FASHION DESIGN PRACTICES AND EMERGING TRANSFORMATIONS

A CASE OF INTERDEPENDENCE BETWEEN FASHION CREATIVE PROCESSES AND MANUFACTURING SYSTEM IN THE MADE IN ITALY DISTRICTS

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.
Competing Interests: The Author(s) declare(s) no conflict of interest
DOI: https://doi.org/10.36253/fh-2256

Abstract

The current article focuses on emerging transformations in fashion creative processes in regard of the enhancement of digitalization processes, the opportunities offered by new sustainable business models, and a new relation between user, production, and consumption. In particular, this article discusses the case of the Italian manufacturing districts where digitalization strongly pervades the production, integrating the local craftsmanship savoir-faire with up-to-date technologies. Within the strategic duo "fashion and technology", we highlight emerging opportunities for the integration of creative processes and manufacturing skills. Moreover, the need for sustainable practices offers new significant insights into the integration of the roles of the designer and manufacturing processes. Moving from this discussion, the article presents an overview of ongoing transformations of fashion design practices in relation to the technological and social issues, offering a framework to read the articles included in this issue.

Keywords: Fashion Design, Creative Processes, New European Bauhaus, Digitalization Sustainability

The Contemporary Fashion Industry in the Global Industrial Economy and Societal Changes

The current turbulence in the economy and industries globally, which is both dynamic and complex, is sharpening and exacerbating challenges that the contemporary fashion industry – as a network of interrelated stakeholders including brands and designers, manufacturers, distributors, retailers, and consumers – has been facing in the last two decades. Geopolitical risks, such as political instability, conflicts, trade wars, and protectionist policies, are creating challenges for businesses that operate in affected regions or rely on global trade and on imported goods or services. The COVID-19 pandemic has also had a profound impact on the global economy, causing significant disruptions to supply chains, reducing consumer spending, and leading to job losses and business closures (McKibbin & Fernando, 2020). Lockdowns and border closures disrupted the movement of goods and labour, leading to delays in production and delivery, and causing a backlog of inventory. In fact, the COVID-19 pandemic has created significant uncertainty and volatility in the fashion industry, worsening the existing vulnerability and leading to its disruptions.

In addition, the pandemic led to a shift in consumer preferences and buying patterns, with a decrease in demand for specific merchandise categories, such as formalwear and outerwear, and an increased attention and desire for casualwear and athleisure (McKinsey & Company, 2021). These new consumption behaviours have pushed the evolution of a new concept of occasion of use toward a faster and further blurring among product categories, thus requiring a new design and planning approach to fashion collections. This shift in demand caught fashion companies unprepared and highlighted the inflexibility of their supply chains even more.
The need for greater adaptability and resilience of the fashion supply chains is also exacerbated in light of the digital acceleration affecting all sectors, not only in support of the shift to phygital retail but also in favour of improvements to interoperability, higher traceability, and transparency across manufacturing, logistics, and distribution (Casciani et al., 2022).
While traditional fashion companies are dramatically lagging behind in the process of digital transition at operational and managerial levels, the request by consumers for transparency relates not only to the concept of environmental and economic

sustainability but it refers also to an emerging social and civic consciousness under the increasing demand for responsible practices and products.
The social dimension of innovation (Penati, 1999; Pinch, 2005; Bucchi, 2010), embedded into a sustainable development, moves from a simplistic technology-driven concept in favour of design-driven approach, focusing on the construction of meanings (Krippendorff, 1989, 1990, 2006; Norman & Verganti, 2014; Bertola et al., 2018) in processes and products and on the centrality of the role of human beings.
This reflects in the consideration that the fashion industry does not simply correspond to its supply chain, but it refers to a creative and cultural industry where tangible and intangible products and specific modes of production concur to covey cultural and symbolic meanings that are significant for consumers and that correlate with the value of a company (Bertola et al., 2016).
Within this framework, the principles of the New European Bauhaus (European Commission, 2021) – aesthetics responding to needs and improving quality of experience beyond functionality, environmental sustainability, and inclusion –, empowered by digital transition but also integrated by a holistic approach to sustainability (Hawkes, 2001; UCLG, 2010), characterizes the contemporary arena in which the fashion industry restructures towards hybrid value chains where brands, supply chains, and consumers enter new relationships while redefining processes, products, and services (Bertola et al., 2018).
In this context, the management of the fashion creative processes, harnessing the adoption of digital technologies, is of the utmost importance in order to empower a positive transition towards efficient and sustainable productions and responsible cultural and consumption dynamics.

Fashion Creative Processes towards Digitalization and Sustainability Pathways

Highly efficient and streamlined creative processes and collaborative practices, empowered by digital technologies, are at the centre of restructuring the relationship between research, production, distribution, and consumption, thereby highlighting a renewed integration of the creative processes and the manufacturing system.
The application of digital technologies, such as 3D virtual and digital technologies (Casciani et al., 2022), and more in general the paradigm of industry 4.0 (Bertola et al., 2016) offer the opportunity to restructuring the linear supply chain of traditional fashion companies, which sees each phase as closed, with decisions taken before the launch of the next step. This reasoning can be replaced with multiple iterations within the ideation phase, as digital technologies facilitate design decisions in digital and virtual context, exploring and validating the design possibilities. New design solutions can be achieved, for example, thanks to the evaluation of possible construction choices supported by mathematic information on 2D/3D geometries and 3D, advanced, and automated manufacturing processes. Therefore, prototyping aided by such technologies becomes a tool for idea generation and not simply for testing solutions. Moreover, design options created in digital and virtual spaces can drive the request for new basic and applied research, as in the case of the choices of materials and fabrics which are interdependent with product construction solutions and manufacturing processes. This leads to multiple iterations between the product design, prototyping, and product development phases, which, together, act as an experimentation cycle. The hands-on logic of these processes streamlines design choices, helps to assess manufacturing solutions and processes, reduces environmental impact, and improves resource efficiency. Moreover, in this streamlined process, experimentation is configured as a multifaceted component of the creative process that needs to be integrated in-house to ensure a strategic advantage so that fashion companies exercise full control over design-driven decisions. Keeping control in-house leads to a more agile supply chain by aggregating different phases in multidimensional and interoperative loops, thus reducing companies' dependency on external suppliers and increasing the responsiveness of the supply chain itself. Nurturing creative processes with digital technologies allows to reduce the environmental and economic impacts, due to overproduction and waste generation, and to promote new scenarios for fair and equitable labour and for competence and skills development.
The integration of data-driven recommendation and generative systems, from research and idea generation down to product development, offer a further positive impact in regard of social and cultural sustainability goalposts. In fact, the collaborative dimension among the actors involved in research and design development is extended

to consumers whose insights – elaborated from personal data, preferences, and interactions with brands, products, and communities collected via applications and social media platforms – are converted into institutionalized input for a smart and co-creative process. Big data and artificial intelligence allow fashion brands to align decisions with emerging consumers' behaviours by diversifying aesthetics and functional standards, potentially promoting diversity and inclusiveness, beyond the traditional personalization and customization practices. Beyond a mere tech-enthusiasm, new research strands are debating the ethical implications of the use of consumers' data and artificial intelligence. However, we can see the limitations of the industry 4.0 paradigm and the opportunities that the industry 5.0 shift (European Commission, 2021) offers in term of collaboration between humans and machines to boost human creativity and manufacturing skills, towards a more sustainable society.

In this scenario, the integration of traditional know-how and digitalization represents a key aspect, and also a challenge, in the complex productive context of fashion. The Made in Italy manufacturing districts represent an emblematic case study of a value ecosystem, where the production is immersed in innovative technological systems and products are the result of a collective negotiation among different stakeholders, all participating in the economic, social and environmental co-evolution of the system they are part of (Serrano et al., 2018; 2022).

The Case Study of Fashion Made in Italy

Italian manufacturing processes in the high-end fashion include a complex system of intellectual and manual know-how that merges heritage and tradition with innovation and contemporary demands, high-end market positioning with ethics, and craftmanship with mass-production. "Made in Italy" industrial districts are specific geographical areas in which networks of companies specialized in production processes have established a model that deeply links industrial culture, know-how, and genius loci. These districts integrate creativity and production know-how through extraordinary competitive skills and design-driven innovation, based on a time-tested production system and design processes that interpret emerging trends and global customer expectations (Goretti & Chikh M'hamed, 2022).

The "Made in Italy" model stands not only as a productive economic phenomenon, but also as a cultural manifestation rooted in fundamental historical elements that originate precisely in the product-territory-society synergy. Italian manufacturing districts are made up of a constellation of small and medium-sized enterprises (SMEs) with articulated production differentiation and a collaborative structure based on mechanisms of exchange and trust in which the artisan component strongly affects the competitive advantage of companies (Rullani, 2014). These elements characterize this specific production model (Becattini, 2004) by transferring the cultural aspects of the territory and the intangible values of "Made in Italy" into a product recognizable for its strong and significant aesthetics (Morace & Lanzone, 2010).

SMEs in high-end fashion, in which traditional craftsmanship plays a central role, today find themselves facing challenges of a global scope, with the effects perceptible in the local dimension. The Italian manufacturing system presents significant integration between savoir-faire, based on "thinking-in-action" processes embedded in SMEs' attitudes (Goretti, 2022), and advanced digital technologies. This synergy develops into what is usually called "advanced craftsmanship". In these contexts, on the one hand, quality in production in high-end manufacturing is developed through the use of advanced machineries. The digital and sustainable transition explained above causes intense repercussions on value chains (Schwab, 2017), affecting them in operational, organizational, and management terms (Epifani, 2020; Nambisan et al., 2017). On the other hand, the introduction of innovative technologies can co-exist the artisanal values embedded in the local production savoir-faire. SMEs based on artisanal processes, often the backbone of many production systems (Brozzi et al., 2018), can take advantage of local specificities (Floridi, 2020), projecting them into a global context (Zabulis et al., 2019) while developing a glocal manufacturing approach. Development of up-to-date services and time-to-market optimization allows SMEs to be part of the global value chain, while respecting their identity and intrinsic genius loci.

According to Teece (2017), dynamic capabilities are among the most important skills of a manufacturing firm, contributing to their ability to manage their resources and skills in order to exploit the aforementioned skills and mitigate risks

in the fast-changing environment according to market and design trend transformations. Table 1 illustrates how the dynamic capabilities of fashion manufacturing SMEs are able to integrate digital transformation within the manufacturing process. Production firms are creating a new strategy in the digital era to quickly respond to the changing market environment. More specifically, the dynamic capabilities of a SME in the apparel industry facilitate the integration of new processes and products into the existing system and gain a competitive advantage (Teece, 2017).
Within this transition, which is still in process, we highlight common patterns in the digital transformation of Italian SME manufacturing districts:
- Paths of technological innovation are developed in production processes through technology transfer from other production contexts (e.g., the transfer of precision technologies from the automotive system to the fashion sector, as parametric design in modelling of fashion metal gears or ultimate advanced technologies in laser cutting);
- Preservation of craftsmanship values within the implementation of technological innovation in/of the supply chain (e.g., the integration of advanced machines and manual processes in leather goods production);
- Improvements in production planning and time-to-market, procurement of materials, traceability and certification of product authenticity through new digital archiving systems, and the use of up-to-date PLM platforms.
Within this transformation in Italy's manufacturing districts, the urge for environmental sustainability becomes a platform for integrating innovation and the recovery of "historical" manufacturing processes. Prato's textile district represents an emblematic example. It has been known for its wool textile manufacture since medieval times. The city's textile vocation dates back to the 12th Century and was exploited around the second half of the 19th Century with the opening of new markets. Prato is known in particular for regenerated wool processes called Cardato (carded), as well as textile recycling in general. Carding is a specific way of processing fibres where yarn is produced using virgin fibres but also by reusing fibres obtained from recycling old clothing or knits, and cuttings of new fabrics used in the garment industry.

CATEGORIES	**INDICATORS**	
Dynamic Capabilities	Sense	Identify and assess opportunities outside the company
	Seize	Capture value from those opportunities
	Transform/ Reconfigure	Redesign the business model and realign tangible and intangible assets
Digitalization	Digital Transformation	Implement digital technologies

Table 01

Currently, the Associazione per il Tessile Riciclato[1] includes the majority of recycling SMEs certified through Textile Exchange Label[2]. Many production steps are developed by traditional techniques avoiding polluting treatments thanks to a "green supply chain management" (GSCM) (Islam et al., 2022). For example, textile materials are grouped based on colour before initiating the recycling path. Through this differentiation, the regenerated cloth will not need to be coloured again, avoiding a significantly polluting step.
Based upon this ancient know-how, Cardato Regenerated CO2Neutral[3] trademark was created in 2015 to offer market fashion leaders eco-friendly products according to European Commission requirements (Ellen MacArthur Foundation, 2013). Its development is based on assessing water and energy consumption levels and CO_2 emissions from the manufacturing processes. According to solomodasostenibile.it[4], fashion and technology represent a strategic "duo", especially regarding sustainability in production and consumption.
As represented by Cardato Regenerated CO2Neutral, the synergy in between innovation in manufacturing and creative processes play a crucial role in introducing virtuous production process and eco-friendly materials into the fashion system, by implementing it in new design collections and product storytelling. For example, Tiziano Guardini, emerging designer strongly focusing on sustainability, is closely collaborating with SMEs manufacturing Cardato certified fabrics. The designer selects their materials and develops the concepts that emphasize this specific production process rediscovered by Prato district, working on the resulting special finishings and texture. Guardini, taking in consideration technology advancements in manufacturing, develops fashion products as "manifesto" of a new fashion mood where new shapes and details are combined with eco-friendly meanings. Tiziano Guardini[5] has been the winner of Green Fashion Award 2017[6].

The relationship between fashion design and manufacturing is often not totally proactive, with manufacturing occupying a role as a developer and problem-solver rather than a collaborator in design implementation (Fry et al., 2017). Designers' creative ideas frequently relate directly to up-to-date production advancements within production clusters that promote their achievements in fashion B2B fairs (i.e., Première Vision in Paris, Milano Unica in Milan, Techtextile in Frankfurt). Then the fashion design departments select the most interesting raw materials and samples to implement their work. There is a sort of "mutual dependence" between designers and manufacturing SMEs but without a proper integrated proactive dialectic. However, in recent decades, we can see that emerging practices offer significant new stages to the designer-manufacturer relationship.
The case of Prato textile district shows the emerging potential of SME manufacturing clusters in Italy not only as production districts but also as cradles of up-to-date technologies and best practices in process innovation. Within this context, designers can develop creative processes interdependent with the advancements in manufacturing, setting a proactive relation with brand-new production achievements as new craft processes and techniques, while pursuing higher sustainability levels.
In March 2021, National Geographic published an article about the Prato textile district and included on the cover a dramatic image of a large bunch of used fabrics. The cover [Fig. 03] illustrates that these items are not destined for the rubbish dump; rather, they can become new clothes to be worn again. The article on "The End of Trash" (Gambi, 2020; Goldberg, 2020; Kunzig, 2020) presents Prato as one of the capitals of the world's circular economy. In February 2016, a group of companies in the Prato district decided to join the Greenpeace Detox[7] commitments.

1 Associazione per il tessile Riciclato: https://astrirecycling.it/en/astri-recycling-2/.
2 Textile Exchange – retrieved from https://www.solomodasostenibile.it/2020/07/24/la-moda-il-riciclo-e-leconomia-circolare/.
3 Cardato and Cardato Regenerated CO2 Neutral brand: http://www.cardato.it/en/en-home/.
4 https://www.solomodasostenibile.it
5 https://www.texmodatessuti.com/sostenibilita/tiziano-guardini-texmoda-tessuti/
6 https://www.wearglobalnetwork.com/news/winner-of-green-carpet-fashion-award-2017-designer-tiziano-guardini-selects-new-concept-by-santoni-fulgar-as-key-accessory-for-his-collection/
7 About Detox: https://www.oeko-tex.com/en/our-standards/oeko-tex-detox-to-zero

The Transformations in Fashion Design Practices: New Research Perspectives

Within the framework this article offers about the contemporary relationship between fashion design processes and the manufacturing system, in the light of the New European Bauhaus principles empowered by digitalization, the debate unravels in multiple directions for research and practice. The creative and cultural dimension of the fashion industry shows the research silos that keep fashion studies and fashion design research separate, limiting a richer conversation about the role of fashion as cultural and political agent. As Fiorani (2006: 7-8) stated, fashion is "(…) the mold of the contemporary culture, in its ability to join the dynamics between individual and society. (…) Fashion is the most complete expression of a post-modern industrial culture (…)". In its identity-making dimension and because of the cultural embodiment process it materializes and promotes, fashion acts in the creation of a cultural phenomenology (Csordas, 1999) where the embodied experiences we live and the multiple cultural meanings we experience intersect.
Fashion becomes a political agent when carrying meanings and messages (Calefato, 2021) and thereby allows the reappropriation of roles and spaces. Therefore, it becomes a driver of responsible choices of designers, brands, manufacturers, governments, consumers, and citizens at large as well. In fact, the role of fashion is shaped in the relationship between the meanings embodied in the products and the nature of processes that generate those products. As Manzini (2022) suggested about fashion becoming an agent of regeneration, and therefore a political actor, fashion needs to redefine the meaning of newness, diversity, care, and therefore quality.
Paolo Franzo in his article "Fashion as a Practice of care" moves from this premise and the concept of futuring (Fry, 2009) and fashion futuring (Payne 2019; Vaccari & Vanni, 2020) to discuss the agency of fashion. He discusses the construction of relationalities through fashion production, and the promotion of civic and environmental activism supporting the idea of fashion predesign practices as socio-cultural driver for the enhancement of territorial specificities and traditional crafting practices.
Martina Motta discusses the social impact of the political agency of fashion in detail in the case of the Psycoknit research project, which focuses on overcoming the post-pandemic emotional fear of touching through knitwear practices. In Motta's discourse, the dialectical relation between individual and communities in their being in time and space is key, and fashion design has the potential to lose the traditional connotation of industry and become associated with awareness, self-support, empowerment, and individual representation.
The concept of futuring and reflecting on practices to design futures connects also to the need to develop plural perspectives. The work of Rodriguez-Schon and Colombi discusses the AI-empowered trend practice in fashion. They comment on the ethical implications of AI in relation to the creation of biased knowledge and inequalities due to the lack of diverse representation, the lack of neutrality in the information generated, and the lack responsibility for the use of data.
The creation of alternative stories about fashion and alternative imageries is further explored by Davalli within the theoretical framework of The Pleasure of Text by Roland Barthes. In particular, in "Meaty Mags and Fleshy Films: Observing the Morphing Body of Text In Fashion Visual Culture", Davalli discusses the relation between written texts in the fashion communication and the visual fashion culture that is created as a result of complex metaphorical and semantic processes where media and tools are reinterpreted.
Filieri, Benelli and Filippi bring the discourse even further, reflecting on the relationship between Fashion and Art, very often debated by scholars. They highlight how Fashion acts in the engagement of the consumers and question about its real ability to be inclusive, sustainable and equal.
Discussion on the role of fashion designers is more relevant than ever. While Franzo highlights the social and civic connections between the designers and the territory intended as a complex reservoir of knowledge, competences, and relations, Faerm proposes the idea of the "Designer-As-Social Scientist", stressing the need for a holistic approach to consumers' needs and questioning the traditional fashion design process' fit in the contemporary world. The discourse on the epistemological dimension of design and the role of designers started with the first edition of Herbert Simon's (1969) The Sciences of the Artificial, then updated in the 1981 and 1996 editions. This idea has been explored by other scholars such as Schön (1983) and Cross (2001), among the many. It reverberates now in Faerm's article and also in the manuscripts of Denaro, Bortolotti, Quartu

Fig 01

and Giraldi. The three authors contextualize this discourse in relation to the digital transformation of fashion. Denaro discusses the competencies and skills required within a 4.0 fashion industry, where digital competencies need to be integrated with soft skills beyond disciplinary boundaries. Bortolotti zooms in to read the identity and role of artisanship in the 4.0 paradigm, especially in the Italian manufacturing landscape, where advanced and digital technologies can empower an "artisanal intelligence" that can be the real engine toward the 5.0 paradigm. Quartu's work explores a project of digitalization of fabrics from historical archives and explore their application in interactive digital environments. The research opens new perspectives for innovation in textiles and fashion design, with the potential for immersive phygital experiences and digital archives for fragile artifacts. Giraldi closes the circle of thoughts, analyzing the opportunities offered by the metaverse. The real impact of the Metaverse in the fashion industry is currently under discussion so we ask ourselves: What is fashion in the metaverse? If fashion is not just an industry based on designing, producing, and selling garments and accessories, how can the metaverse streamline fashion's political, cultural, and social roles and objectives? What is the object of such fashion?

Coppola's article also tackles a renovated approach to fashion, starting from the environmental needs posed by overproduction and overconsumption in an attempt to change the narrative and the perceived value of waste in the traditional fashion process.

The aforementioned research perspectives are reflected also in current debate on fashion education (Bertola, 2018; Bertola & Colombi, 2021), where the shift to an open, accessible, non-disciplinary knowledge is asking for new educational models. Morea's work can be seen as part of this discourse as it presents a toolkit to integrating sustainability assessment as a constitutive component of the fashion design practice and therefore of fashion design education. Traditional tools, such fashion libraries, see their identity and role renewed because of the relationship with the digital realm, as Trame explains in her manuscript. In fact, the expansion of the concept of libraries and their practices in the digital age highlights the need to reconsider the nature of these institutions and the accessibility of fashion documentation. Lo Savio discusses the incorporation of artificial intelligence

equipping creative individuals with tools that can assist them in tasks such as collection management, trend interpretation, cataloguing, and reduction of material waste. By conducting a thorough analysis, he assesses several cases where AI is employed in fashion design, exploring its role in either collaborating with or substituting the fashion designer.

Finally, Sbordone recalls fundamental questions in regard to the relationship between the design and creative culture and the quality of fashion, to the expression of the self in the digital era, to the belonging to a context, being it digital or natural, and to the reconstruction of the connection between those two dimensions.

This overview updates streams traditionally debated by scholars, but it highlights the urgency of building virtuous relationships between industry and civil society in search of a responsible and sustainable system. The perspectives offered by the articles included in this issue question the fashion status quo and our understanding of fashion not only as an industry but as a socio-cultural and political agent. Finally, they stimulate further investigations in order to capture the everchanging redefinition of fashion in light of the contemporary challenges and opportunities we are facing as a society.

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Figure Captions

Table 01: Operationalization Table. Source: Teece (2017)
Fig. 01: Cardato Regenerated CO2Neutral, Samples. Source: Texmoda

Aknowledgements

This article is the result of common research and findings; nevertheless, Chiara Colombi edited Sections 1, 2, and 4; Gabriele Goretti edited section 3.