Artificial Intelligence and Blockchain in the Sustainable Fashion System

Today's Information Technology scenario draws a very interesting landscape in the fashion sector, with robots that sew and cut fabrics, artificial intelligence algorithms that optimize production as well as apps that collect data and enrich consumer information. Especially during the pending crisis caused by Covid19, the use and development of artificial intelligence and machine learning applications was accentuated. For example, many brands have equipped themselves with chatbots to fill the absence of dedicated staff and improve the consumer experience in e-commerce. Another use of artificial intelligence concerns inventory management through the analysis of the flow of live information, also useful for managing the exhaustion of stocks on the shelves. In this case, the technology generates automatic replenishment notifications for store employees and alerts distribution centers to send more pieces.

Many brands have taken steps to minimize consumers' fear of buying something on the internet which does not fit, nor matches with what they had imagined. These problems are overcome, often by offering fast shipping and free returns options that, however, do not consider the environmental impact and emissions caused by logistics and transport. The most recent invention relies on virtual reality to show the user the image of the product as if she/he was trying it in the store. By specifying the measurements, you can now get a realistic answer of how a garment will fit on your figure.

A further reason why, even in the fashion system, we are increasingly moving towards solutions related to IT and AI is the growing awareness of the environmental impact. As a matter of fact, according to an investigation carried out by the Environmental Protection Agency, the "new" fashion, the one chosen and purchased from home or on the move, has considerable impacts on pollution. Consumers are increasingly paying attention to ethics involved in the making of a product. The British brand Burberry has developed a mobile app that follows the path that a material takes periodically from its place of collection to its place of processing and, finally, of storage and sale. We arrived

at the development of Voyage, an application to keep an eye on the path of the life cycle of an item of clothing, by scanning a label or entering a unique code.

Process management software, artificial intelligence, robotic automation, blockchain and IoT technology - including sensors, RFID, cloud and networks - will simplify collaboration throughout the supply chain. About 44% of retailers in Europe are currently implementing IoT for supply chain visibility and control, while another 36% are planning to roll out the technology in the next one to three years. There are already examples of retailers such as H&M, Net-a-Porter and Adidas, who have used technology as an enabler of sustainable growth, becoming a key point of the strategy of resilient organizations. Inditex has announced that by 2025, 100% of the cotton, linen and polyester used by all eight of its brands (including Zara, Zara Home and Massimo Dutti) will be sustainable or recyclable. The digital transformation and decisive progress towards the most demanding sustainability standards are complementary and supported by the efficiency of the business model, which is based on offering customers the best in quality fashion. Among the key initiatives launched in recent years, there are the use of "green" raw materials, such as organic cotton, recycled polyester and lyocell, together with the implementation of processes that are more respectful of water and energy consumption, greater attention to the circular economy (collecting used clothes for subsequent reuse or recycling for charity), and the launch of an eco-efficient store platform. "*In Italy business model innovation, brand awareness, market growth and regulatory compliance are the main drivers of retailers' sustainability strategy*"[65].

"*The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value*"[66]

Generally, Blockchain means a decentralized and distributed digital register in which each transaction is recorded in chronological order, giving rise to permanent traces of the operation. The Blockchain is a Distributed Ledger Technology that allows the recording and storage of data through multiple data files controlled by a computer network. The first blockchain was created in 2008 thanks to the development of tools such as cryptography

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[65] Available at: www.datamanager.it
[66] D. and A. Tapscott, Blockchain revolution, 2016

and the processing of data control algorithms that operate autonomously with different levels of security.

The blockchain works by entering information or data of the source, then information and data that are received during each transition are added. It generates a chain consisting of a set of blocks each containing information. This chain, however, has an immutable nature since as a rule its content once written is no longer modifiable or eliminable.

The basic but fundamental components of the Blockchain are:

• Node: these are the servers of each participant

• Transaction: consists of the exchange of data that is verified, approved and then archived

• Block: set of transitions that are archived

• Ledger: is the immutable digital register in which transactions are recorded

• Hash: operation that allows the mapping of text or numeric data

A possible application of the Blockchain is certainly in the tracking of products in the luxury sector along with the entire production chain up to the final buyer. As a matter of fact, through this form of technology, more value is brought not only to the supply chain but to the fashion industry as a whole. Furthermore, the Blockchain can promote the elimination of the traffic of stolen goods and counterfeiting by ensuring greater protection of intellectual property rights through certification and authenticity systems of products that also have repercussions in terms of social and environmental sustainability.

The use of the Blockchain in the Italian fashion industry was enhanced by a pilot project commissioned by the Ministry of Economic Development and by IBM in 2019 focused on the protection of Made in Italy in the textile sector. Furthermore, in the same year, Italy joined the European Blockchain Partnership to strengthen the skills and expertise in terms of new Blockchain technologies and applications. Finally, in March 2021 the first Italian Blockchain network for the provision of public services was designed (Italian Blockchain Service Infrastructure - IBSI project), which saw Inail, Infratel, INPS, Poste Italiane, SOGEI and GSE as main actors.

The phenomenon of fast fashion has led to the creation of very large but not so transparent supply chains that often adopt unsustainable practices from the point of view of environmental, social impact, the protection of human rights, as well as labor policies. Today, especially among younger consumers, there is a strong need to verify that brands are sustainable and ethical, in this sense the traceability guaranteed by a blockchain system would allow the consumer to be informed of those who do not use good production practices. On August 26, 2019, 32 companies committed themselves to achieving concrete goals on climate, biodiversity and oceans together by signing the Fashion Pact. One of the main objectives of the Fashion Pact, which thus far has been signed by over 60 companies active in the fashion and textile sector including the Kering Group, Chanel, Prada, Hermes, Ermenegildo Zenga and Armani, as well as H&M and Inditez, is to promote sustainability within the fashion industry. Also, many brands and companies have tried to increase the traceability of the supply chain of their products and to invest in transparency and consumer education.

The advantages of a blockchain system concern not only on traceability (and therefore the knowledge of the origin of the raw materials and the entire production process up to the final consumer), but this also affects the quality of the product and its compliance. As a matter of fact, the blockchain has proved to be very useful in combating the phenomenon of counterfeiting. According to the Global Brand Counterfeiting Report 2018, the losses due to the marketing of counterfeit products amount up to 30 billion dollars.

Counterfeiting not only generates a loss of profit but also leads the consumer into a state of confusion due to the inability to distinguish the original product from the copy. This uncertainty inevitably affects the image and reputation of the brand. The inclusion of intellectual property rights in an unalterable distributed digital ledger has clear advantages over archiving in a traditional database. This is called smart IP rights. In fact the information on the use of a trademark contained in a blockchain-based official trademark register would allow the competent IP office to be constantly informed, for example [67].

Another application of the blockchain - in terms of protection of intellectual property rights- concerns designer creations and copyright. In practice, designers often rely on

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[67] Lecture held by Gilberto Nava, Tech and Fashion

unregistered designs or copyright protection because product design is constantly changing and registration processes can be expensive and time consuming. However, the protection of unregistered intellectual property rights can cause difficulties that could be overcome using blockchain technology that would allow designers to document every step of the creative process, providing evidence of creation, existence and ownership.

The fashion industry has experimented with different applications of the blockchain to trace the origin of products, prove their authenticity and quality, and affirm ethical claims and fair business practices. Technological collaborations between fashion brands and software houses are increasingly frequent. An example is the invention and application of so-called "smart labels" designed by Martin Jarlgaard, a London fashion designer, in collaboration with the blockchain company Provenance.

Smart labels allow to record every step of the production process and all the actors involved in the process from the farmer to designer, producer and customer can register and follow each step, including identifying the source of the yarn via the Provenance website or the relevant application.

Another example is the Scottish cashmere brand Ballantyne which has created a product authentication platform to ensure quality and to fight the counterfeiting market. The protection mechanism consists in a label sewn into the garment that shows a code that can be scanned with a smartphone to confirm the authenticity of the product.

In the field of new technologies and blockchain, the LVMH project in collaboration with Microsoft and the software company Blockchain ConsenSys was certainly emblematic. In May 2019, LVMH launched AURA a platform based on the Ethereum blockchain technology offering product traceability services. The technology used is a multi-nodal private blockchain protected by ConsenSys technology and by Microsoft, which will allow information to be recorded in a secure and non-reproducible way and generate a unique certificate for each owner. Aura Blockchain Consortium is a non-profit organization, and for this reason the profits will be reinvested to ensure the technological development of the platform[68].

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[68] Available at: www.esg360.it

"AURA makes it possible for consumers to access the product history and proof of authenticity of luxury goods, from raw materials to the point of sale, all the way to second-hand markets"[69].

AURA's goal is to create a unique system that cannot be tampered with and that at the same time ensures the LVHM group that it is acquiring original raw materials that will make up the final product. In the luxury sector, given the high-end prices, the success and survival of a company depend heavily on the authenticity of the products. Through AURA - a company that seeks to track the origin of its raw materials up to the point of sale - LVHM will be able to have 360-degree control using this tool.

The only sacrifice required from a company is to include the Blockchain system in its corporate structure and make it an integral part of its business operations.

The LVMH blockchain application is useful for consumers who want to know the origin of the product and have the guarantee of purchasing an authentic product. But also, it is helpful to monitor sales and distribution channels by analyzing market trends and anticipating demand. The services offered by AURA are aimed not only at satisfying the needs of brands but also at building customer loyalty and at finding high quality raw ingredients, demonstrating the uniqueness and authenticity of their product.

In conclusion, the use of new technological devices and blockchains has many advantages concerning the entire production system as a matter of fact it guarantees the opportunity for companies and brands to record all the details relating to a product advancement through the phases of the chain. In addition it generates a network of loyalty and trust, customers can see firsthand the utilization of sustainable practices and responsible sourcing conducted by individual brands. Furthermore, the transparency generated by the blockchain highlights the corporate culture by enhancing the ethical and sustainability aspects of the production chain, as well as helping to fight against counterfeiting and the trafficking of stolen goods. For example, the information disclosed in the blockchain chain may contain details that publicly indicate whether the activities carried
out are aligned with the principles of equality, equity, privacy information, social

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[69] T. Simms, Louis Vuitton and Christian Dior Owner Unveils Blockchain Platform to Verify Luxury Goods (2019)

assistance or environmental sustainability that the company claims to respect and promote.

However, it must also be considered that the blockchain can be an illusion. As a matter of fact the main problem remains the original data/information. There is no a verification system for the information/data introduced at the origin. In fact, the use of the blockchain to verify each step of the supply chain can only be a slogan or a marketing operation. On one hand it is true that once the data is entered it becomes immutable and therefore its authenticity is guaranteed, but on the other hand, before the insertion, the information can be manipulated, or even false. Technology can only guarantee the immutability and the time of existence of the information, but not its truthfulness. No certification of information can be obtained through a DLT.