

**education** for  
**FASHION-TECH**

*design and technology for future  
fashion creatives*

**Chiara Colombi, Livia Tenuta (eds)**



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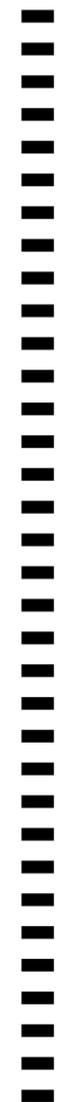
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# 01. FASHION TECH TODAY

Livia Tenuta, Susanna Testa

## 01. FASHION-TECH TODAY

L. Tenuta, S. Testa

In February 2018, the Benchmarking Report - a foundational intellectual output of E4FT project - described the state-of-the-art of Higher Education programmes and other high-qualitative didactic experiences, Research Centres and Companies. The report analysed the intersection between fashion and digital technologies in different steps of the fashion processes: measuring, designing, producing and testing, embedding, communicating and retailing. Through desk research, complemented by face-to-face and long-distance interviews to HEIs, research centres, and companies, data has been collected, compared, and mapped following a qualitative analysis. Specifically, it was described the Companies' approach towards innovation starts (up) from scratch; Research Centres technicality's fail's to formulate scenarios and Universities' generic approach to innovation neglects to hit the market. This analysis underlines Fashion-Tech as a fragmented, disjointed reality that involves and activates various and heterogeneous professionals, disciplines, competencies, methodologies, trends, products, and applications. For this reason, it has highlighted the need to better understand the meaning of the three main areas of Fashion-Tech--Smart textiles, Wearables, Digital manufacturing-- and to create a shared

and more comprehensive definition.

**Wearables** are on body products such as clothing, footwear, accessories and jewellery designed to create communication and interaction, enabled by technologies (digital and virtual) to amplify and extend the natural ability and performance of the human body or add new functions to the user connecting them to their body, other persons or objects and with the environment.

**Smart textiles** are knitted, woven, non-woven fabric systems designed to sense and respond to external stimuli (mechanical, thermal, chemical, biological, magnetic and electrical) enabled by advanced, physical and digital technologies.

**Digital manufacturing** is an integrated approach to manufacturing that is centred around a computational system using tools such as 3D technologies, robotics, AI and AR and the integration between digital technologies for manufacturing processes and embedded digital technologies in products-services (IoT) to enable open and distributed manufacturing that can reshape design, production, distribution and retail processes. The extent of applications ranges from large scale industrial systems, in



The Benchmarking Report, Education-4Fashion-Tech, Available at <https://www.e4ft.eu>

industry 4.0 and DIY/ mini and micro-factory up to digital service platforms and bottom ascending innovative processes, on-demand manufacturing, collaborative and on-site manufacturing (fab-lab and maker space), and repairing and remanufacturing systems.

Combining desk research and the results of interviews, this report also provides an overview of current researches and emerging topics. In particular, 5 macro areas emerged as a representation of possible directions for the future development of the Fashion-Tech sector:

**1. Protection and body enhancement through artificial second skin:** Wearables and Smart textiles with embedded sensors are able to monitor physiological, neurological and body kinematic parameters that are critical for healthcare.

**2. Culture driven Wearable:** Art, technology and innovation: generating thoughts and knowledge around human behaviours, interaction with the body, other people and the environment.

**3. Hyper-body:** Connecting senses and materials: involving three of the five senses (eyesight, hearing, touch) enhancing or “substituting” them.

**4. Fashion takes care:** Sustainability across

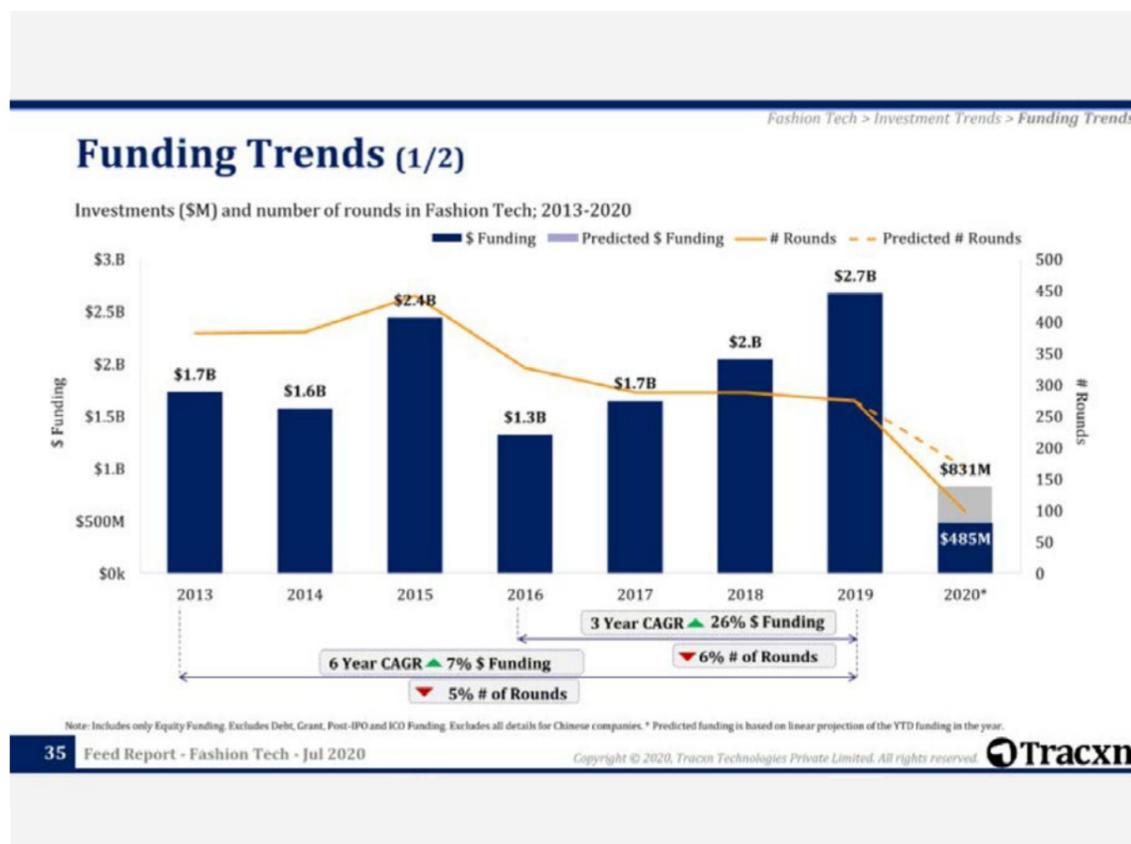
design, production and retail covering the entire supply chain. It is intended to provide efficiency, recyclability, transparency, mission orientation and ethical upgrades.

**5. Real/Virtual mixed environments:** analogical/digital places created and customized with mixed reality as a result of the addition of virtual and augmented reality; new dimensions for self-assembly and programmable materials; artificial intelligence for all the supply chain.

This analysis was carried out starting from a data collection in the second half of 2017, and although the transversality of Fashion-Tech from design to retail has remained a constant, in three years much has changed. “Innovation has been scaled-up along the entire fashion value chain and is here to stay” (McKinsey & Company). Thus, as expected, activities around Fashion-Tech have grown significantly.

According to The Tracxn Feed Report, investments in Fashion-Tech in 2017 were 1.7 billion dollars, 2 in 2018 and 2.5 in 2019. This constant growth confirms the market’s interest in the topic but also leads to a significant increase in the complexity of the sector.

The interest in Fashion-Tech and the need to create a well-structured system to support it emerge not only from the birth of new case



studies, but also from the formation of new educational courses and companies academy. This confirms what was ‘predicted’ in the Benchmarking Report: to face the market we need specialized figures able to manage the different activities related to Fashion-Tech whether they involve products, processes or services. In addition, two major emergencies have had a decisive impact on the proliferation of Fashion-Tech: sustainability and Covid-19, which on the one hand have slowed down all those “non-essential” innovations, on the other hand, have pushed innovation and research on all those technologies that could represent a valid answer to the questions and problems raised by these two critical issues that have undoubtedly challenged what have been the pillars of the fashion system until now. Last but not least, the role of the leading companies in the technological field in the Fashion-Tech field will be deepened, starting from the proliferation of patents they registered.

## EDUCATION GOES FASHION-TECH: COMPANIES' ACADEMIES AND NEW EDUCATIONAL COURSES

**W**e will all need to become life-long learners”, it was stated in the Jobs of the Future report at the World Economic Forum and the European Union has agreed on a 2020 Digital Education Action Plan to stimulate, support and scale-up purposeful use of digital and innovative education practices in Europe. Education and training represent crucial aspects in the context of Fashion-Tech and more generally for innovation practices. The development of new sectors automatically generates the formation of professions that need novel educational models, and therefore lead to the renewal of the system. Compared to the analysis carried out in 2017, the initiatives dedicated to the sphere of Fashion-Tech training have seen an increase. This, therefore, underlines not only the growing importance of the sector in the world of education and business training (Yu, 2020) but also a greater awareness of the characteristics and skills that professionals operating in the sector should have. Case studies of Educational Courses or Companies' Academies relating to Fashion-Tech are presented here below.

### **Tommy Hilfiger + STITCH: New Learning and Technology Capabilities**

“The potential of 3D design is limitless, allowing us to meet consumer needs faster and in a more sustainable way,” said Daniel Grieder, CEO, Tommy Hilfiger Global and PVH Europe (businesswire.com, 2019). Grieder technology plays a fundamental role within design practices and has the potential to significantly accelerate the speed of product placing on the market, avoiding sample production and discards, replacing traditional product photography. For this reason, Tommy Hilfiger announced in November 2019 the goal of incorporating 3D design technology into all clothing design teams at the Amsterdam headquarters. Tommy Hilfiger collections for SS 2022 will be entirely designed using 3D design platforms, in the broader future perspective of digitizing the entire value chain. The brand is investing in a training process that involves all the design teams at its headquarters in Amsterdam to design the Spring 2022 clothing collections entirely in 3D. For this purpose, Tommy Hilfiger has founded STITCH, a technological incubator aimed at digitizing brand design practices. From the digital library of fabrics, patterns and colours to 3D presentation tools and rendering technology: since 2017, a team of software engineers, 3D design

experts and transformation specialists have oriented their practice towards the development of an ecosystem of proprietary tools enabling an entirely digital design workflow. The brand's goal is to train all teams of designers, model makers, technicians, product developers and merchandisers through the STITCH Academy to use 3D software and shift many of the traditional practices to the digital realm.

### **Nvidia AI Technologic Center and AI Academy**

Nvidia AI Technologic Center (NVAITC), inaugurated on 16th January 2020 at the University of Modena and Reggio Emilia, is the first Italian technological centre dedicated to research on artificial intelligence (RUBEIS, 2020). The technopole founded by the Californian giant Nvidia has the aim of pushing the adoption of AI solutions, especially in the industrial field. The agreement signed by Nvidia and Cini, the National Inter-University Consortium for Information Technology, will lead to the opening of other avant-garde centres in Italy in the next three years. The Nvidia-based centre will be opened within the Almage Lab of the university's engineering department. Unimore has been working on the creation of an AI Academy. The aim is to transform the department into the largest

Italian research centre, specialized in computer vision, machine learning and deep learning.

“We need to invest in technology and development to successfully design the artificial intelligence of today and the future. Taking advantage of Nvidia's experience will certainly help to maintain a position of excellence in training in our country. Our researchers will work to develop artificial vision systems aimed at recognizing human behaviours and its interactions, useful to predict movements and events in smart cities,” said Rita Cucchiara, project manager and director of the Cini-AIIS national laboratory on intelligent systems and AI. A strong signal is the presence of companies such as Tetra Pak and Yoox Net-a-Porter Group and representatives of Cineca of Bologna, the inter-university consortium of 67 Italian Universities.

### **Fashion-Technology Academy (FTA)**

The Fashion-Technology Academy (FTA) is a collaboration with Fashion Enter Ltd - a sister company to FashionCapital.co.uk - Haringey Council, DWP and global e-tailer ASOS.com. Opened in March 2016, FTA is an extension of the Stitching Academy and includes a range of qualifications, which cover the entire of the garment life cycle including stitching, production and pattern cutting. With the aim of training a

new generation of professionals, the FTA operates alongside a live factory and fashion studio ensuring that students gain exposure to actual manufacturing skills whilst training for their qualifications.

#### **Fashion-Tech Programme by Startupbootcamp**

The Startupbootcamp FashionTech programme (startupbootcamp.org) consists of a thirteen-week campus in Milan, during which selected start-ups will be able to acquire the tools needed to grow their business with the support of selected experts and a network of partner companies, including Accenture, Coin, Prada Group, PwC, Stone Island, Unilever and Withersworldwide. The FashionTech initiative sees companies taking part as supporting partners in the programme, including the selection and acceleration of the best 30 innovative start-ups able to offer advanced technological solutions to meet current and future market challenges. The areas of greatest interest for the group range from marketing and retail to the search for innovative solutions along the entire value chain. In three years the Startup-Bootcamp FashionTech programme leads to the acceleration of 30 start-ups, following the proven acceleration format developed by Start-

up Bootcamp, which has been operating for 10 years with more than 20 sector programmes in each continent.

#### **Specializing Master in Fashion-Tech**

The Specializing Master in Fashion-Tech of the Politecnico di Milano, managed by POLI.design is dedicated to the futures scenarios of fashion, open to contamination between sport and fashion, competition and leisure, but also Wearable technologies for interactive accessories.

Since 2017, the Master meets the needs of the market that requires innovative products and designers with technical and creative skills and knowledge on new materials, technologies and fashion languages. The Master provides skills relating to product planning for both active and interactive sportswear, for lifestyle in terms of innovative contributions of materials and technologies, for Wearable accessories which can integrate fashion aesthetics with new contents and new functions given by integration with Wearable technologies. It trains designers as capable of working in the field of sporty clothing, sportswear and competitive wear, as in those sectors where one must know how to combine technical materials, new technologies and performance.

#### **MA Fashion Futures: a new direction in Fashion-Tech**

Starting in 2020/2021 LCF has added a pathway with a focus on Fashion-Tech to the MA Fashion Futures that places sustainability and forward-thinking at the heart of fashion practice to help shape the next generation of fashion practitioners who prioritise environmental, social, economic and cultural criteria. It derives from an insight that new technology is a strong force to help to make the industry sustainable. Students are encouraged to analyze the nature and purpose of design in a rapidly changing world, imagining and envisioning alternative ways in which fashion can create and experience in the future, whilst grounding their research in an understanding of the immense challenges that face the industry and wider society today. Students are encouraged to explore and develop experimental fashion practice and theoretical perspectives in parallel to conceptualise a transformed fashion system, one that values nature first and creates economic prosperity in service to this goal. Using your own knowledge, practice and experience as a starting point, you will identify new territories for fashion and work in new spaces with novel technologies, to communicate ideas in relation to design for sustainability to varied au-

diences. MA Fashion Futures offers a space to experiment with new ideas and physical/digital prototyping to challenge existing narratives as well as being a place to put principles into action in a manner that aligns with each student's individual strengths, interests and future aspirations. Aligned to the Centre for Sustainable Fashion, the course involves research and knowledge exchange led teaching, with contribution from a range of the Centre's members. Specialist technical teaching and support in the area of physical computing, e-textiles, creative coding, mixed and virtual reality and 3D print will be provided by the Digital Learning Lab.

#### **FTalliance: Weaving Universities and Companies to Co-create Fashion-Tech Future Talents**

"FTalliance: Weaving Universities and Companies to Co-create Fashion-Tech Future Talents" is a three-year (2020 – 2022) Knowledge Alliance Project co-funded by the Erasmus+ Programme of the European Union aims to facilitate the exchange and flow of knowledge within the Fashion-Tech sector to boost students' employability and innovation potential. The established alliance comprises partners from 6 Programme Countries: 12 full partners among which are higher education institutions

(Politecnico di Milano, ESTIA École Supérieure Des Technologies Industrielles Avancées, University of Borås, London College of Fashion - University of the Arts London, Technische Universiteit Delft), research organisations (Centexbel) and small, medium and big enterprises (Decathlon International, Grado Zero Innovation s.r.l., Pauline van Dongen, Pespow s.p.a., Stentle (M-Cube Group), We Love You Communication). Along with the full partners, the Consortium will be supported by PVH Europe as an associate partner. The purpose of the Project is to ensure the ongoing innovation in the European Fashion-Tech sector by providing emerging talents with relevant competencies and know-how to enter the jobs market. Fashion-Tech means new products, processes, tools and professional figures that come about as a result of cross-disciplinary approaches. To keep up with this emerging field, there is an increasing urgency for organisations to adapt and advance collaborative practices, to find ways to integrate new technologies into fashion and design. FTalliance takes the challenge, by joining different realities into a multidisciplinary and intersectoral project that combines companies' technological, creative and market leadership with universities through theoretical and applied researches and experiences. Over

the next three years, the Consortium will deliver a series of educational activities, from designing and piloting innovative mentoring formats for students to the development of a Fashion-Tech Residency, embedding young talents in the companies' innovation activities. The selected students will have the chance to develop concrete projects and products accessing coaching opportunities innovation spaces, facilities and equipment provided by host companies. In the long-term, the project aims at increasing the relevance, quality and impactfulness of Fashion-Tech innovations and also at enhancing the competitiveness of the European Fashion system at a global level revamping the industry through innovative practices. In addition, the creation of a Fashion Academy by establishing a multidisciplinary and collaborative European network of Higher Education Institution aims at increasing better employability and preparation of students to the market needs.

#### **Digital Fashion at Polimoda**

Creativity and technology in the name of innovation. Polimoda in Florence offers a Master's degree in Digital Fashion, a 9-month programme which aims to train future Chief Innovation Officers for the main fashion houses. The programme, supported by industry experts

and professionals who provide mentorship to the course, such as Lisa Lang, founder of The Powerhouse, and Ashley McDonnell, Global Luxury Account Manager at Google, through cross-field courses addresses topics of current interest and it provides tools to face the challenges of the sector, from the digitization and optimization of the value chain to the adoption of sustainable approaches not only for production but also for merchandising and retail. From hyper-personalization to new ethical materials, the teachings range from strategies for launching and promoting fashion brands online to defining fashion collections through the use of data, from identifying high-potential markets for fashion brands through AI to innovation management.

#### **Big Do and Textile Challenge**

The Swedish government has given the University of Borås the task of establishing and leading Textile & Fashion 2030—the national platform for sustainable fashion and textiles. The five-year assignment is led by Smart textiles, part of Science Park Borås at the University of Borås, in collaboration with the Swedish School of Textiles, the Swedish Fashion Council, the RISE Research Institutes of Sweden, and TEKÖ, the Swedish trade and employers'

association for companies working in the textile and fashion industry.

Big Do is a design hackathon/sprint within Textile & Fashion 2030 that will inspire stakeholders in our industry to move into a transformative decade towards a new prosperous state for the textile and fashion industry. The Swedish School of Textiles and the Do-tank Center at Science Park Borås have provided knowledge and laboratory facilities, enabling the participants to keep full focus on creativity and innovation. It involved companies Gina Tricot, Craft Sportswear, Houdini Sportswear, Guringo Design Studio and Naomi Bailey-Cooper from LCF.

Textile Challenge is a series of activities aiming to inspire and challenge the textile and fashion industry and identify the obstacles to reach the Agenda 2030 goals. The activities welcome participants from all parts of the value chain within the textile and fashion industry.

#### **The Business of Fashion, Textile and Technology (UAL), <https://bftt.org.uk/>**

The BFTT SME R&D Support Programme is an ambitious research and development initiative providing structured support for UK SMEs looking to achieve sustainable growth through R&D. Started in 2019 the programme will dis-

## FASHION-TECH PRODUCTS, PROCESSES AND SERVICES: AN UPDATE

burse around £2.5m in funding (plus leveraged funds). Throughout the course of three and a half years it will take forward up to 25 R&D projects led by SMEs in partnership with leading academic partners.

The programme provides SMEs - and any associated industry partners - with a targeted range of support including funding, mentoring, wide-ranging fashion, textiles and technology industry expertise and showcasing opportunities specifically designed to help SMEs turn bright ideas into commercial products. Interesting examples are Pinatex and AWAYTOMARS. The program is built around the following visionary themes.

### *Reimagining materials and production*

Can future-facing innovations, from bio-technologies to artificial intelligence be adapted for impactful applications within fashion, textiles and/or cosmetics; creating new materials and production processes that improve efficiency, quality, circularity and overall sustainability?

### *Inspiring sustainable consumers*

What business model innovation, novel product-service-systems (PSSs) and/or design solution could lead to systemic change in the sector? What approaches could encourage more sustainable relationships with fashion and beauty?

### *Uncovering hidden data and insights*

The FTT industry has access to the power of data throughout the supply chain to generate a positive impact and change businesses. How can the sector capture in new ways, and ensure that data collected is of high quality, scrutinised effectively, and communicated in ways that drive transparency, collaboration and sustainability throughout product lifecycles?

### *Designing new experiences*

Can technologies like virtual and augmented reality provide new reasons to visit local high-streets?

Could innovations in virtual environments such as those in the gaming sector merge with design and creativity from the fashion world?

**«The magic of the best technology is receiving a great experience, and not knowing whether it's through a human being or artificial intelligence.»**

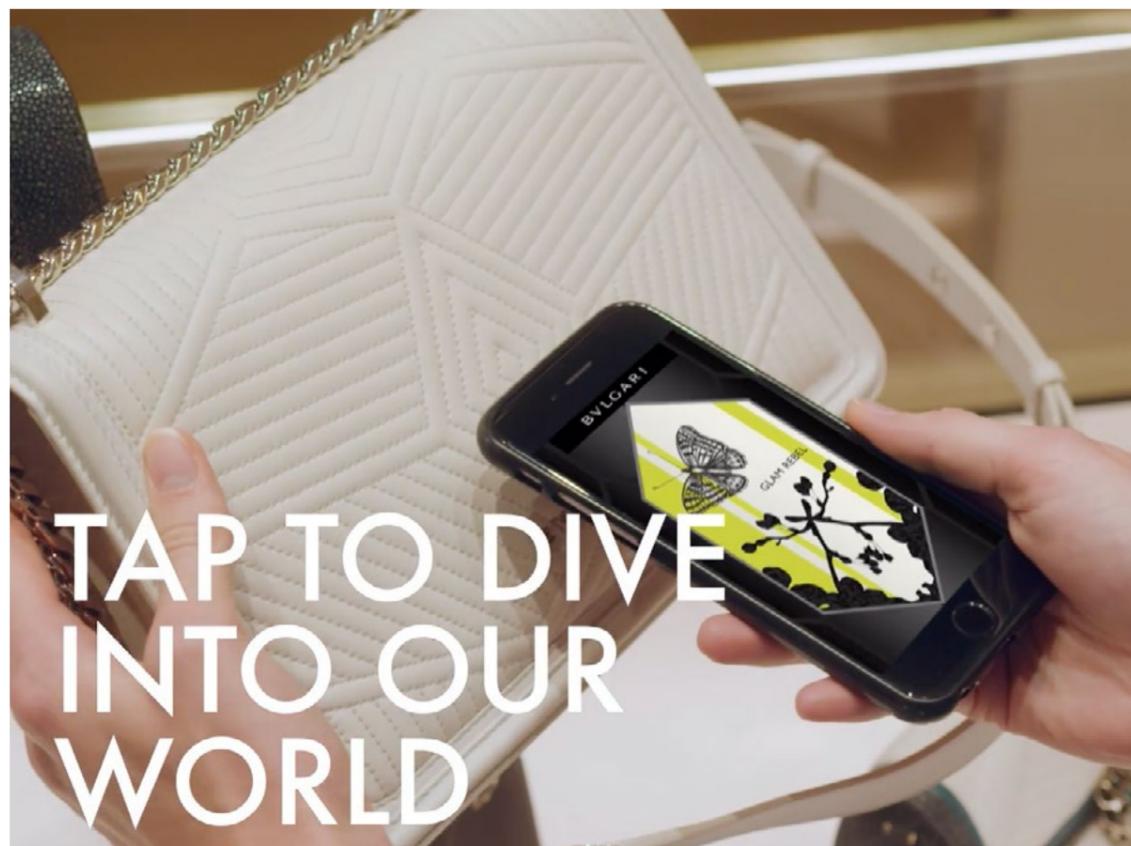
**Michael Klein**

Director of Industry Strategy for Retail at Adobe  
(Theblog.adobe.com, 2018)

Given the need to rise to contemporary challenges and to be innovative, the forms of cross-fertilization are becoming ever more frequent and daring, while the number of sectors involved is steadily growing (Testa, 2019). Over the past three years- since the Benchmarking report was published -, the exploration within the borderline area generated by the interconnection of fashion and digital technologies hasn't certainly stopped, but on the contrary it continued constituting an area of growing interest for companies to face societal contemporary needs and to generate innovation. The experimentations of cross-contamination involved all stages of the value chain, with case studies ranging from products, to services and processes and strategies. As far as product is concerned, companies, from high jewellery to

sportswear, continued exploring the possibility of creating enhanced and personalised experiences for consumers through embedded technology, using the product as an enabling tool capable of generating dynamic interactions with the wearer in different ways.

It is the case, for example, of Bulgari who launched Bulgari Touch, a worldwide product digitization project. Thanks to the NFC tag embedded in the accessories, the brand manages to communicate in a personalized way with customers through the product itself. From luxury to activewear. Nike included the NFC tag in the t-shirts of all NBA teams, in this way customers could interact with the shirt receiving special content related to the team, such as highlights and statistics. As a reward NBA teams offer discounted tickets to special events. Through a partnership with



Bulgari Touch by Bulgari.

Source: Bulgari, <https://www.bulgari.com/it-it/stories/bulgari-touch.html>

Smartrac, the leader in RFID based Internet of Things solutions, Spyder is powering a select collection of its U.S. Ski Team (USST) items to connect with NFC-enabled consumer devices globally. NFC Chips in the products allow customers to have real-time information on events, weather, slopes, social media and sports data on the current races of the US Ski Team. Puma, instead, developed projects by combining NFC and QR code allowing customers to activate special content on sneakers. Carlings, the historic Scandinavian clothing company, created the Last Statement T-shirt. Through a custom version of Instagram/Facebook filters, the design of the t-shirt can digitally be modified. So the shirt can display each time a different animated design to convey and amplify a message. xShüu works as well on customization: the products of the brand have digital surfaces that can be controlled by users through smartphones. Indeed embedding technologies in products enable users to engage in new interactions by connecting them with their body, with other users and with the surrounding environment. In order to provide users with new, enhanced performances these connections generate a mass of discreet data that may be used in real-time, or else exchanged with the system and stored in another spatiotempo-

ral dimension. Screen-centred interactions, in which users dialogued with their devices by means of keyboards or screens, have been increasingly replaced by interactions that take place everywhere and originate new gestures. Indeed, the most cutting-edge project's promoted by big technology multinational companies strive to enable interactions with any kind of surface, and possibly even to eliminate the physical component altogether, thereby turning the gestures themselves into interfaces.

Companies increasingly target digital investments towards different ways to satisfy customers' desires and behaviours. Personalisation, waste reduction, authentication and protection are some of the objectives towards which fashion companies are orienting their practice today. Collection and use of data and artificial intelligence are indeed increasingly powerful tools capable of allowing companies in the sector - as in the case of Kering and Yoox Net-a-Porter programmes - to modulate the offer promptly based on latent (or even declared) consumers' needs, from advanced clienteling to smarter omnichannel shopping experiences, up to the use of data to design and develop products and services. Digital technologies are also a tool that can promote sustainable model adoption practices. Some initiatives and busi-



The Last Statement T-shirt by Carlings.  
Source: [www.dezeen.com](http://www.dezeen.com)

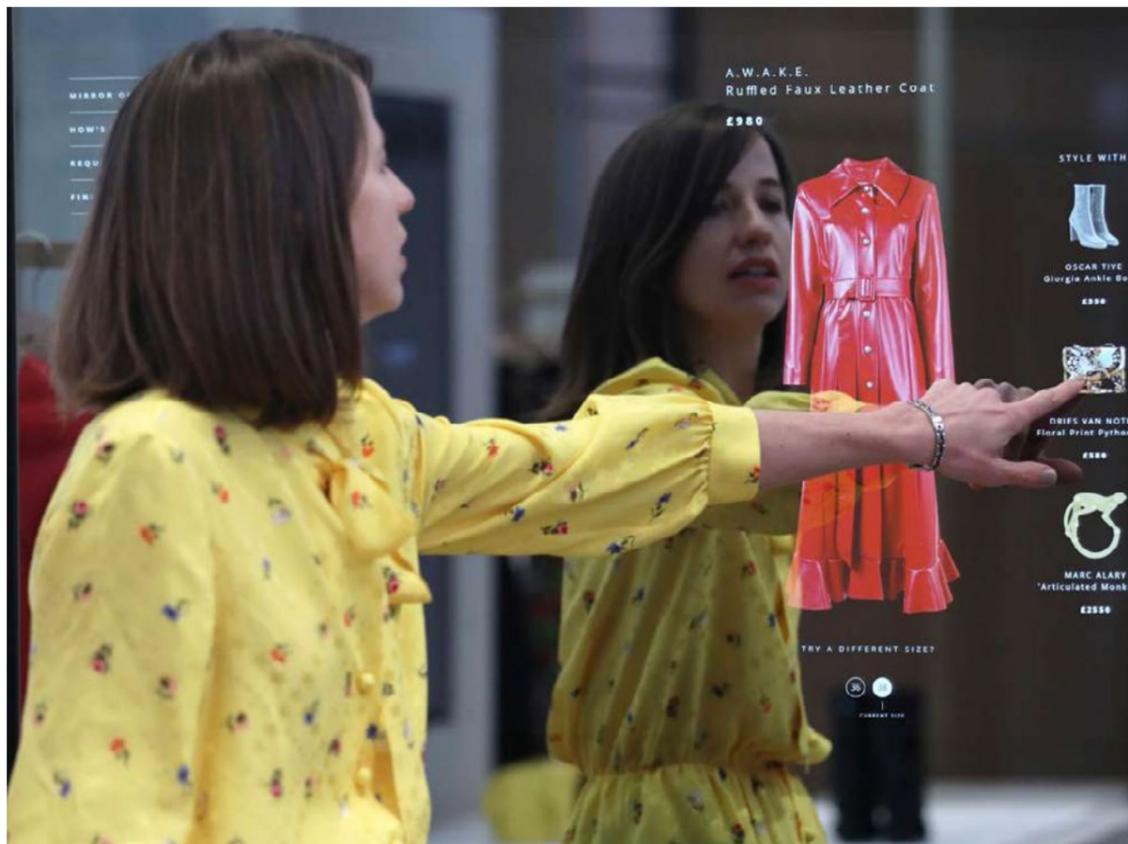


ness models have moved around the possibility of satisfying the need for continuous novelty, typical of the fashion sector, albeit with a view to limiting waste, through the implementation of rental and resale digital platforms: luxury brands such as Burberry have signed official partnerships with The RealReal and other resale sites, while Urban Outfitters Inc. has launched the Nuuly rental service. Sustainability and circularity are the trademark elements of the economic system that should be encouraged; modern-day consumers are increasingly becoming more informed and aware, and demand to know the provenance of the products they buy. Indeed other elements that nowadays plays an important role in enhancing the consumer experience are traceability, transparency, security and data protection. Fashion and luxury goods companies that collect, analyse and use big data to improve user experience and increase sales have been asked to implement data protection and privacy measures and strategies (Luxurysociety.com, 2016). Blockchain enables brands to tell the story behind the products they sell transparently, and also lets them give democratic credit to all the actors involved in the production process. Each object has a history that goes from raw materials to store sale, and Blockchain allows every stage of the pro-

duction chain to be identified and appreciated. Brand trust and sustainability are especially important for younger consumers, and Blockchain is very efficient in tracing products. Moreover, companies enhance customer experience by widening the scope of their narrative dimension and by letting their customers discover their history as well as the origin of every product. While today an increasing number of companies invests on the traceability and sustainability of their production chains, and introduce consumers to their suppliers, also fashion retailers caught the potential of the blockchain: LVMH linked up with Microsoft on Aura, Ba&sh is offering resale through blockchain-enabled purchases and Farfetch joined the Libra Association. Another powerful instrument capable of originating an interactive experience for consumers is artificial intelligence. Big data and artificial intelligence are in the process of bringing about important changes for the fashion industry, with positive results affecting the whole production chain: these concern not only the way products are sold, but also how they are purchased, designed and commercialised (Futureofeverything.io, 2018). In 2016 the Business of Fashion magazine anticipated that artificial intelligence would soon penetrate every sector of society; the modern world seems to confirm

their predictions. Suffice it to consider Alibaba, the e-commerce giant that has invested more than 15 billion dollars in artificial intelligence-related research and development, or even the fact that investments in this sector have tripled since 2013. It would nowadays be unthinkable for online brands to manage customised sales processes without automatization (Exponea.com, 2018). Gartner has estimated that by 2025 85% of the relationships between consumers and companies will take place without any direct interaction between humans. Artificial intelligence will enable particularly busy customers to bypass in-store shopping, and to delegate the whole endeavour to algorithms and smart systems. The whole system is therefore moving towards automatization not just in terms of supply, but also as regards haggling, purchasing, and delivery (Trendwatching, 2018). Some companies find artificial intelligence a very useful tool, as it can optimise processes and provides consumers with a customised experience. This is the case of GhostWriter, an Italian start-up offering a tool or a proprietary technology dedicated to digital marketing, which allows identifying the target audience, knowing their needs and sharing language and objectives. GhostWriter has created a semantic engine, capable of decoding, inter-

preting and reworking texts. Algorithms can extract value from different contexts. One of the challenges of communication today is in fact to decode texts to identify user behaviours on the web. Modern consumers are well-informed and have higher expectations as regards their shopping experience, products and prices; the latter, in particular, can be checked instantly and worldwide (The State of Fashion, 2018). Many online fashion brands have come to appreciate the importance of dividing their market into sub-segments based on the data supplied by the internet. Some of them use this technology to improve the search function on their e-commerce websites. This kind of technology entails the use of algorithms which can predict consumer behaviour; these are based on consistent, frequently recurring parameters such as the number of accesses to a given website, the kind of device used to browse the net, and the geographical location. All of these elements help brands trace consumer profiles, and to tailor the offer on their website on the outcome. Algorithms can follow the online trail left by customers, and support them in identifying the most suitable products. Stitch Fix is based on an extremely innovative retail model which includes active cooperation between consumers, designers, and artificial intelligence. Thanks to



**«In the age of mobile internet, the merging of online and offline [retail] is a trend, consumers don't distinguish between online and offline as long as it fulfils their needs.»**

**Jianzhen Peng**

Secretary General of the China Chain Store Franchise Association  
(Technologyreview.com, 2017)

its services, users no longer need to do their shopping in physical points of sale, and can even forego searching for products online: Stitch Fix delivers customised suggestions directly to their homes at regular intervals, and users are then free to decide whether to keep or return them. Feedback is constantly recorded to improve the algorithms that outline consumer preferences, but also to predict future trends. This model has been very successful: in 2017 this company generated revenues for 1 billion dollars and had 2.2million active customers (Forbes.com, 2018). Retailers such as Stitch Fix and Trunk Club have also adopted a mixed approach of machine learning algorithms with human personal stylists, in order to ensure

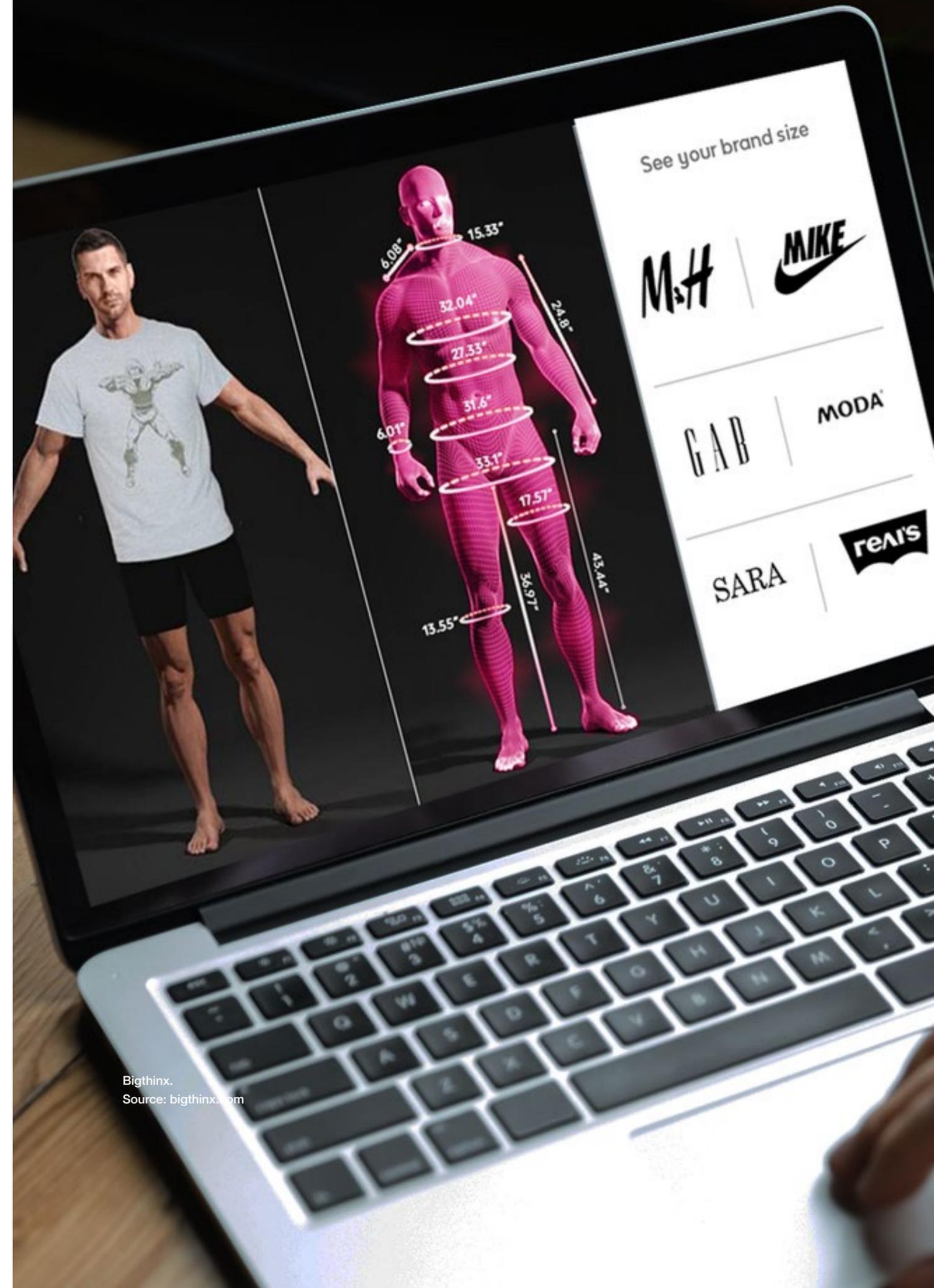
a customised offer. To give but an example, an order placed with Stitch Fix is processed by anything between 5 and 10 algorithms before it reaches a human stylist; the whole process, moreover, is supervised by more than 85 scientists (Forbes.com, 2018). Artificial intelligence has made a great contribution to significantly boosting the development of eye-tracking tools for the fashion industry, which in turn has granted consumers more engaging shopping experience. Websites can nowadays provide advice and suggestions that simplify online user searches, with the consequent reduction of the steps required in the process. Indeed, users can now search for products they may have seen online or on the street, upload images on

Store of the Future by Farfetch, Source: Bloomberg, <https://www.bloomberg.com/news/articles/2017-04-24/online-retailer-farfetch-and-the-retail-store-of-the-future>

a virtual platform, and have an algorithm select the relevant products from a virtual catalogue; users then select the appropriate images by clicking on them and completing their custom. An example of the application of artificial intelligence to a physical point of sale is Farfetch's Store of the Future: it is equipped with a consumer recognition system, shelves and clothing rails with embedded RFID technology, and monitoring mirrors which let users view items in different sizes and colours, before they buy them directly through the mirror itself. In occasion of the celebrations for the Chinese Singles Day, Alibaba launched FashionAI: it is an in-store app that jointly analyses the data from the scanning of the garments customers try on in the changing rooms, from the inventory of the available items, and from the information collected through fashion experts and designers to provide suggestions on fashion items similar to the ones being tried on. Alibaba's sales on that day alone were worth 25 billion dollars (technologyreview.com, 2017). A few brands have chosen a 'conversational' sales approach, which encourages consumers to use chatboxes or voice assistants to speak directly to brands. The system relies on smart agents that simulate human behaviour, conversation programmes (Mauldin, 1994), and customer sup-

port software with natural language processing systems that stimulate conversation with consumers and suggest the most suitable products. Brands like Louis Vuitton, Everlane, Burberry and Nike use Facebook Messenger, which also relies on artificial intelligence, to offer customers a guided shopping experience. Another relevant example is Bot, Levi's Virtual Stylist. Developed in conjunction with Mode.ai, it is a chatbox based on Facebook Messenger which supports consumers looking for a pair of jeans, thus reducing the number of returned products. The Virtual Stylist understands the users' language, analyses the content of the information it receives and infers the purpose of the consumers' query; its suggestions are synchronised with the products virtual catalogue, and only indicate those products that are listed on the inventory. Finery is an automated digital wardrobe management system that provides advice on the basis of predictive analysis: it collects information on the users' previous purchases, organises the relevant items in a virtual wardrobe, and elaborates several matching outfits based on either the individual user's wardrobe or other e-commerce portals.

The degree of customer satisfaction with this kind of experience is higher (73%) than with e-mail or phone interactions (Unbx.com,

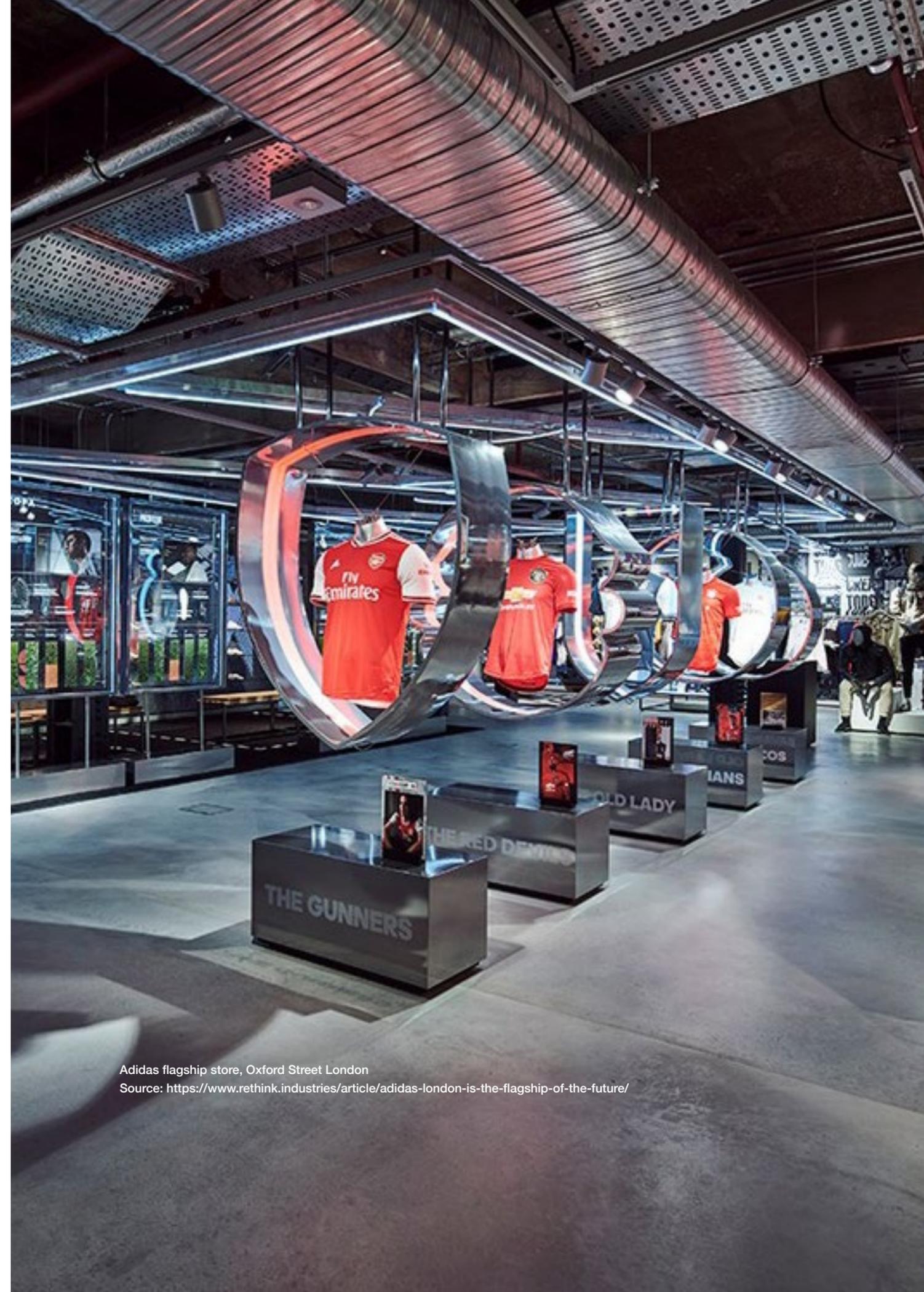


Bigthinkx.  
Source: bigthinkx.com

2017). Artificial intelligence can make the whole production chain from the design stage to the communication one more efficient, with the ultimate goal of giving users a positive experience and, by extension, of increasing profit. Bigthink is an advanced technology start-up specialized in Artificial Intelligence for fashion, fitness and retail. The software the company uses performs a three-dimensional scan of the body from only two pictures taken by smartphone to calculate 44 measurements and identify body composition ratios with an accuracy greater than 95%. Bigthink's neural networks not only create a personalized virtual avatar through given photographs but using AI to digitally recreate virtual clothing from any 2D image to show how it would look the garment in reality. The start-up has also ventured into digital models and virtual photoshoots, allowing brands to produce catalogues and organize fashion shows in an entirely virtual way and at a fraction of the cost of traditional physical procedures. AI can also contribute to the analysis of consumer preferences and the identification of the most popular items on a given company's inventory; once this information is passed on to designers, new products responding to the emerging trends may be created. Amazon, for instance, has developed a programme that determines

whether a garment is fashionable by comparing it to images from the latest collections. This technology is not yet mature, so today it is difficult to provide a critical analysis based on real data. Nevertheless, it is possible to predict that applying artificial intelligence to fashion design may have significant impacts on the system and in particular on the trend research phase and the role of the designer. When it comes to technology and artificial intelligence, there are always conflicting opinions and, even in this case, there are dystopian views of those who claim that the adoption of this software could have negative effects on the role of the designer, who could shift from being a creative actor to a mere performer. However, the tools themselves are neither good nor bad, but their value largely depends on the way they are used. Avoiding technological progress a priori equates to cut oneself off from the games (Baricco, 2018).

Regarding services, in particular, the shopping experience has undergone substantial changes with the intervention of the technology. Younger generations tend to prefer to spend in order to benefit from immaterial experiences, rather than to acquire material goods (Fashionretail.blog, 2018): modern consumers have replaced purchasing finished products with the quest for emotionally-gratifying solutions full of



Adidas flagship store, Oxford Street London  
Source: <https://www.rethink.industries/article/adidas-london-is-the-flagship-of-the-future/>

meaning (Iannilli, 2010, p.18). In this scenario, consumer goods are not identified with mere physical ownership anymore, but rather become associated with the personal enrichment which consumers experience within new contexts. Approaching the project becomes much more complicated, as the latter no longer meets the needs of an expanding society with finished products, but rather supports an evolving society either through services that establish interpersonal relationships or through communication strategies. Points of sale consequently acquire great importance in the interaction between objects and users and help to create a narrative structure around the product (Conti, 2012). Indeed, over the past few years, businesses have reorganised their structure to embrace new models which may generate positive consumer experiences (Simeone, 2001, p. 37). Points of sale are no longer merely devoted to trading, but have in fact turned into hubs of interaction to which consumers have to be attracted. Through their custom consumers become part of a narrative in which every element contributes to the creation of a new scenario; points of sale are thus turned into places favouring participation and interaction. The new technologies have helped develop new spaces, both virtual and physical, which can establish

an immersive dialogue with consumers (Trevisan & Pegoraro, 2007). The new communications technologies have had a significant impact on retail. Flagship and showroom are ever more contaminated with digital technology and change profoundly. An example is constituted by the Adidas Megastore in central London, a space dedicated not only to the mere purchasing act but to a fully engaging experience: workshops, demonstrations, events are organized in-store, mixing media, where analogue practices and tools are mixed with all new technologies available - such as RFID chips in the dressing rooms to understand everything about the garment. It is nowadays no longer possible to draw a strict categorisation between the various types of sales channels: e-commerce and the physical points of sale have been supplanted by hybrid intermediate models which use diverse, context-related channels to enhance the consumer experience. Cloud4wi, an American company with Italian roots - they are a university spin-off created by students from Pisa - offers solutions for the provision of Wi-Fi networks in stores and, based on these, a system of analysis of customer behaviour in the store. A new business, that of Wi-Fi networks and shopping to increase customer engagement that has provided the cue for the birth of

new fashion & tech start-ups. Hybrid systems, conversely, managed to combine the intuitive straightforwardness of online shopping with the physical advantages of traditional points of sale, thereby making the experience of digital purchasing immersive and highly customised. As further proof of this trend, research by NRF has highlighted that the aspects which make online shopping most appealing for consumers include, apart from app-store browsing (66%) and making payments through trusted portals (65%), the possibility to make a purchase online and collect it in-store (68%). Omnichannel shopping requires a revision of customer strategies and of the way in which products and services are offered. Against this backdrop, customer experience demands that the fashion in which products and information are presented, together with customer service, the architecture of points of sale, and warehouse management, be designed from scratch. Other retail solutions focus on customization. Like Viume: a web app that exploits artificial intelligence, combining human expertise and machine learning, to find the most suitable outfit, depending on the occasion, according to the personal characteristics and lifestyle of each customer. Or Scroble for closing the gap between online and physical shopping. Or Obsess and SKMMP focus

on the practicality of the shopping experience. Obsess offers, “enhancing” e-commerce on behalf of brands and retailers, a shopping platform with 3D 360 experiences in HD quality through virtual reality and augmented reality, optimized for mobile phones. SKMMP is a B2B multi-brand digital showroom for men’s and women’s clothing. The “intelligent” showroom allows buyers to use voice, thanks to artificial intelligence, to process the order transaction. “Now, the contactless system in the fashion field not only stops at providing an online shopping platform but also allows people to experience fashion in detail at home with virtual reality (VR) and augmented reality (AR) technology. Soon we will be able to see fashion items in 3D at home showing the quality of the materials used and the decorations put on the items,” Kan Hosup, Korea Society of Fashion Business President, said. 5G will power augmented reality and live video shopping. The processing power of smartphones and their networks has limited effective augmented-reality projects, including shop-adjacent uses in fashion. As the fifth generation of wireless technology, 5G promises faster downloads and less latency. Combined with the influx of AR developer tools from mainstream platforms like Apple and Facebook, 5G could facilitate the technology’s presence on

social media in 2020. For example, customers will be able to “try on” designs on social platforms before checking out in-app. According to Yoram Wurmser, eMarketer principal analyst, 5G will also allow streaming media formats with higher-definition graphics, sound and interactive technologies. Livestream video shopping is already generating \$4.4 billion in sales in China as of 2018 and thanks with 5G will become even more popular. Monki and ShopShops, which connects Chinese shoppers with US boutiques, are some the early adopters.

## THE TWO SIDES OF EMERGENCIES

**«Don't let innovation stop, because this could be the window of opportunity. Use this time to reinvent how you do what you do, bring consumers new alternatives, new value, and in the process even reinvent your own brand.»**

**Doug Stephens**

Retail Futurist

(The Business of Fashion, 2020)

**T**wo main emergencies characterised the last years and strongly affecting the contemporary scene: sustainability - which is not a so-recent-issue but it has become a priority in the fashion industry in the last years - and Covid-19. On the one hand, the two emergencies have slowed down “unnecessary” innovations, while on the other hand, they have speeded up progress to face them. The pandemic that hit the planet at the beginning of 2020 overwhelmed, threatening profoundly, not only public health but also the economy and society. The fashion sector was severely affected by the crisis, and according to the Office for National Statistics (ONS), clothing store sales saw a sharp

fall when compared with the previous month, at negative 34.8% in March 2020. In addition, the lockdown has made the management of e-commerce sites more complex, whose deliveries have been converted according to the rules of social distancing and decrease of personnel involved. The basic processes along the fashion system value chain slowed down drastically, if not a real and proper halt. In this context, for various companies in the sector, the digitization of some activities represented a fundamental opportunity. This is the case of Asos, the e-commerce retailer, which turned to digital fitting models with new garments, allowing it to continue promoting new products among consumers during the lockdown. Asos simulated



## TECH GIANTS TAKING POSITION IN FASHION-TECH

the fittings using a tool developed by Zeekit, an AR and AI company based in Tel Aviv, for up to 500 products every week using six real models. The technology works by digitally mapping each product on the model in a realistic way, taking into account the size, cut and fit of each piece of clothing.

Another example is provided by the format re- definition of the Fashion Weeks, starting from Shanghai, whose organizers have cancelled the physical events for the season, directing their organizational strategy towards a digital dimension: not only Live stream presentations of the collections but also allowing brands to sell the items of the current season through Tmall, Alibaba's platform, partner of the event. Likewise, the activities of the showrooms that deal with the wholesale of the Shanghai Fashion Week brands were largely conducted through live streams, videoconferencing appointments and online orders. The specialized technology platforms that turn to fashion - from the Joor digital showroom to the live stream Hero startup - recorded a significant increase in demand during the first half of 2020. In particular, Hero recorded a 20% increase in average orders placed during the first two weeks of March 2020 in the United States when the coronavirus epidemic was gaining speed (LIEBER, 2020).

In the dramatic nature of events, the current emergency highlighted several limits to the system. But these same limits can represent an opportunity for the relaunch of the sector according to new logic and in a more sustainable perspective. Through 3D technology, virtual sampling and planning based on artificial intelligence, fashion brands will have the opportunity to operate more flexibly along the value chain, reducing time to market and adapting more responsively to trends and consumer needs, avoiding waste.

**T**ech industry's first steps towards a closer relationship with fashion were originally taken autonomously in the 1980s, as the myth of ubiquitous computing and the notion that computers could be essentially carried everywhere began to make their way through the sector. Fashion followed much after. Today the dynamics do not seem to have changed. In fact, while the fashion industry is defining strategies for adopting sustainability-oriented measures and getting ready for digitization, the technology industry has taken a stand (ThePowerHouse Group, 2020). Fashion and fabric companies are lagging behind in the wave of innovation and are not keeping up with the tech giants in asking and obtaining patents in the sector and fashion will be forced to pay expensive license fees to use these technologies. In fact, today various are the examples of IT companies patenting Fashion-Technologies. 2015 was a crucial moment in this context (O'Mahony, 2020). In fact, that year, Sarvint Technologies Inc filed a lawsuit against a number of brands, including Ralph Lauren Corp, Adidas and Sensoria. The lawsuit related to the alleged infringement of U.S. Pat. n. 6,381,482 (2002), 'Fabric or garment with integrated flexible information infrastructure' and U.S. Patent n. 6.970.731 (2005),

an innovative tissue-based sensor for monitoring vital signs. Although Sarvint ultimately lost to Sensoria in 2017, the lawsuit kicked off tricks from industry players, prompting them to become more protective of their IP to avoid episodes of this nature. The tech giants are moving rapidly towards the industry monopoly: Google, Samsung, Apple and Microsoft are taking the lead in marketing smart clothing and fabrics and filing dedicated patents. In particular, in November 2019, Microsoft filed a patent for electronically functioning yarns and a second patent in which it brought its idea of smart fabric one step further with the smart glove project, made of electronically functional fabric (Jones, 2020). IDTechEx chief analyst, James Hayward, says that for the vast majority of textile companies, e-textiles are not an option. Online research shows that by typing the term "e-textile" between patents, the main assignees come from sectors such as electronics, software, medical devices, energy and sports clothing (O'Mahony, 2020).

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