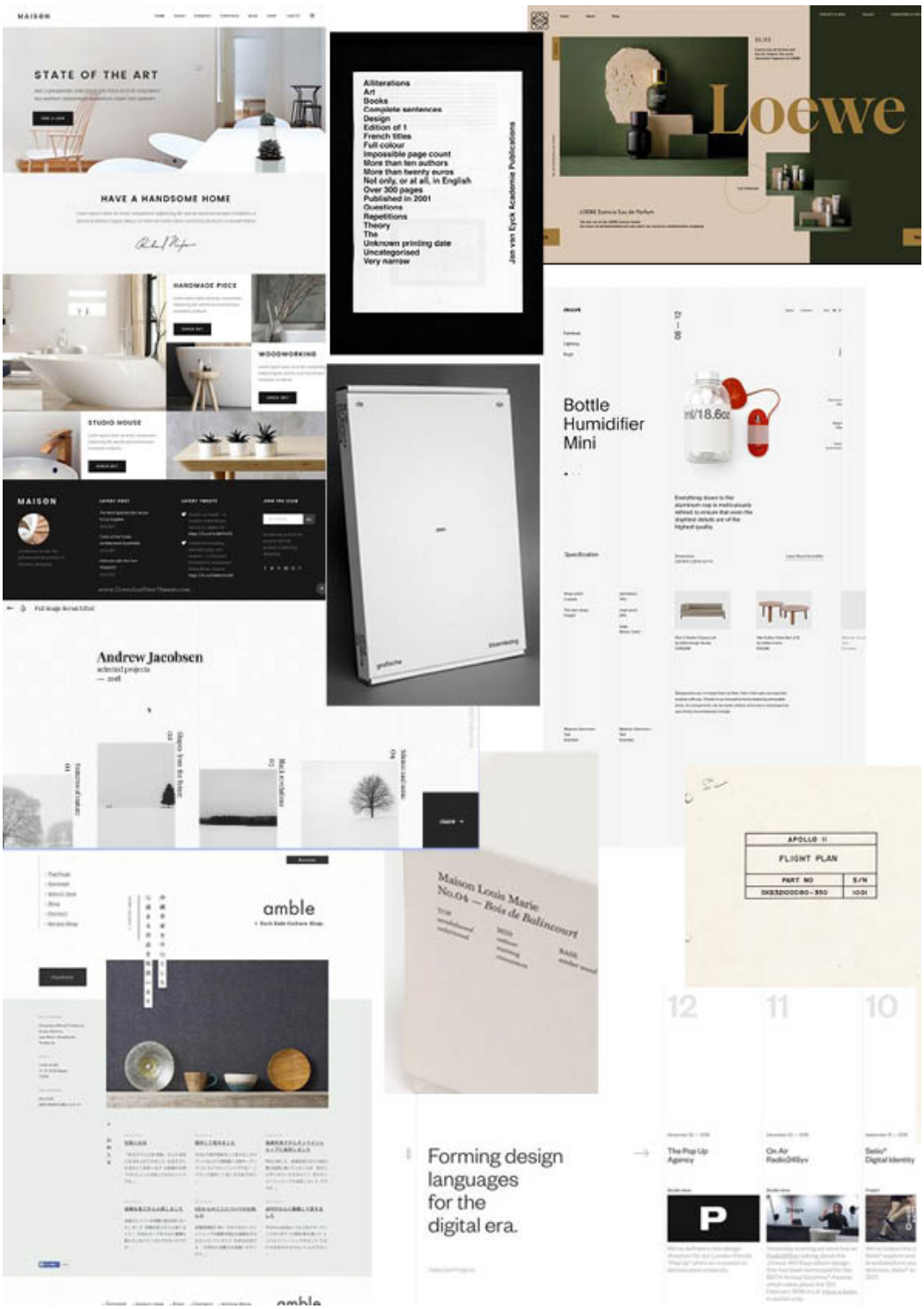
Designers in the fashion industry attribute a great deal of meaning to aesthetics, so the platform must be visually appealing and relevant. The visual aspect of the tool must facilitate an easy access to and understanding relevant information by the composition and ergonomy of the different visual elements. The information and the language, in which it is expressed, must be neither intended for experts nor too generalized to facilitate understanding and the acquisition of new skills. A short, precise, simple language of clearly presented information will facilitate adherence to this new tool. Each piece of information will be proposed in the form of key points and with in-depth information. From then on, each user will be able to choose the level of detail desired. The platform will be offered first in English, which is the most common language in the fashion industry, and secondly in other languages relevant to the fashion industry such as French, Portuguese, Mandarin and Italian. This opening to other languages will aim at the inclusion of all fashion actors around the world. Finally, the platform must be able to be included in the users' day-to-day materials and become the to-go-place when information on sustainable fashion design or business is sought. A reputation must therefore be built among users by ensuring that they will find verified and diversified information. We must be careful not to create a dogma where only one solution is proposed and must be followed blindly but create an ecosystem of solutions. A plurality of solutions must be proposed so that the diversity of responses can correspond to the diversity of the companies present in the industry.

This platform is created within the framework of an entrepreneurial project and is therefore a for-profit organization. The service is not free of charge, however the price can be adapted to the size and income of the user company. The goal is to ensure a perennial financing of the platform so that it can be updated regularly. It is also to avoid depending on sponsors and to ensure the independence of the company and the objectivity of the information reported.

The company's business model must be sustainable and balance the three -environmental, social and economic- pillars by, for instance, have the smallest environmental impact as possible, offering an optimal work/life balance to employees and assure the economic prosperity of the company. This business model should not be designed for exponential and infinite growth, but should be designed to serve designers in the fashion industry, have a positive impact on society and act on the climate emergency which planet Earth faces. Just as the platform wishes to promote transparency in the industry, so too will the company be transparent about everything that constitutes it: its calculation methods, its limits, its finances, its social and

environmental impact, its board of directors, etc. Finally, in order to build this platform and this company, a team of experts in their respective fields and trusted people will have to be constituted. It is a question of acting with humility to build the best possible service and that this service meets the expectations of the users. It is also by surrounding oneself with experts in the field of LCAs, data management, ethical issues, researchers, etc. that trust with users can be built.

Image 17. Visual moodboard of the platform



7. Conclusion

Fashion is of paramount importance in the expression of identity and cultures. Nevertheless, the current environmental and social context of the fashion industry requires the development of sustainable alternatives while preserving this cultural strength. Indeed, the fashion and textile industry is responsible, for example, for a major part of the environmental impact of the European Union: It is an intensive consumer of water whether in the cultivation of cotton or in the finishing of textiles. It also consumes a large share of the chemicals produced in the world. From a social point of view, the fashion and textile industry is a major employer worldwide, but part of its production chain is located in countries with low social protection for workers. This leads to unsafe working conditions, below subsistence wages, discrimination and exploitation of the most vulnerable workers such as women and migrants. Some of these negative effects can be reduced during the design phase, which is why it is essential to integrate sustainability into the practice of fashion design.

This master's thesis explored how designers design and integrate sustainability issues into their design practice. This research was based on a literature review and empirical research consisting of interviews with European fashion designers working in companies that have expressed a public commitment towards sustainability.

Fashion designers attribute a great meaning to the visual aspects of the design. Aesthetics is an essential part of their practice and they are keen to enjoy a strong creative freedom. Even though clothing design is the result of compromises between various criteria such as aesthetics, sustainability, comfort or even the financial aspect. Fashion designers work together in teams, but also in collaboration with other company departments such as marketing or development and they collaborate with external partners such as suppliers. There is a particularly strong human link between designers in small and medium-sized companies and their suppliers and manufacturers. Designers design with the help of many examples and images or objects of inspiration.

Competences related to sustainability issues are acquired by fashion designers in an empirical way, through testing, investigation and continuous questioning. Knowledge is acquired through experience, media, meetings and collaborations. Here too, examples and inspiration play a central role in the acquisition of this new knowledge. Sustainability is implemented by companies through different strategies. Nevertheless, a pattern has been established. The most common design strategy is the use of sustainable materials, followed by design for long-lasting products and a local production strategy. A common goal is to implement a circular strategy, but this is not yet achieved.

During the interviews, the material aspect of design was predominant in the answers to the questions. The practice of sustainability in fashion is still primarily seen as a question of choice of materials. Designers encounter difficulties in implementing sustainable strategies in the design process. These difficulties are a lack of time to devote to these issues, the complexity of the problem but also the complexity of the organization as well as the opacity of the industry and the difficulty to access and understand the information needed to make informed decisions. In addition, there is a difficulty in seeing and implementing sustainability in a broader way that is not only through material choices, especially in large companies.

This is where designers are looking for help. One of the answers that can be provided is the use of eco-design tools. These design tools can be quantitative by measuring the environmental or social impact of an existing or future product or they can be qualitative by offering support in thinking about sustainability issues. However, academic literature and empirical research show that very few of these tools are part of designers' everyday practice. This can be explained by the lack of knowledge of many of these tools. But also because in general they do not meet designers' expectations in terms of competences - they are either too technical or too generalist - and meaning - their form, aesthetics, values, criteria do not match designers' mindsets.

In order to support designers, and other design-interested actors in the fashion industry, in the implementation of sustainability strategies in their practice, a proposal for a digital web-based platform has been developed. It is a new type of qualitative, universal tool in the form of a digital platform designed to provide concrete help for the implementation of sustainable strategies through example, inspiration and pre-made research. The tool offers a learning experience by providing a plurality of practical solutions related to material issues, business model, production and innovation. The platform responds to the need for transparency expressed by designers and uses pre-established mechanisms of collaborative work and the "inspiration" vector, both of which are very present in designers' practice. The founding principle of the platform is to make information accessible, to facilitate work and informed decision-making and to answer the questions "how to do it and where to start?". The tool will have to pay attention to the relevance of the proposed case studies, the language used and its visual communication in order to be integrated into the daily practice of users. The stated goal of the platform is to become the to-go place to learn about sustainable fashion design and business.

Limitations and further works

The first limitation encountered by this master's thesis is the bias that interviews, and more broadly qualitative research, may involve, both on the part of the respondents and

in the analysis of the responses. Interviewees, knowing the subject of the interviews, could emphasized the sustainability aspects of their practice more than what is happening in reality. As, during the analysis, some answers from respondents could be misinterpreted and a risk exists to 'heard what I want to hear'. The second limitation is that the segment of ten designers allows a first exploratory phase, but another broader study will be necessary to validate or invalidate the results obtained here, especially with designers who do not work in companies committed to sustainability. Furthermore, field observation could complement the interviews. Open up the interviews to designers who are not committed to sustainability and having a field observation could make the analysis more precise and probably more nuanced. It would also be interesting to hear from designers who are not sustainability minded what are their struggles to implement sustainability strategies. In addition, the tool proposed here will have to be developed, prototyped and tested to ensure that it is working, meeting the needs of users and generating interests among designers. Further academic research on the implementation of a new eco-design tool in the practice of designers would be useful to assure the success of the platforme.

If the tool is to be transformed from a mere hypothesis into a concrete entrepreneurial project, several steps will need to be taken. This academic research will have to be complemented by market research to ensure that the tool corresponds to a real need in the industry and to make sure that a similar tool does not already exist. It will be necessary to assemble a team of employees competent in their fields to build a prototype, test it and develop the final platform as well as ensure the day-to-day operation of such a tool. At the same time, a business model will have to be established. Also, funds will have to be found in order to carry out this project from a financial point of view, which will allow it, among other things, to grow and be kept up to date. The work of research, writing and visual communication will have to be thought and established. Finally, a reflection on how to ensure a successful implementation of the tool in the daily practice of designers will also have to take place.

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Appendix

A1. Interview guide

How do you perform your job? What does it entail?
What is your job/position? What are you responsible for?
How are you creating the clothes?
How are you inspired?
What is the most important aspect when designing (esthetic, cost, sustainability, …)?

How is your company operating?
How many designers are part of your team?
What is the sustainability vision of the company?
How does the company work with suppliers?

How do you work with sustainability?
Where the sustainable initiative appears in the value chain of the company (schema?)?
(Pré-production, production, distribution, utilisation, end-of-life)
Who take the decisions ? How much influence do you have?
Where do you get your knowledge/insight on sustainability in fashion?
How have you developed those skills?
Do you use tools?/ have consider to use some? / Are you aware of the tools existence?

What are the difficulties?
Do you feel it is difficult to achieve sustainability in your current work on developing sustainable fashion?
Is it difficult to find informations/ take decisions?

What would you need?
What would be the most simple/efficient for you? Label/lca/media/ conference/ consulting?

My proposition
Virtual/ physical library and database in order to give inspiration and provide examples and make the informations accessible.
Material library (with different criteria research and calculation of environmental and social impact)
CSR policies'/ code of conduct' library
Production supplier database
Innovations presentation (available on the market or start-up that need investor)
What's new in sustainable fashion?
Example of implementation by diverse companies

A2. List of companies and designers contacted but who did not respond positively to the request.

Company	City	Role	Invitation Linkedin	1st message or email send	2de message or	No answer	Don't want to participate	Answer yes but is not part of the thesis &
Filippa K	Stockholm	Studio Manager	30/10 (+ 1 other person)	2-nov				X (But nevers answer back after saying yes)
Balenciaga	Paris	Designer		1-nov		X		
		Designer		2-nov			X (Management don't want him to answer the question)	
		Sustainability manager		25-nov	3-déc	X		
Loom	Paris			30-oct				X (But didn't has the time for a proper video interview)
Marine Serre	Paris		30-oct					
Atlein	Paris	Owner / DA		1-nov	16-nov	X		
H&M	Stockholm	Senior designer womenswear	30/10 (+ 1 other person)	2-nov	16-nov	X		
		Sustainability manager DK		27-nov		x (Maternaty leave)		
				28-nov			X	
Cos	Londres	Head of menswear	30/10 (+2 others people)	16-nov	23-nov	X		
		Global head of sustainability		27-nov	3-déc	X		
Gucci	Florence	Head of corporate sustainability	30/10 (+2 others people)	25-nov	3-nov		X (She left the company)	
Arket	Stockholm	Head od Design	30/10 (+ 3 others people)	4-nov	16-nov	X		
Mud Jeans	Amsterdam	CEO		2-nov		X		
Hugo Boss	Germany	Senior head of designer womenswear	2/11 (+ 1other person)	3-nov		X		
		Head of design Menswear Athleisure	2/11 (+ 1other person)	6-nov	16-nov			X (But nevers answer back after saying yes)
		Director Global Sustainability		27-nov	3-déc			X (But no available before January)
Stella McCartney	Londres	Senior Designer RTW	1/11 (+2 others people)			X		
		Environemental sustaimanbilty manager		27-nov	3-déc	X		
Moseart	Bruxelles	Designer	1-nov			X		
Bottega Veneta	Milan	Designer		24-nov		X		
Rombaut	Paris	Designer and Founder	2-nov			X		
Ganni	Copenhagen		4/11 to 3 people			X		
Pheobe English	Londres	Studio Manager	4-nov	4-nov	16-nov	X		
Kiabi	Lille	Womenswear design manager	16/11 (+ 2 others people)	17-nov	23-nov	X		
Fjällräven	Stockholm		23/11 to 3 people			X		
Veja	Paris		23/11 to 1 person			X		
Better World Fashi	Aalborg			23-nov		X		
Dai	Londres			23-nov		X		
C&A	Düsseldorf	Ladies Denim Designer	24-nov	24-nov				X (But I couln't use their answer Publicly)
		Dress	24-nov	2-déc				X (But nevers answer back after saying yes)
Faguo	Nantes	Co-founder	24/11 (+ 1 other person)	25-nov				X (But wanted to interview the communication manager)
Aigle	Paris	Cheffe de produit		25-nov		X		
		Directrice de Collection		25-nov		X		
		Apparel designer Men & Women	24-nov	25-nov		X		
Roseanna	Paris	Womenswear designer	24/11 (+ 2 others people)	25-nov		X		
Façon Jacmin	Bruxelles	Creative Director		25-nov		X		
Hermes	Paris	Sustainability project manager		25-nov	3-déc	X		
		Sustainability project manager		25-nov	3-déc	X		

A3. Interviewees on source of inspiration

Source of the inspiration	**Companies**
Inspirational images from various platforms	Saint Laurent; Infantium Victoria; Okaïdi; Luxtra; Balzac
Movies	Infantium Victoria; Adidas A
Art	Infantium Victoria; Adidas A; Balzac
Books	Infantium Victoria; Luxtra; Adidas A
Brand's archive	Saint Laurent; Gamut; Adidas; Balzac
Others brands	Okaïdi; Luxtra; Balzac; N'go
Magazines	Luxtra; Adidas A
Shopping	Okaïdi
Vintage	Saint Laurent; Balzac
Everyday life	Luxtra; Adidas B
Practicality	Luxtra; Adidas B
Technique	Infantium Victoria; Adidas B
Clothing codes	Organic Basics
Materials	Infantium Victoria; Okaïdi
Current events, Sustainable Development Goals and trends	Balzac
Object	Infantium Victoria
Recipe	Infantium Victoria

A4. Interviewees on source of knowledge

Source of knowledge	**Company**
Media	Gamut; Okaïdi; N'go; Adidas B
Documentaries	Infantium Victoria; N'go
Professional association	Okaïdi; Balzac
Conference	Infantium Victoria; Balzac
Reading	Organic Basics; Infantium Victoria; Luxtra; N'go
Expert	Organic Basics; N'go
Non-profit and NGO	N'go; Balzac
Suppliers	Organic Basics; Okaïdi
Meetings, colleagues and partners	Organic Basics; Gamut; Okaïdi; Adidas A
Supply chain's workers	Infantium Victoria
Networks of creators	Gamut
Trade fairs	Luxtra; Balzac
Company's sustainability department	Adidas A; Balzac
Company's learning experience	Adidas
Workshop	Balzac
Short classes	Luxtra

Higher education	N'go; Adidas B
Others brands	Gamut; Adidas A; Balzac
Observation of conventional industry	Infantium Victoria
Technical data sheets	Luxtra
Personal Interest	N'go; Balzac

A5. Interviewees on materials used

Materials used	**Company**
Organic cotton	Infantium Victoria; Okaïdi
Recycled cotton	Okaïdi
BCI Certified	Okaïdi
Recycled synthetic materials	Gamut; Okaïdi; N'go; Adidas
Responsible dyes	Okaïdi; N'go
Chrome-free leather	N'go
Ozone washing and laser finishing	Okaïdi

A6. Interviewees on source of materials used

Source of material used	**Company**
Network	Gamut; Luxtra; N'go
Trade shows	Gamut; Luxtra; N'go
Manufacturers' material library	N'go; Adidas B

A7. Interviewees on tangible sustainable vision implemented

Tangible sustainable visions	**Company**
Sustainable materials	Infantium Victoria; Gamut; Okaïdi; Luxtra; N'go; Adidas A; Balzac
Vegan materials	Infantium Victoria; Luxtra
Certified materials	Organic Basics; Infantium Victoria; Gamut; Balzac
Limit use of unnecessary ressource	Organic Basics; Adidas
Circularity and recyclability	Organic Basics; Okaïdi; Luxtra; Balzac
Design for long-lasting products	Organic Basics; Okaïdi; Balzac
Upcycling and unique pieces	Gamut
Modularity	Balzac
Limiting material path	Infantium Victoria; N'go
Packaging	Infantium Victoria; Luxtra; N'go
Maintenance and repair service	Infantium Victoria; Balzac

Take back system	Infantium Victoria; Okaïdi; Balzac
Social responsibility towards suppliers	Infantium Victoria; N'go; Balzac
Local production	Gamut; Luxtra; Balzac
Energy consumption	Infantium Victoria; Luxtra
Monitoring of social and environmental impacts	N'go; Adidas A; Balzac

A8. Interviewees on abstract sustainable vision implemented

Abstract sustainable vision	**Company**
Bcorps certification	Organic Basics; Luxtra; N'go
Being outside of the statu quo	Gamut
Education	Organic Basics; Infantium Victoria
Seasonless and trendless	Organic Basics; Okaïdi
Charity purpose	Luxtra; N'go
Diversity and gender	Gamut
Donut economy	Infantium Victoria
Craddle to craddle	Infantium Victoria