GFC GLOBAL FASHION CONFERENCE 2021

Fashion Design Education Towards Twin Transition. Developing multidisciplinary skills for future professionals

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Abstract

The role of Fashion Design Education has been facing a renovation phase, being impacted by the green and digital "twin" transition, which has effects on contents delivered in educational paths and on approaches, tools, and channels chosen for training and educating new generations of young professionals. During their careers, fashion design students should be able to deepen some of the actual macro trends that are challenging and revolutionizing the industry scenario, such as the diffusion of sustainability issues, the effects and improvements of the digital transformation on the whole supply chain as well as new production and consumption dynamics renovating traditional business models (Bertola & Vandi, 2020). Considering this scenario, it becomes urgent to develop new professional creative profiles with multidisciplinary skills and flexible expertise, be trained to catch issues, create bridges between different disciplines, and connect with other fields. Leveraging this challenge, the Higher Educational Institutions (HEIs) are progressively introducing research paths and didactic approaches for providing students with transdisciplinary knowledge (Iannilli & Sancassani, 2020). Open Educational Resources, e-Learning, and Massive Open Online Courses (MOOCs) favour the creation of a blended environment in which the hybridization between the digital and physical sphere enables active and collaborative learning, providing students with more hands-on activities of demonstration of how theoretical knowledge could be applied during project-based classes. Nevertheless, HEIs only partially address these new approaches within design and creative courses (Faerm, 2012; Bruff et al., 2013; Dove, 2020). The need for flexibility has also been expressively highlighted by the pandemic situation that has forced educators and students worldwide to work and learn from home, significantly increasing the adoption of digital tools in didactics but also showing a lack of awareness in mastering them (Mortati, 2020). In light of this scenario, how to train the next generation of fashion designers by equipping them in arts and fashion with digital innovative and multidisciplinary skills? As a response, the paper presents the collaborative European co-funded project "DigiMooD for CCIs – Digital modules of didactic for cultural

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and creative industries" run from 2018 and 2021, which has been considered an initial leading example of innovating design education with Open Educational Resources (OER). Through DigiMood, the consortium prepared for the next Digital Decade even before the pandemic crisis, identifying a set of new competencies and proposing and testing a new curriculum for the digital creative professionals, with a specific focus on the fashion field, from companies' branding, lifecycle assessments to narrative strategies and digital service models. This has been achieved through direct field experimentation and a co-design approach that involved a multidisciplinary team of experts from academia and the fashion industry. The paper elaborates on the results of the project that provided students with the necessary knowledge to design and operate across disciplines within the fashion system while also testing and experiencing innovative learning environments through blended learning approaches, including the combination of Massive Open Online Courses (MOOCs), Field Projects and internship experiences.

Keywords

Fashion education; Twin Transition; MOOCs; Skill Gap; Sustainability; Digital Transformation.

ISBN: 978-989-54263-2-4

1. Fashion facing the challenge of contemporary transformations

Contemporary societies are impacted by dramatic transformations challenging cultural, societal and economic paradigms which characterized the 20th Century. Being fashion both a culture intensive sector as well as a flourishing industry, it is particularly touched by ongoing changes.

First of all, we are assisting a reconfiguration of geopolitical balances, where global migrations, mass urbanization, religious and political frictions are challenging the very nature of western democracies as well as reshaping and hybridizing cultural identities. As a system producing products and services with high cultural content, fashion is particularly exposed to these dynamics. In fact, during the last few decades, phenomena such as "fast fashion" have contributed to cultural globalization and homologation, often associated with harmful practices of job exploitation. At the same time, fashion acts as a mediator between individual and social identities, and it can be a powerful tool for preserving and empowering cultural meanings and nudging positive behaviours.

Secondly, the environmental crisis is starting to impact people's daily lives. By affecting our planet ecosystem, climate change is putting human health and survival in danger and increasing differences and prosperity's polarization. Globally widespread, fashion is today the second polluting industry in the world. It produces more greenhouse gases yearly than France, Germany, and the UK combined, totalling 2.1 billion tons of CO_2 emissions, approximately 4% of total global emissions. Moreover, in the EU, only about 50% of collected textiles are reused (e.g. exported to other countries), and about 50% are recycled, of which only 1% is made into new clothes (McKinsey&Co, 2021; (Ellen McArthur Foundation, 2020). At the same time, it is one of the few industry in which several sectoral initiatives have been lunched for promoting a paradigm change (i.e. Fashion Pact https://thefashionpact.org/; Global Fashion Agenda https://www.globalfashionagenda.com/; Sustainable Markets Initiative https://www.sustainable-markets.org/) and where new brands and companies are embracing sustainable practices.

Third, new production and consumption dynamics such as distributed manufacturing systems as well as practices belonging to the sharing economy model are emerging, showing recent trends in consumers' behaviours towards more responsible approaches. But still, the majority of fashion groups remains anchored to overproduction and overconsumption dynamics, stiffened in the complexity of their supply chains networks and value chains, unable to rethink their models radically. At the same time, new start-ups and brands are quickly popping up, taking advantage of the potential of new technologies for creating more sustainable and inclusive business approaches. These are progressively promoting new production and consumption dynamics where the process of servitization is playing a critical role (i.e. second hand and rentals).

In light of the depicted scenario, fashion is at a crossroads. It could both twist for becoming a powerful driver of the global change that is needed or, on the contrary, accelerate its own cultural, societal, and environmental negative impacts. For this very reason, the role of new generations is increasingly essential.

Education can play a critical role in growing the awareness, knowledge, and competencies needed to take the right path towards a sustainable future (Bertola & Vandi, 2020).

2. Coupling 'green' and 'digital': design as a driver for the twin transition

The urgency of contrasting ongoing dynamics of environmental and societal crisis as well as climate change are only recently pushing institutions to act for implementing specific policies and strategies. They often support technological innovation that is seen as a powerful lever to accelerate the green transformation if guided with a clear purpose-driven goal. This coupling of digital and sustainable transformation, the so-called 'twin transition', is in fact considered to be a multiplier of the several effects that each of these two processes can separately produce. This vision has been shaped starting from an increasing need for a new responsible approach to technological innovation, which should be guided towards collective and positive goals, more informed by careful consideration of its impacts on a medium long term. The nature of contemporary technologies, where we assist a convergence of nano-bio-info and cognitive sciences, leads, in fact, to unpredictable implications (Roco et al. 2013). They open up unexplored innovation trajectories but also raise several ethical questions, which imply a more explicit definition of the boundaries of research and innovation processes and a growing capacity to envision their impacts. Within this scenario, design is emerging as one of the critical drivers of innovation due to its peculiar nature and cognitive approach.

First, it is by nature a practice that bridges arts with sciences, linking manufacturing and technological systems with cultural and societal evolution. This relevance of arts and humanities in design practices is emerging as an essential component in driving innovation processes towards meaningful collective goals. In fact, pure technocratic approaches, blind to societal and cultural impacts of innovations, have often proved to produce harmful effects on communities and the environment.

Second, design practices have been maturing specific user-driven approaches and methodologies which put at the very centre of innovation processes user experiences, and which are based on a conception of users' and societal values as the main drivers for innovation.

Third, the design process is based on the practice of reiteratively materializing into visual forms (data visualization, mapping, sketching, modelling, etc.) the knowledge and outputs emerging from the innovation pathway, since its early phases and at any stage. This focus on early and continuous prototyping has been proved to be a powerful tool for enhancing innovation processes, facilitating all stakeholders interaction and contributions and setting the stage for collaborative innovation practices.

For these very reasons, design-driven innovation can be an effective approach to promote the so-called 'twin transition', especially in the context of fashion, particularly exposed to current transformations and in need of a paradigmatic change.

In light of this premise, as shown in Figure 1, we can look at design as a creative engine driving innovation at all levels. Through its value-driven approach, it sources both from societal and cultural transformations as

well as from technologies' potentials to envision and visualize meaningful innovation scenarios. These can effectively drive both product-processes innovation and business models innovation, which consequently can also inform both supply-chains and value-chains innovation. Within this model, design is interpreted not as an 'executive function' but rather as a 'thinking practice', whose domain of expertise range from scenario-narratives design to products-services design up to systems-meanings design. Therefore, there is the necessity to equip future designers with the proper knowledge and skills to address this broader and reconfigured domain of practice. To pursue these goals, a new approach to fashion design education is needed, able not only to renew topics and contents but also to overcome the generalized and outdated conception of fashion design as purely product-style centred. This can be done only by fully embracing the potential of coupling the green and digital transition while designing educational paths. They should support fashion designers to familiarize themselves with all digital technologies transforming all key processes within the fashion cycle, linking their potential to reach sustainability goals.

Considering this scenario, it becomes urgent to develop new professional creative profiles with multidisciplinary skills and flexible expertise. They are trained to catch issues, create bridges between different disciplines, and connect with other fields (Iannilli & Sancassani, 2020).

Leveraging this challenge, the following sections will introduce the results of a European project led by Fashion in Process research team at Politecnico di Milano, which have been experimenting along these directions, on the one hand addressing with a multidisciplinary perspective both topics of digital and sustainability, on the other hand approaching technologies themselves as enablers of new educational processes, through the application of blended didactical modalities.

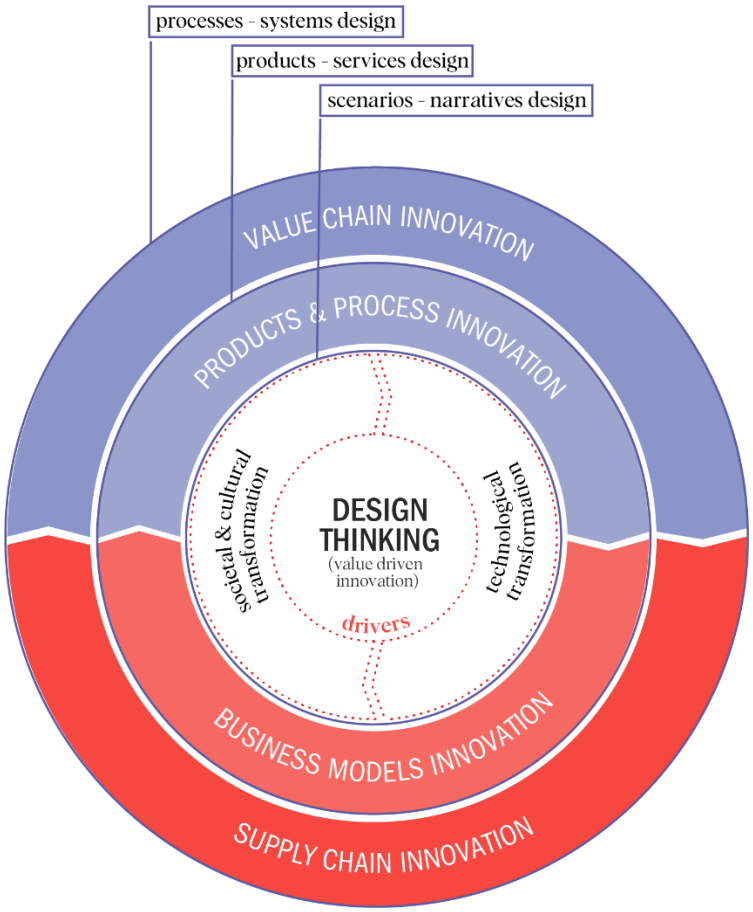

Fig.01 Twin transition through design

3. Research & Methodology

The results presented were developed within the European co-funded project "DigiMooD for CCIs – Digital modules of didactic for Cultural and Creative Industries" (digimood4cci.eu) (Bertola, Mortati, & Vandi, 2020) ran from 2018 and 2021, which has been considered an initial leading example of innovating design education with Open Educational Resources (OER).

Indeed, through a co-design and co-creation approach that involved a multidisciplinary team of experts from academia and the fashion industry, the DigiMooD consortium identified a set of new relevant competencies for designers and creative young professionals.

"Dialoguing with industry, the research consortium has aimed at comprehending employers' and entrepreneurs' needs, their vision for the future of the sector, and the potential translation of this into competences. Confronting different disciplinary knowledge, the project has aimed at being multi-disciplinary in its nature, experimenting with the crossing of traditional academic barriers" (Bertola et.al 2020)

The identified competences (Fig. 02) were proposed and tested through the introduction of six MOOCs as an opportunity to investigate new educational paths and resources especially aimed for Fashion Designers. In fact, the specific focus of DigiMooD MOOCs is on the fashion field, particularly dealing with companies'

branding content strategies, product lifecycle assessments, retail and interaction design strategies, and digital service models.

A special focus is given to sustainability, whose main topics and issues related are faced throughout the whole digital learning experience.

The interdisciplinary modules were designed, implemented, delivered, and evaluated during DigiMooD with the further aim of progressively integrating all of them into the permanent Fashion Design courses offer of Politecnico di Milano.

In connection with the first evaluation tests, modules were offered in a hybrid modality that combined MOOCs, field projects and internships opportunities to offer students a first-hand experience to apply and verify acquired knowledge and skills.

All the digital modules are available in open access from the Polimi Open Knowledge (POK) platform (pok.polimi.it), the first Italian university platform of Politecnico di Milano offering free online courses open to everyone.

3. DigiMooD approach: blended learning methods within educational paths

The pandemic crisis has highly accelerated digital transformation within education, forcing educators and students worldwide to work and learn from home, significantly increasing the adoption of digital tools in didactics but also showing a lack of awareness in mastering them (Mortati, 2020). DigiMoooD project was based on the creation of a set of MOOCs online educational materials delivered through an online platform that are freely accessible to learners.

MOOCs were the first to structure open educational material freely accessible for teaching and learning (mainly in the form of video lessons) into courses, with specific learning outcomes and a series of connected didactic activities (Sancassani et al., 2019). Consequently, MOOCs platforms such as Coursera, Udacity, MIT edX, and FutureLearn were created, validating and corroborating the innovation trajectory of distance learning, that has its roots in the Open Access and Open Knowledge trend.

Even if MOOCs are available and open to anyone, hence potentially appealing to great numbers of people, they are increasingly conceived and designed to be incorporated into universities' instructional portfolio in order to trigger and push the implementation within traditional and established didactic courses (Burd et al. 2015). These needs became clearly urgent for HEIs during the pandemic. Social distancing acted as a major stimulus for remote education, where the adoption of online didactics was the only way to deliver knowledge to students.

The depicted scenario has forced people to an unprecedented shift to online learning at universities around the world (Sood, 2020). Indeed, even though Open Educational Resources, e-Learning, and MOOCs have been progressively integrated into HEIs since 2011 (Griffiths et al., 2015; Morris, 2014) when Stanford University

started to develop digital online courses, the exploration of these innovative forms of pedagogies has been slow and restrained by HEIs.

Unlike this direction and along with the return to campus life and the recovery of face-to-face classes on university campuses, the need for integration and harmonization of open educational resources within existing degrees remained a good practice in order to provide students with more hands-on activities to demonstrate how theoretical knowledge acquired through the MOOC could be applied during project-based classes. This modality confirms that Open Educational Resources like MOOCs – even though their introduction to didactics was speeded up by the pandemic– could become a long-term solution in order to innovate teaching and learning approaches to respond to the current digital transformation. Concurring to this, recognized main elements that characterise MOOCs as powerful blended-learning methods are: (i) the limited timeframe of the course, with specific contents delivered on a weekly base, (ii) didactic contents conveyed through video lectures, with the possibility to integrate extra materials such as papers, slides, and external links, (iii) the availability of quizzes and collaborative features to self-assess the training process (Mortati et al. 2020)

As reported by different articles and studies, the introduction of such innovative methods still presents some weaknesses to be improved (Goodman J. et al. 2019; Reich J. et al. 2019, Bertola et al., 2020), starting from the low completion rate, which is one of the reasons for the MOOCs to be combined with more traditional didactic modes. DidiMooD project's approach was designed to possibly overcome these weakness and explore the potential of digital technologies in renovating didactical methodologies by creating a set of Open Educational Resources (OER). They have been conceived as MOOCs to be flexibly used to train design students filling in their digital skills gaps within all main processes of the fashion cycle and integrating sustainability in each OER as a transversal topic on which all processes, thanks to digital transformation, can produce beneficial impacts. Moreover, they have been tested to be used hybridizing the digital and physical sphere for the creation of blended learning environment in which traditional teaching methods are matched with digital-mediated activities developed online.

Fig.02 The DigiMooD Conference Framework (Bertola et al., 2020)

5. Results and discussion: Digital Modules for Twin Transition

The goal of DigiMooD project was to provide students with the necessary knowledge to design and operate across disciplines, highlighting how the topics addressed in the MOOCs involve sustainability in all aspects of the digital transformation of the fashion value chain. Hence, digital innovation in education becomes the trigger to implement a positive change related to sustainability, and is addressed both as a topic of courses, as well as a key component of the process through which delivering their didactical contents (D'Itria, Vacca, 2021).

DigiMooD developed six MOOCs, addressing different key processes of the fashion value chain.

The MOOCs series begins with the introductory module **"New Business Models and Creative Entrepreneurship in the digital era".** It explores how fashion companies are shifting their strategies from product orientation towards digital, service-oriented paradigms, responding to the need of implementing and developing strategy planning and network development competencies for creative young professionals. In fact, in recent years, technological evolutions advocated the shift of values from owning, to use or share goods. What has been defined "**sharing economy**" is favoured by behavioural change in consumers and networking among peers (Puschmann, Alt,. 2016), mainly enabled by social networks and community platforms. Apart from the economic benefits created for providers, intermediaries, and consumers, from an ecological perspective, the Sharing Economy is constituting a promising move to reduce one of the biggest

issues for the fashion system, which is overproduction, which only result in a significant amount of clothing ending up in landfills without use.

Overproduction and digitization of services lead to another significant transformation within fashion business models which is the increasing **virtualization and dematerialization of products**. In a context where garments are designed, "virtually" produced, and sold directly in the digital sphere, the role of fashion designer needs to be rethought and developed beyond material garment design, promoting the flourishing of dematerialised approaches through digital making competencies. Digitalization can hence support companies and brands from the style office to the communication, wholesale, retail and e-commerce departments, bringing about a change to embrace sustainability in processes, creating new narratives, providing new revenues and value-producing opportunities.

The second MOOC **"Digital Supply Chain Ecosystems for Creative Industries"** tackles sustainability from the upstream side of the fashion pipeline in terms of relationship with suppliers and the warehousing, getting to the downstream part in terms of physical distribution. Indeed, the focus is on supply chain management processes, and, in particular, on how – with the support of technologies – both higher efficiency and effectiveness in logistics can be achieved. Through this module – mainly involving management engineers as teaching professors – students mature technology-empowered logistics competencies which can indubitably produce beneficial effects in terms of sustainability, helping circular business models to be actualized and put into practice. In fact, **distributed manufacturing** informed by digital ecosystems and **blockchain logistics** leads to a controlled and updated tracking and tracing of products and a more efficient planning of assortments by different geographical areas. This results in reducing waste and unsold stocks but also enabling better management and refinement of supply chains' architecture (Bertola, 2021).

In this context, interdisciplinary capabilities typical of designers will be key in approaching detailed blueprint maps to deal with different manufacturing approaches, addressing design choices based on proximity of sourcing-chains and nearshore production. A best practice concerning an innovative way of approaching a supply chain ecosystem through digitalization coming from Salvatore Ferragamo is showcased at the beginning of the course, in order to give an instant overview on the theoretical topics to deal with during the video course.

As a Cultural and Creative Industry (CCI), fashion participates also in the dynamics related to social and cultural sustainability (Vacca, 2021). In fact, being considered as a medium between individuals and their socio-cultural environments, fashion brand evolution has always been characterized by an intense interaction with users that, after the advent of social media technologies, shifted, more naturally and quickly than other contexts, from a passive reception to an active participation of "fashion audiences" in sharing and cocreating contents and values (Bertola and Iannilli, 2021).

Analysing what is happing in the downstream part of the fashion supply chain in relation with retail and after-purchase strategies, the fourth MOOC **"Retail and Service Experience Design for CCIs"** investigate how brand values, multisensorial and communicative qualities of products and services are conveyed and translated into different languages and interaction spaces both physical and virtual, tangible and intangible.
In the specific case of fashion and creative industries, the symbolic meaning of products and services becomes tangible in the retail space, which can now be experienced both online and offline through a multichannel experience. The hybridization of physical and digital environments has favoured the creation several reinterpretations of the purchase experience. Sustainable trajectories adopted by conscious brands regards **circularity-oriented retail services** that involve the post-purchase phase of the chain and allow brands to increase measures to "close the loop". Repair, reuse and recycle opportunities are offered within retail stores and online platforms by brands which try to reduce the production of traditional garments to favour reselling strategies of already existing garments and accessories. SUNNEI, a young and interdisciplinary fashion design brand was selected as a best practice for having innovated its retail and service experience as well as its approach to fashion shows through virtualization.

The MOOC titled **"The Fashion tech paradigm disrupting CCIs models"** is aimed at understanding the impact of Industry 4.0 distributed opportunities for fashion production which mainly led to the democratization of technologies and open innovation – especially for digital manufacturing–, independence of distribution and customization of production. The increased necessity of **personalization and customization** of the fashion product asked by new consumers requires designers to comprehend how the intersection between products and services can be developed thanks to advanced technologies and digital manufacturing. Furthermore, experimenting and prototyping skills will be developed in relations to approaching hyper-craft advanced tools. As outcomes, artefacts developed are designed placing the user at the center and easily considering the environmental impact of materials and production methods, to then scaling up to the entire product lifecycle, including aftercare and disposal measures implementation (Black and Eckert, 2010).

The MOOC **"Data science, visualization and interactive narratives for CCIs"** illustrate how the increased availability of data, as well as their management and representation allow the development of insights and decision-making processes. In this context, especially **Enterprise Resources Planning** (ERP) systems can work towards a sustainable future (Addo-Tenkorang, and Helo, 2011), if fully integrated with **Products Lifecycle Management Systems** (PLM) and **Operational Technologies** (OT) to directly support decision making already within the design phase. Within this approach design act as a creative engine fueled by data offering meaningful pictures of behaviors and performances of all companies' external resources, from suppliers to retailers, up to final customers (Bertola, 2021).

Relevant to respond to the need of transparency requested by new generations, data driven visualizations constitute an opportunity for the fashion system to engage with new audiences.

Considering this scenario, technical capabilities related to analytics and data management as well as algorithm design and coding techniques will be beneficial for creative professionals in order to decode messages from data and to translate and transfer them into sustainable decision-making processes.

Fig.03 How sustainability issues are tackled throughout the whole DigiMooD didactic offer

6. Conclusions

Blended learning approaches integrated within traditional fashion design courses constitute a positive opportunity for students in order to comprehend the complexity of an impactful system that is struggling to reverse the course towards a sustainable paradigm supported by the strong potential of digital tools and platforms. The offer of digital modules presented facilitates the creation of highly interdisciplinary professional profiles, able to face and deal with complex systems and emerging challenges.

Finally, the modules provide to students the opportunity of personalizing the learning experience (i.e. using MOOCs to make the pace of learning individual), and support them in the development of problem-solving, collaboration, and creativity skills.

7. Acknowledgements

The authors like to acknowledge the funding from the Creative Europe programme (call for proposals connect/ 2017/3346110) for the project “DigiMooD for CCIs – Digital modules of didactic for cultural and creative industries” (GA n. LC 00793005) on which this book draws. They would like also to acknowledge the work of all partners of the DigiMooD consortium and the companies and start-ups involved in the project. A special mention goes to Metid the “Innovation Teaching and Learning Task Force” of Politecnico di Milano which was in charge of the development of guidelines for the recording and the production of MOOCs.

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