education for FASHION-TECH

design and technology for future fashion creatives

Chiara Colombi, Livia Tenuta (eds)

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Digital has disrupted many industries. New values, new vision, new business models… and new actors! E4FT provides today's fashion leaders a unique opportunity to be in the driving seat for the next decades. The outcome of this European initiative express the challenge well beyond technologies: we tend to forget that innovation is not only about technology, but also about adoption. It includes social, cultural, emotional dimensions. Although these dimensions are obvious for the creation of a new product, they are usually forgotten when we start to speak about innovation. This essay express the strong connections between research, education, industry. Disruptive innovation requires new thinking, new tools, new skills, new profiles. It must be sustainable to provide return on investment. It means to create solutions, but also to educate and understand the impact, to make it last. E4FT is ambitious and pragmatic, inspiring and reliable. It's the new corner stone of an exciting and productive relation between the worlds of research and industry.

Nicolas Henchoz
Founder and Director of EPFL+ECAL LAB

This roadmap is a great resource for those involved in fashion education and more broadly for companies, policymakers and individual designers in the clothing and textile industry. It clearly highlights the environmental, social and societal urgencies and how they are intertwined and expressed within fashion. It reflects on the opportunities that technology has to offer, while also holding a critical stance towards the role and effects of the merge of fashion and technology. It provides new ways of looking at the human body and emotional needs within a rapidly changing environment that challenges design students to reevaluate the fashion system as well as individual relationships with clothing. By giving both theoretical grounding and practical guidance, it can accelerate the convergence of disciplines that is necessary in order to bring new perspectives into the fashion system and promote conscious innovation. The proposed shift in education generates a new awareness and perspective for action for a new generation of students.

Pauline van Dongen
Wearable Technology Designer,
Founder & Creative Director of Pauline van Dongen

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Chiara Colombi, Jose Teunissen, Ann Vellesalu

05. HIGHER EDUCATION INSTITUTIONS' TRANSNATIONAL PARTNERSHIP

C. Colombi, J. Teunissen, A. Vellesalu

More and more companies are building close relationships with HEIs. They are no longer only interested in placements or recruitment of graduated talents, they want to develop relations with students while they study, to be close to the talent pool. Another motivation is to facilitate collaboration with students and HEIs on major challenges the industry is facing to find answers to bridge the gap between traditional design and new technologies that help to make the industry more sustainable, forward-thinking and effective.

To facilitate the exchange, flow of knowledge and co-creation within the Fashion-Tech sector industries to boost students' employability and innovation potential is the main aim today. The E4FT project was mainly focused on Higher Education Institution, the next step is the one to create a connection with the industry to test and implement the professional figures educated with the methodology developed during the E4FT project.

ENVISIONING FUTURE SCENARIOS FOR TRANSNATIONAL PARTNERSHIPS IN HIGHER EDUCATION WITHIN FASHION-TECH FIELD: FTALLIANCE

That is why another European Project was activated, FTalliance: Weaving Universities and Companies to Co-create Fashion-Tech Future Talents and the consortium comprises 13 partners (12 full + 1 associate) among which are higher education institutions, research organisations and small, medium and large enterprises. The European dimension of the consortium reflects the complexity and the international character of the Fashion supply chain. FTalliance ambition clearly requires a major collaborative effort by pooling and sharing know-how and resources. A European wide university-business cooperation is needed to enhance the fashion and textile designers' skills and capabilities to compete at international level. To enhance industrial, research or educational institution cooperation on a European scale, multidisciplinary skills and resources are necessary to carry out innovative educational models when engaging a holistic business value chain. In particular, the combination of specialised knowledge in fashion design, engineering, material science, manufacturing, and business modelling is needed to develop Fashion-Tech savvy professionals. Within the consortium each partner has a unique complimentary speciality embedded in a regional cluster (Lombardy, London, Nouvelle-Aquitaine, Holland and Västra Götaland). FTalliance is an International Industry-Academia educational Alliance designed to enable mutual learning from different research, training and industry experiences, to exchange know-how and build an open-innovation model to foster cooperation and nurture the competitive growth of the Fashion-Tech market. The FTalliance project starts with a series of knowledge exchange activities aimed at fine-tuning a multidisciplinary Fashion-Tech curriculum integrating fashion, design and engineering with industry-relevant challenges through open innovation and project-based learning methodologies. Secondly, the project is aimed at designing and piloting innovative mentoring formats for students. Workshops will be launched in the form of challenging based design activities to boost creative encounters within the framework of a number of industry briefs, allowing beneficial and reciprocal exchanges between the student participants and companies. Lastly, the project explores the development of a Fashion-Tech Residency and cocreation opportunities to foster innovative concept development and products prototypes. The residentcies have the objective of generating a hands-on pedagogical model embedding students in company innovation activities. The selected students will have the opportunity to develop their projects through coaching opportunities provided by the host company. At the end of the Residency period, FTalliance will deliver a portfolio of developed projects. The purpose behind the project is to ensure the ongoing innovation in the European Fashion-Tech sector by providing emerging talent with relevant competencies and know-how to enter the jobs market. We will do this by building strong and committed partnerships between higher education institutions, fashion enterprises and their socio-economic supply chains. Fashion-Tech means new products, process- es, tools and professional figures that come about as a result of cross-disciplinary approach- es. To keep up with this emerging field, there is an increasing urgency for universities and companies to adapt to and advance collaborative practices, to find ways to integrate new technologies into fashion and design to boost competitiveness.mAs previously seen, according to the most recent reports the Fashion-Tech area is not anymore, a future direction but it is a tangible reality. The new research report published by MarketsandMarkets™ proves that the Wearable Materials Market size is projected to grow from USD 1.5 billion in 2018 to USD 2.9 billion by 2023, at a compound annual growth rate (CAGR) of 15.0% between 2018 and 2023.The global smart fabrics market, on the other hand, was valued at USD 1.72 billion in 2017 and is expected to reach USD 4.08 billion by 2023, at a CAGR of 19.01% over the forecast period (2018-2023) (Mordor Intelligence). Also, regarding production, new technologies such as robotics and 3D printing are maturing and overcoming some of their early limitations and may enable companies to deal with these time pressures and offer customers greater personalisation at the same time. However, to support the competitive growth of the emerging EU Fashion-Tech sector we need to ensure that fashion and textile, design and engineer graduates are equipped with necessary Fashion-Tech skills. Fashion-Tech Master's courses are emerging along with existing modules to train students in the design and development of products that embed technologies in the process or in the product itself. These courses must ensure they are in dialogue with fashion and technology companies to ensure they are responding to industry needs.

The challenge is to co-create shared experiential models among fashion, design, engineering HEIs and fashion, apparel and accessories enterprises including:

- knowledge exchange activities aimed at fine

tuning a multidisciplinary Fashion-Tech curriculum and integrating within it industrial relevant activities through open innovation methodologies, project and challenge based learning; educational experiences aimed to satisfy the expected level of competence according to the field-oriented approach in Fashion-Tech. Delivering a new curriculum and innovative delivery models making the knowledge triangle work by linking fashion, textile and design higher education, research and Fashion-Tech businesses for excellence and regional development. This is expected to contribute to the EU 2020 goal of raising graduate numbers and to support the implementation of the Bologna Process improving HEIs European Qualifications Framework (EQF) and using the ECTS systems to assure the recognition of the skills acquired;

• learning experience with students and companies in the form of contests to boost creative encounters within the framework of a challenge rich in innovations allowing beneficial and reciprocal exchanges between the participants and companies;

• development of a Fashion-Tech Residency and co-creation opportunities to generate innovation and to propose a model through a multidisciplinary exchange between the creativity of young international talents and the know-how, expertise, tools and channels of the host company; this educational model aims to improve the entrepreneurial attitude of students.

Generally, the companies will get the following benefits:

• Having students through Fashion-Tech residencies with the goal of producing connected fashion (Innovate processes and products form ideation to implementation);

• Co-create examples of how connected fashion can create new revenue models for fashion companies;

• Inspire and accelerate radical Digital Fashion innovations and their uptake;

• Being influential on the next cursus for Fashion-Tech;

• Using resources on Fashion-Tech topics matching industry needs.

The project is designed to support technological developments and global competition creating new opportunities for people in higher education. The project contributes to achieve into the EU Education policy objectives as it promotes sharing knowledge from one another across national

borders and to work together on joint projects to develop good learning and teaching and teaching models, undertake excellent research and promote innovation in the field of Fashion Design and Engineering.

Starting from the conviction that today it is necessary to share as much as possible one's knowledge and results, all training materials and results produced by the Alliance will be made openly available to the public as open educational resources (OERs) via the project website, the partners' websites and their own institutional platforms and repositories as well as through the E+ Dissemination Platform. To favour a wider diffusion of the results, the IP framework will be based on Creative Commons licences. Course material, edited lectures and other content harvested from the teaching and learning activities will be collated, re-formatted and presented to allow future engagement with this material by a European-wide fashion and textile HEI community. Additionally, each partner will share with teachers and students the training resources through their own institutional learning platform; POLIMI's Open Knowledge platform; UAL LCF's Moodle; ESTIA's Moodle; TUD's Brightspace collaborative and learning environment.

Open Educational Resources: the teaching/learning resources and content produced by the project will be made available under Creative Commons-Share Alike 4.0. This to boost content use and reuse. Learning resources will be also shared in other open sources educational content repositories and in formats suitable to guarantee interoperability with state-of-the-art open learning management systems.

Open Access: publications in peer-reviewed journals through academic dissemination will occur and which will be of value to the research, teaching and industrial community, The partners plan to publish findings about the training and learning experience in peer reviewed journals. To attain a wide dissemination of the knowledge the partnership will follow a self-archiving strategy (Green Road to Open Access). Electronic copies of the peer-reviewed accepted manuscripts will be stored in on-line repositories which allow papers to be publicly accessible in full-text together with complete metadata such as UAL Research Online, OpenAire, Zenodo.org, ResearchGate. Green Open Access will also provide access to other types of content such as conference presentations and training materials.

Open Data: data obtained from the educational activities will be made available as open data through the website, or as supplementary materials in publications and mirrored in other suitable repositories selected e.g. or http://databib.org. The aim is to achieve a wide use

ABOUT

FTalliance

Specifically, FTalliance shows an innovative approach according to the following points:

• Supporting innovation and creativity through partnerships and inter- and transdisciplinary approaches

The partners are committed to drive the collaboration between higher education and companies to ensure a graduate profile that is relevant to the growing Fashion-Tech market.
Through this design-led partnership, there is the opportunity for knowledge exchange, training approaches and sharing best practice to create curricula that directly respond to the trends of the European Fashion-Tech market. With these creative and innovative approaches to develop education in the field of Fashion-Tech, the role of higher-education will be strengthened through its positioning within the field of practice as well as its links to the industry who will be engaged in the project as stakeholders.

• Enhancing the quality and relevance of students' knowledge and skills

The partners see the need and the opportunity for developing specific knowledge and skills of students looking for a successful career in the contemporary Fashion-Tech market. The collaboration among the HEI partners and companies will combine heterogeneous and complementary skills and approaches to Fashion-Tech to:
- design an innovative and relevant curriculum for the sector;
- design a multidisciplinary and intersectoral learning experience for the Fashion-Tech sector;
- create a Fashion-Tech Residency model of integration/multidisciplinarity.
The innovation concerns deepening knowledge on the state-of-the-art of digital technologies for fashion design and manufacturing and the acquisition of new design methods focused on emerging product segments. To enhance the quality, innovative pedagogies will be tested, together with companies. This would lead to develop training models that are more collaborative, learner-centred, experimental and experiential, open to co-creation and peer-learning, supporting entrepreneurial and intrapreneurial skills that are essential for innovation management in fashion industries.

• Open and innovative practices in a digital era

Open and agile collaborations are crucial to respond with speed and to enhance competitiveness in the fast-changing Fashion-Tech sector. To this end, the project is aimed at testing innovative and open innovation practices through the organisation of a series of co-creation Labs organised so that through collaboration, peer- and challenge-based learning, students will be able to face current and future challenges and to convert knowledge and ideas into products and services for economic and social benefit.

and re-use of the data produced in the project to support further educational and pedagogic research in fashion and design but also to support companies innovation. All data will be identified using a standardised file naming protocol agreed by the partners which will include relevant metadata to ensure their accessibility and findability.

IDEAS FOR IMPLEMENTATION

All the experiences carried out during the three years of the European project have let the EFU4FT partners to identify tools and recommendations in the contemporary panorama, that can serve to implement the teaching and learning activities related to Fashion-Tech and which are reported below.

Learning from Distance

The last few years, and specifically early 2020 because of the Coviud-19 emergency, have seen massive changes in how undergraduate and postgraduate courses are delivered. It is now expected that much, or perhaps all, of the course content will be made available online. This change to online forms of delivery would seem to provide the ideal circumstances for non-traditional methods of teaching and learning to be re-examined.
Online collaborative and cooperative learning techniques are not widely practised, despite their many widely recognized advantages – see for example Panitz (2000). However, interest in such techniques is increasing, as evidenced by the biennial Computer-Supported Collaborative Learning (CSCL) conferences and recent books on the topic by Barkley, Cross, & Major (2003) and Roberts (2003, 2004).
In online collaborative learning, students and teachers learn primarily by communicating amongst themselves via the Internet. In online cooperative learning, students are allocated to, and learn in small groups, and communicate within those groups via the Internet.
Given the increasing importance of distance learning, we have identified two case studies that directly involve two partner universities in the E4FT project and which are described below.

Shared Campus
Seven art and design higher education institutions (University of the Arts London, Zurich University of the Arts, Cit University Of Hong Kong, Hong Kong Baptist University, Kyoto Seika University, Japan, Lasalle College Of The Arts, Singapore, Taipei National University of the Arts, Taiwan) bringing together London, Zurich, Singapore, Taipei, Kyoto and Hong Kong have launched Shared Campus; a united university concept to collaborate on creative education, research and knowledge production across multiple countries. Spearheading an ecologically sustainable, cross-cultural digital university model, Shared Campus partners will build

up collective knowledge by connecting their shared interests, competencies, resources and infrastructures to form a virtual campus.
Based on borderless creative knowledge and values, the project marks the beginning of an education model of worldwide day to day collaboration on global issues.
With a two-year inception phase - December 2019 -, the partners will co-develop activities and tools in support of progressive teaching and learning approaches, addressing cross-disciplinary themes of international relevance. In the longer term, students at the individual institutions will be able to access innovative student mobility and learning experiences, including joint study projects, co-teaching events, digital exchange and online classrooms.

Mooc
MOOC (Massive Open Online Courses) are courses designed for distance learning involving a large number of users.
Participants in the courses, coming from different geographical areas, access the contents only via the network; since the courses are open, access does not require the payment of a registration fee and allows them to use the materials distributed by them.
At Politecnico di Milano, for example, in 2014 the POK, Polimi Open Knowledge, was launched: it is the portal of MOOC (Massive Online Open Courses) of Politecnico di Milano.
POK's slogan is "MOOCs to bridge the gaps": it, therefore, expresses the strategy adopted by the Politecnico di Milano for:
- support students in the various stages of their career;
- promote educational innovation for teachers;
- promote awareness of citizenship.

Advanced Tools

To support collaborative learnings, tools such as AR, VR for a digital design space, to utilise the competence and resources from external HEIs can be a valid support.
As suggested by Susan Smith Nash, a blogger, educator and early ed-tech adopter, five technologies are making a major impact in the higher education classroom:
1. Google Docs and Slack Grant Flexibility in the Higher Ed Classroom
Flexible and able to ensure real-time collaboration with students and teachers, cloud tools like Google Docs adapt to students' needs. Also, formatting is never lost, an advantage of Google's new workflows that makes it easier for educators to build models.
2. Augmented and Virtual Reality Facilitates Hands-On Learning
Virtual reality in the higher education classroom provides a lot of potentials for immersive learning. Educators can enhance teaching of certain techniques by bringing in VR to assist with visualisation. VR also has huge potential in getting students to think outside of the classroom.
3. Adaptive Learning Boosts Student Success
By merging data with elements of artificial intelligence, adaptive learning helps to organize classroom work according to students' abilities. This could represent a breakthrough in academic education.
4. Mondopad and Microsoft Surface Hubs Boost Collaboration
Displays are a mainstay of technology tools in the classroom, whether in the form of one large screen or several small ones. Interactive displays, in particular, foster collaboration.
5. Videoconferencing Technology Expands Higher Education's Reach
Classrooms equipped with video cameras and high-definition displays have generated new possibilities: distance learning teachers, different learning opportunities, the participation of students who were not able to physically take part in the lessons and ultimately greater access to class resources.

Finding a shared Definition of Fashion-Tech

The previous research carried out in 2017 and presented in the Benchmarking Report has emerged as main keyword integration, intended not only as an integration of technologies in products but also as an integration of processes, languages and professional figure and this is nothing else but the learning of the masters of the design that is that designing doesn't mean inventing new shapes but creating new behaviours.
In the contemporary, from the case studies analysed throughout the essay, from the results emerged during the applied research and from the future directions of the Fashion-Tech scenarios it is clear that integration is already in place. Heterogeneous worlds, disciplines and professionals have already activated a dialogue that needs a fluid reading of the contents.
If at that time it was considered important to collect all the information in precise areas, today an approach that takes into account contamination and hybridization that involves the actors of the Fashion-Tech sector is necessary. It is enough to look at the learning units presented in chapter 3 to realize how essential flexibility

is in the management and organization of contents according to the expected output, or look at the case studies that involve apparently distant worlds - from medicine to wellbeing, from fashion to clubbing.
If before the Benchmarking Report proposed a definition of Fashion-Tech according to three categories (Wearables, Smart textiles and Digital manufacturing), today this is no longer possible and we suggest a more open definition, more fluid, that can involve all those areas and disciplines that intersect with fashion, design and technology in the development of products, processes and services related to Fashion-Tech.

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