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# Trace: design and responsibility in the Prato textile district

Elisabetta Cianfanelli<sup>a</sup>, Renato Stasi<sup>a</sup>,

Matilde De Gennaro<sup>a</sup>, Maria Grazia Soreca<sup>a</sup>, Margherita Tufarelli<sup>a\*</sup>

<sup>a</sup>University of Florence, Architecture Department - DIDA, Design Campus

\*margherita.tufarelli@unifi.it

**Abstract** | Nowadays customers expectations has changed and consumers have become much more conscious, demanding and always looking for transparent and traceable services and products. World fashion market is changing too, thanks to younger customers who share their experiences and needs through social networks and digital platforms: this developed a new critical approach to companies behavior, who are now asked to respond of their social and environmental responsibility. Unfortunately, despite their distribution, many of these platforms are not easily accessible. In this context, textile industry is one of the most articulated ones, appearing mixed and heterogeneous especially because of the presence of many companies and actors working in one of the longest supply chain of the manufacturing industry. Those reflections conducted to the design of a platform: Trace, that will provide clarity and guarantee the quality of Italian products throughout the supply chain.

**KEYWORDS | ETHICAL FASHION, TEXTILE SUSTAINABILITY, TRACEABILITY, SUPPLY CHAIN, DESIGN MANAGEMENT**

## 1. Introduction: the Prato textile district

Companies agglomeration in districts represents the primary vehicle of Italian manufacture international opening (Becattini 1998; Brusco, Paba 1997; Fortis 1998) also in the fashion sector. The Italian Fashion System is composed indeed of an archipelago of specialized territorial areas; this represents a unique wealth for industrial development opportunities.

It is possible to identify the textile-clothing sector in Italy in a strong fragmentation: there are local systems specialized in textile manufacturing activities, others in clothing, others in both. Companies operating in these local systems work together with mechanisms of exchange, generation, and reproduction of intangible resources such as knowledge or trust. (Becattini, 2003; Becattini, 2015; Dei Ottati, 2005).

This research is rooted in the Prato textile district, which is composed of several companies dedicated to the processing and production of textile fibers. The Prato textile district has been assumed as an archetypal exemplification of Marshallian Industrial Districts' processes (Becattini, 2004). This is a particularly articulated reality in which different sectors coexist, including actors supporting the whole supply chain. All the peculiarities that qualify leading companies in the district seem to be as crucial as diversified in operating methods, technologies used, reference markets, and above all, the organization of the supply chain. Moreover, the presence of numerous actors makes this sector heterogeneous with one of the most extended and elaborate production chains.

Thus, the integrated and coordinated management in a supply chain represents a primary tool to ensure a winning service and to gain a competitive advantage through collaborative conduct and transparency, especially in an evolving market like fashion, with ever-higher levels of uncertainty and unpredictability.

This research was conducted according to two parallel axes: one leading to the historical link with the environmental sustainability of the district was carried out within the Datini archive located in Prato. The second is based on a field analysis within a sample of companies.

The analysis revealed that the coordination of the supply chain was often underestimated due to the lack of information shared between downstream and upstream companies. Moreover, the multiplication of competitive pressure requires companies to explore new areas for improvement within the individual company. The risk management shared between producer/distributor and shopkeeper resulted in being decided unequal.

Besides, the intense transformations undergone in the whole fashion sector is worth mentioning: it is possible to notice the growth of different consumption model generated by the social change. Examples can be found in growing attention to pollution and global warming issues lead by numerous campaigns such as "Fashion revolution" or the Greenpeace campaign "Detox my Fashion". The latter includes 80 worldwide companies committed in reduction of their environmental impact and use of chemicals in production processes. It is also noteworthy that among these 80 companies participating in the Detox campaign, 34 are in the Prato area, bringing out a deep-rooted awareness of the sustainability of the Prato textile district.

For decades we have witnessed the delocalization of production (mainly oriented towards the Asian continent), impacting significantly on the planet in terms of pollution and emissions. Many studies have focused on the social and environmental impact of the fashion and textile industry, (Boston Consulting Group, 2017, Claudio, L., 2007; Birtwistle, Moore, 2007), showing that the impactors elements are manifold and not exclusively linked to the production of raw materials.

Moreover, the fashion consumer nowadays is demanding, connoisseur, selective, and his/her buying habits are based on personal evaluation of the product, and therefore, challenging to permeate. As it happened with the customer-product, the relationship between client and brand is currently based on reputation and feedback, making the old fidelization methods ineffective.

This contribution has the aim to explore strategies for safeguarding and enhancing the Prato textile industry, through the proposal of a new model of traceability for products and processes. The aim is to trace and systemize all information regarding the supply chain: from raw materials to production and distribution processes. The result would reveal itself inviolably through a platform based on Blockchain technology.

Hence, this contribution intends to investigate transparency and traceability in the textile industry, with a specific reference to the Prato district. The output of this reflection is TRACE: the proposal of a traceability platform that aims to provide clarity to the customer, as well as guarantee the quality of Italian textile products throughout the supply chain.

## 2. Emerging scenarios: ethical fashion

Sustainability in the fashion system is an extended field of study that has evolved from a vision centered on purely ecological aspects to a global meaning concerned about how social and economic dimensions of supply chain can impact on the territory (MacArthur, 2013).

In the past few decades, the fashion industry has been one of the main driving forces for global development (Maloney, 2015). The scenario is changing; sustainability and responsibility issues have become central in the debates on the future fashion industry, mostly thanks to the change of a fundamental actor in the supply chain: the consumer (Choy et al., 2012).

### 2.1 Ethical fashion

Multiple realities compose the concept of environmental sustainability in the textile-clothing system. Sustainability concept is rooted in the longevity of the product and the possibility of a second life through the recycling of the fibers (Ricchetti, Frisa, 2011) as well as social impact of production processes. There are, therefore, multiple aspects that can be considered cornerstones of this theme, all strongly connected.

Information and communication technologies (ICT) nowadays drive industry competition, tending to reshape the nature of manufacturing and manufactured goods (Porter & Heppelmann, 2014). Moreover, information technology opportunities have led the consumers to become increasingly aware, demanding, and looking for transparent and traceable services and products.

Companies have perceived these changes in consumer behavior as a request to exhibit their social and environmental responsibility transparently (Brown, 2010). Hence, the "prevailing ideological system" (Fabris, 1995) changes and significant new opportunities are emerging for design culture.

Sustainable fashion is a growing need, especially facing the critical issues that have emerged in the fashion industry in the last decades. The term Eco-Fashion means a virtuous circle that includes all the steps: the design of a more durable product, the choice of materials, production, and distribution of products, trying to achieve the minimum possible environmental impact.

Eco-Fashion has an excellent media response, is a communicative force for a new life approach that allows ideas for sustainable strategic design. The increasing presence of Eco Fashion collections on the market shows a growing awareness. It seems to be strategic and oriented towards more solutions made of transparency, traceability, certification, communication as a function of a possible recycling facilitation.

A sustainable system is not simple at all; one of the ways may concern the reduction of the consumption of primary resources (raw materials, energy) and the reuse as well as the recycling of materials. In other words, the goal is to be able to adopt an economic system whose mission is to reduce the waste generated during all phases of the product. Approaching sustainable management in the fashion sector inevitably means including the entire textile supply chain.

"The difficulty (in the fashion industry) is to see how all the suppliers of the individual components can be ethically secured and accounted for, together with the labor used to manufacture the garment, its transport from factory to retail outlet, and ultimately the garment's aftercare and disposal "(Beard, 2008).

## 2.1 Ethical consumer

Changes in consumer behavior actively contributed to the centrality of sustainability and responsibility themes in the fashion industry.

The new consumer is an active part of marketing strategies, compared to the past it is no longer faithful to a single brand, it is more selective and demanding and often changes consumption styles (Rinaldi, Testa, 2013).

Digital technologies are the main contributors to this change in dynamics. "In the digital age, people are used to commenting, documenting, and sharing their experiences online. Therefore, loyalty is also and above all, determined by advocacy, or by the willingness to recommend a brand to other people" (Kotler, Stigliano, 2018).

The current consumer, therefore, is an increasingly fluid figure, has multiple identities, and escapes traditional segmentation attempts. He is autonomous, informed, prudent.

Francesco Morace speaks of Consum-Author (Morace, 2016) as a subject who becomes the protagonist and "author" of his existence and his own consumer choices. It is a hybrid figure that wants to be involved and informed on both the genesis and the traceability of the product he/she buys. This phenomenon has led to an increasingly strong binding between being and buying, taking the path of critical and participatory consumption. As Francesco Morace (2011) wrote: "sustainability can be an element of differentiation and advantage of a product, but over the next 20 years being 'sustainable' will be a necessary feature that every product will have to incorporate in order to access the market ".

Thus, social and environmental issues are crucial, especially for young consumers, who through their purchasing habits by promoting brands aligned with their values. Nine out of ten consumers of generation Z believe that companies have the responsibility to address social and environmental issues (Cone Communication, 2017).

Being recognized individually and receiving an offer designed according to specific tastes and needs are fundamental prerequisites for establishing a lasting relationship between people and companies. In order for this bond to be established, it is necessary for companies to put customer-centered innovation processes into practice, one of the design capabilities of "Leading Business by Design" (Micheli, 2014). The company acquires value as much as the consumer participate in the corporate culture.

Consumers have created a more respectful buying habit. Specifically, the increasing amount of available information modifies the models of value creation. In this scenario, a designer can be a "creativity manager", assuming a vital role in the project of all product lifecycles, as well as in need to generate, or in some cases support, the conscious criticism of the contemporary user in this fashion sector.

## 4. Transparency and traceability

Transparency and traceability are now acknowledged as necessary to measure social and environmental sustainability in the supply chain of the fashion sector.

"Being transparent" in the entire supply chain is the result of work done on traceability and certification, guaranteeing ethical standards, respect for social criteria relating to workers' rights and respect for environmental criteria (water supply, energy recovery, polluting emissions into the atmosphere, production and management of waste, management of dangerous substances and materials).

the widely accepted definition of traceability is from the International Organization for Standardization (ISO), with the added key component of a sustainability focus:

Traceability: The ability to identify and trace the history, distribution, location, and application of products, parts, and materials, to ensure the reliability of sustainability claims, in the areas of human rights, labor (including health and safety), the environment and anti-corruption.

Being able to implement a traceability system means being able to map the operational and production flows, from the extraction of raw materials to the production of semi-finished products and parts up to the production of final products, retail, and possibly the use and reuse, in line with a circular economy.

Using this approach means involving all the players in the production network and educating them towards transparency; provide information that allows for a standard, transparent, and accessible understanding.

Educating the different actors of the supply chain means for companies to develop adequate design management capabilities connected to five factors: awareness, planning, resources, skills, and process (Kootstra 2009).

The theme of traceability is undoubtedly not a brand new topic, dealt with for years in the study areas linked to the dynamics of logistics and business management. Nowadays, the communicative aspects of traceability systems grow in importance as they represent an additional point of contact with the consumer.

A series of opportunities for design are grafted, also thanks to the technological advancement and, in particular, the most recent opportunities potentially offered by the blockchain.

Recent studies on the application of blockchain technology in the agrifood sector show that open-source, decentralized, distributed database for storing transaction information (Francisco, Swanson 2018) can ensure the accuracy of this information, such as product quality, safety, and labeling.

In the context of sustainability, traceability is a tool to ensure and verify the sustainability declarations associated with goods and products, guaranteeing good practices and respect for people and the environment along the entire supply chain.

## 5. Trace: the design of a traceability platform

Trace has the aim of providing transparency and traceability within the supply chain. The entire project was experimented in the Prato district, which represents "an exemplary history of Italy's districts" (Becattini, 2000)

Based on blockchain technology, this platform addresses its offer both to companies, suppliers of yarn/fabric, and to the consumer who will purchase the final product. The application of this technology within the textile supply chain becomes a strategic tool, suitable for enhancing the industry itself, optimizing production processes, and reassuring the consumer about the operations conducted by companies.

Moreover, blockchain technology ensures the integrity of the data when it is exchanged in a transition, allowing the elimination of intermediaries and simplifying the relationship between brand and consumer. In order for a transaction to take place, all the nodes (participants) must agree on the correctness of the data transferred.

Once the transaction is validated and inserted into the Trace platform, it remains unviolable and visible to all the network. This solution can guarantee reliability and security of the transferred data transparency (as every data is visible to all the actors of the network), thanks to the distributed database that allows establishing a new concept of trust.

The blockchain can guarantee a "digital" architecture capable of connecting and guaranteeing the exchange between the various players in the supply chain, stimulating them for collaboration.

Trace follows the product in every supply chain process, and thanks to the help of new technologies, information is collected quickly and intuitively. Each item in the production chain will be equipped with a "digital passport": labels, like a membrane, are applied to each piece of fabric. Labels are made of MINERVA PHA, a high-performance biodegradable biopolymer, in which a chip is inserted to assimilate step by step the information regarding the different processes.

All actors involved in the supply chain can view and approve the status of the article. In the final stages of production, the chip is extracted and inserted inside the tag that accompanies the garment in the stores.

The consumer, willing to know the origin of the garment, can trace the history of the product thanks to the chip and intuitively know exclusive content about it.

Ensuring a system based on traceability, thanks to blockchain technology, contributes to the enhancement and protection of a Made in Italy product. Collaborating in the creation of conditions of transparency and environmental protection, as well as increasing consumer confidence.

The opportunities of this platform have, above all, an ethical and social value. The conscience of the place is an intermediate step to regain social responsibility and can reopen the way for a vision of society that goes beyond the market.

Trace is based on a clear concept: production is a social fact and, therefore, a manifestation of cooperation between subjects. Thanks to Trace, Prato's textile product can have a new



Figure 1. The TRACE process from both producers and consumers point of view.

strategic value that will allow it to diversify for international markets, where social responsibility offers a competitive advantage.

It is essential to make known products characterized by the imprint of a district that has undergone many transformations, strongly linked to tradition with a look at innovation and resource management. Social responsibility as a value but also as an identity. Trace allows to shed light on these issues and make all the information accessible to the final consumer.

Thanks to the design culture combined with opportunities led by recent technologies, tangible and intangible values are intertwined in Italian production, offering a new vision that communicates through a different perspective.

## 6. Conclusions

The fashion sector has one of the most complex supply chains, with collections that follow one another continuously imposing tight rhythms of development and lead times.

The structure of the Italian supply chain in the fashion sector is complete, with companies operating upstream producing semi-finished products for the subsequent phases (spinning and weaving) and companies downstream that market the finished product.

The sudden change in the market leads companies to choose a sustainable direction but in an ever shorter time. The adoption of an adequate Supply Chain Management tool that allows synchronizing all the operations of supply, production, distribution, and sale ensures optimal performance and savings in time and costs by promoting product quality.

The multiplication of competitive pressure obliges companies today to seek new areas for improvement within the individual company. There are very few companies in Prato that deal with the entire production process, ranging from fiber selection to marketing. On the other hand, there are many industrial companies that cooperate for the return to the end customer of a qualitatively valid product.

In this scenario, there is also an intensification of competition, which is associated with less accessibility not only to financial resources but also to raw materials, and these conditions have increased the competitive centrality of human capital, technological innovation, and efficiency in the use of resources. Moreover, the impact of the crisis has made it necessary to contain those phenomena - increasingly less sustainable - through social inclusion policies, the fight against poverty, respect for human rights, work, and the environment.

It is therefore possible to claim that the process of globalization and the economic and financial crisis have contributed to the growing idea that survival and future development presuppose balance and compatibility between three fundamental aspects: the achievement of financial results, social implications, and environmental impacts.

Companies are key players in the concrete implementation of this development model, which finds its synthesis in the concept of sustainability.

Hence, it is possible to elevate sustainability to a business paradigm, which includes the Triple Bottom Line model (Elkington, 2013): achieve Profit by respecting the environment (Planet) and People.

TRACE, in line with ethical and environmental values, represents a strategic tool, ideal for managing communication between the various players in the supply chain, guaranteeing information security and respect for production.

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#### **About the Authors:**

##### **Elisabetta Cianfanelli**

Architect and Industrial Design Specialist, is Full Professor at DIDA (Architecture Department) of University of Florence (Italy), Design Campus section. President of the CdLM in Fashion System Design, and scientific director of the DIDA Lab REI (Reverse Engineering & Interaction Design).

##### **Renato Stasi**

Has been involved in the creation of clothing and accessories collections for the fashion segment for almost thirty years, as a designer and responsible for product development. He is an adjunct professor at the DIDA - UNIFI Department of Architecture, in the CDL in Industrial Design and CDLM Fashion System Design.

##### **Matilde De Gennaro**

Designer, graduated from the Master of Science in Fashion System Design at the University of Florence (Italy).

##### **Maria Grazia Soreca**

Designer, graduated from the Master of Science in Fashion System Design at the University of Florence (Italy).

##### **Margherita Tufarelli**

Designer, PhD in Design. Currently a research fellow at DIDA (Architecture Department), of University of Florence (Italy), Design Campus section. Her research interests concern the heritage/creativity sphere within the digital evolution, investigating further applications, impacts and opportunities.