

DIGITALIZATION IN THE FASHION AND TEXTILE INDUSTRY

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Abstract: Digitization has been very influential in the fashion and textile industry it has been reshaping the traditional business model, and also it has added the new dimensions to the production, sale, and promotion of products. One of the main achievements of digitalization is the use of technologies such as Artificial Intelligence, Internet of Things and „big data“ analytics that have enabled companies to better know customer preferences and also to predict trends, and to improve production processes. The digital world and social media have even more massively globalized fashion trends, consequently, brands and designers may react to the global audience almost immediately. This paper will discuss a comprehensive overview of the effects of digital technology on textile and fashion industry as well as how it adopted various technologies as the industry got older.

Key words: digitalization, fashion, textile industry, Artificial Intelligence, Internet of Things, digital platforms

1. INTRODUCTION

Digitization has become a key driving force in all industries, and the fashion and textile industry is no exception. Through the integration of digital technologies into business processes, fashion has crossed the boundaries of traditional business models and acquired new dimensions that affect the way fashion and textile products are produced, sold, and promoted [1]. This process enables a faster, more efficient, and more global connection between brands and consumers, thereby changing the way fashion trends are perceived and shaped [2].

Digital marketing, e-commerce, social networks, and advanced technologies such as Artificial Intelligence (AI) and Internet of Things (IoT) are the most notable tools that companies are using in order to respond to the market needs with precision and rapidity. Accordingly, today, not only fashion collections but also designers and the presence of digital platforms would be vital if the companies are to reach out and adapt new styles in the rapid distribution of the good news through the world [3].

Artificial Intelligence technologies are extensively used in the analysis of customer preferences as well as in predicting any upcoming trends. As a result, organizations are able to quickly adjust their strategies based on the real-time feedback from consumers [3]. Globalization of fashion trends can also be seen to be one of the advantages of the digital platforms as they allow designers and brands to be seen by the entire world right after the fashion show is over. As a result of this, not only is the fashion industry progressing but designers and the position of these digital platforms are crucial for the companies that aim for new styles and at the same time, want to be the first to ship the latest trends to every part of the planet overlord. By collecting and analyzing a large amount of data (forming "big data"), the company can better understand the customer, his needs, and optimize the production process [4]. Through the use of AI, IoT, and digital platforms, brands reimagine how to engage and lead their customers. By making the most efficient production and shortening the supply chain, companies tend to satisfy consumer demands very quickly and precisely. This paper examines these changes, focusing on the pivotal role of digital technologies in shaping the future of the industry.

2. ARTIFICIAL INTELLIGENCE TECHNOLOGY

Artificial intelligence (AI) is a growing sector in the information technology field that is about the development of computer programs and systems that can perform tasks that normally require human intelligence. This model is developed on the basis of an approach that aims to emulate human

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thinking, learning, perception, and decision-making [5]. Within the area of Artificial Intelligence, there exist extensive methods and techniques, such as machine learning, that allow systems to learn from data without any direct programming, and natural language processing, which enables machines to talk to and understand human language [6].

The user's data is used to analyze the solution with the help of Artificial Intelligence in a personalized way, and, in addition, it also offers a better experience and more user satisfaction. Among other things, it is to leverage the natural language processing as it is that which allows the AI to respond to the user's inquiries faster and more accurately [7]. Artificial Intelligence has the capability to analyze large-scale data in real time and derive meaningful insights from the data. In fact, this will allow companies to discover hidden patterns, market trends, and user preferences. There is the ability of AI models to predict the future and thus reduce the risks to be managed as the data will provide decision-makers the input they need [8].

The fashion and textile industry is at a stage of increasingly using Artificial Intelligence which it regards as one of the main drivers in the development of new fabrics and the improvement of production processes. This industry utilizes AI for several very important applications. The key one of them is the development of new types of fabrics. AI transforms the textile design process by virtue of allowing the engineer and designer to fashion materials that come out with unique textures and properties. In addition, AI contributes to enhancing production processes. Production facilities often apply artificial intelligence to data analysis because it enables engineers to effortlessly spot any available chances to boost productivity and make savings on material costs [9]. Another use of AI is that it permits the creation of more advanced textile patterns by designers, which gives them the capability to design patterns and designs with more intricate detail. Furthermore, the AI can make patterns that will suit the weather conditions or adapt to the user's body temperature. Contrary to this that AI in the textile sector is just in the beginning stage of its development, it is without doubt that this technology will fundamentally alter the current way of thinking about the design and production of textiles. In addition to textile design, today there are many softwares that facilitate the design of the garment and the collection itself, where the Artificial Intelligence itself makes suggestions for the design based on the given imputations, making the designer's job easier [10]. Figure 1 illustrates the role of AI in creating innovative fabrics, optimizing production processes, and enabling intricate pattern designs through advanced algorithms and machine learning tools.



Figure 1 – Application of artificial intelligence in the fashion and textile industry

For example, platforms like *Designs.AI* enable designers to create unique textures and patterns for fabrics, while *Adobe Sensei* automates routine tasks and encourages innovative design solutions. Also, tools like *Fronty* simplify the web design process by converting image designs into code, enabling faster creation of functional web pages. These tools use advanced machine learning algorithms to

analyze data and give designers the ability to create materials with unique textures and properties, improving the entire design and production process in the fashion industry [10].

3. INTERNET OF THINGS

The Internet of Things (IoT) plays a key role in transforming the textile and fashion industries by enabling the integration of smart technologies into clothing that can track users' biometric data and interact with the digital world. When sensors are incorporated into the fabric, the cloth becomes „smart“ - it acquires the ability to monitor the body's vital signs like temperature, heart rate, breathing, stress, movement, and hormone levels that make it possible to medical, sports, and emotional service through the use of technology. This technological innovation enhances the capabilities of traditional consumer electronics, such as a smartphone device, and thus makes it possible to wear clothing that is an active agent in the daily activities of the users [11].

In the field of medicine, intelligent clothing presents novel ways of tracking chronic diseases, which include the provision of a continuous flow of automatic data to the cloud, where it is analyzed. The doctors and scientists get access to this data, and this can become the basis for correct and personalized treatments, as well as more precise diagnostic procedures. In the sports industry, the smart clothing uses sensors such as accelerometers and gyroscopes to calculate such parameters as muscle activity, strain, and fatigue which in turn help the athletes to increase their performance and avoid injuries. Moreover, smart clothing is designed to give support to help the user to cope up with the likes of detecting the emotional changes and automatically responding with the required form of support, such as reminders, music, or video content, all of which have been shown to have a positive effect on the emotional balance of an individual [11].

The clothing's design is such that it calls for the utilization of flexible, rock-hard materials, and the incorporation of highly developed data transfer methods via Bluetooth and other wireless technologies to enable easy linkage with the cloud and other devices [11]. The use of IoT in the textile industry introduces the idea of computer technologies into ordinary clothes and brings them to the level of wearable technology. Besides that, it is also connected with the fitness, health, and emotional balance of the users [12]. Figure 2 exemplifies the application of IoT in clothing utilizing advanced wireless connectivity technologies, supporting the fitness, health, and emotional well-being of users.

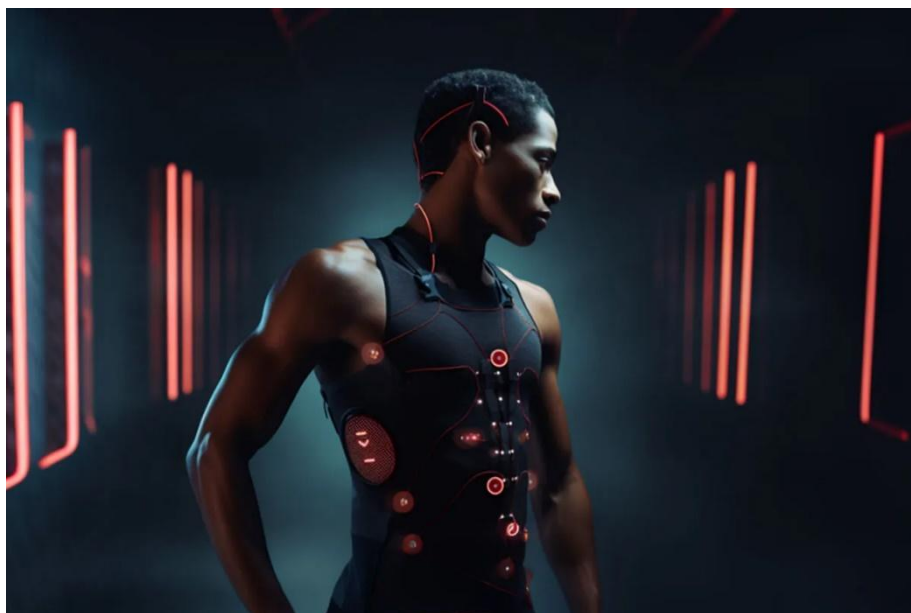


Figure 2 – Application of IoT technologies in the textile industry

In addition to the integration of smart technologies into clothing that allows tracking certain user data, there are also specialized software that improve business processes in the textile and fashion industry, using IoT technology. On the list of the most essential software solutions that integrate IoT technology in the textile and fashion industry are WFX (World Fashion Exchange) Fashion PLM

(Product Lifecycle Management) and WFX (World Fashion Exchange) Apparel ERP (Enterprise Resource Planning). **WFX Fashion PLM** is a product lifecycle management software that gathers all product data in one cloud platform, thus promoting better collaborations between designers, product managers, sales teams and suppliers. This software also provides Virtual Showroom, a digital sales platform that enables brands to invite customers to a private virtual showroom and exhibit collections, thus, helping customers and brands to communicate. On the other hand, **WFX Apparel ERP** is a comprehensive ERP (Enterprise Resource Planning) system that combines all the business functions, starting from the sampling phase to production and accounting, allowing apparel manufacturers to make informed decisions quickly. WFX also offers WFX Smart Factory (Manufacturing Execution System - MES), which is a manufacturing execution system that enhances operational efficiency, accelerates the production process, increases quality, and optimizes the factory performance using real-time information. These software solutions allow fashion brands and manufacturers to utilize IoT technology for their business operations, thus, they will achieve efficiency, transparency, and collaboration [12].

4. DIGITAL PLATFORMS

The globalization of fashion trends through digital platforms is made possible by the development of digital technology and content, which facilitate the rapid and wide sharing of information. Videos, live streaming, virtual showrooms and remote interaction platforms have enabled luxury fashion brands around the world to innovatively present their collections. These approaches contribute not only to the promotion of brands, but also to the creation of unique experiences for consumers, making digital platforms key tools for shaping and spreading global fashion trends.

The use of social networks like Instagram, TikTok, Facebook and YouTube has become one of the main fashion brands' promotion channels, which provides an opportunity for the direct dialogue with buyers, the brand recognition and the announcement's success. With its focus on visual information, Instagram is exceptionally suitable for the fashion industry as brands are able to display their products and use visual content to do so. Also, Instagram Shopping gives a chance for the users to buy products on the platform taking the necessary steps. However, TikTok has stood out as a favorite with its potential for viral content that can go rapidly viral through the use of smart, short video content. The platform can be leveraged by the brands to speak to a young audience or work with influencers for product promotion [13]. Figure 3 showcases the use of TikTok as a platform for fashion brand promotion. The *@race.dont.matter* profile creatively highlights iconic styles from renowned brands such as Chanel, Dior, and Gucci, emphasizing TikTok's potential for engaging visual storytelling and viral marketing within the fashion industry. This example demonstrates how the platform can be effectively utilized to captivate audiences, increase brand visibility, and create a dynamic connection between fashion brands and consumers.



Figure 3 – Example of utilizing TikTok as a platform for fashion brand promotion

Influencers have become an essential element of digital marketing within the fashion industry, serving as a bridge between brands and their target audiences. Fashion brands can easily access niche markets and get to specific consumer groups better by employing celebrities, influencers, and micro-influencers. This, in turn, helps companies to drive engagement and sales, particularly using social media channels. In addition to the influence of influencer marketing, e-mail marketing is also very powerful communication. It allows brands to create a direct relationship with consumers by sending them personalized messages. Thus, brands can easily recognize the personal feeling of consumers, which is growing [14].

The fashion industry has become more and more digital and among the most significant is the e-commerce pillar. E-commerce has gone well beyond being just another sales channel; it has drifted into becoming the main channel of product distribution in the fashion industry. This leap in online sales has made it possible for brands to reach out to more consumers by cutting costs and providing a better, more personalized shopping experience. Furthermore, a combined online presence, and a sales channel which is as efficient as that of the digital world makes the company more competitive and therefore it enables the marketing of products efficiently. Moreover, as the digital world is continuing its evolution, the association of influencer marketing and e-commerce is what will drive the fashion industry on the pathways of success and growth [14].

5. CONCLUSION

Digitization of the fashion and textile industry represents a key step towards modernization and adaptation to modern global challenges. AI, IoT, and digital platforms have dramatically changed the course of traditional business by cutting down the time needed for information processing and setting the standard for precision. The boosted capability of AI is a substantial advancement that lifts the design and production processes to another level, it is not only providing personalized products and trend predictions, but also, it is decreasing the competitive disadvantage of the brands. Although these developments are significant, the industry still faces challenges such as sustainability, protecting user privacy and integrating new technologies into traditional manufacturing processes. Future development will rely on innovative strategies that balance technological progress and conservation of natural resources, as well as on increasingly intensive collaboration between technology experts, designers and industry leaders. The sustainability of the future will depend on innovative methods such as floor spaces that also not only limit the technological footprint but also clothes that are more intelligent. Besides, closer collaboration among executives of technology, fashionable investors, and entrepreneurs is needed to address the issue.

6. REFERENCES

- [1] R. Pal and A. Jayarathne, "Digitalization in the textiles and clothing sector," in *The Digital Supply Chain*, Elsevier, 2022, pp. 255–271. doi: 10.1016/B978-0-323-91614-1.00015-0.
- [2] N. B. Powell and N. L. Cassill, "New textile product development: Processes, practices, and products," *J. Text. Inst.*, vol. 97, no. 2, pp. 155–166, Mar. 2006, doi: 10.1533/joti.2005.0154.
- [3] Z. Wu, "Social media marketing strategy and effect evaluation in e-commerce," *BCP Bus. Manag.*, vol. 50, pp. 187–192, Sep. 2023, doi: 10.54691/bcpbm.v50i.5607.
- [4] M. P. Sikka, A. Sarkar, and S. Garg, "Artificial intelligence (AI) in textile industry operational modernization," *Res. J. Text. Appar.*, vol. 28, no. 1, pp. 67–83, Jan. 2024, doi: 10.1108/RJTA-04-2021-0046.
- [5] J. Vrbka and Z. Rowland, "Using Artificial Intelligence in Company Management," in *Digital Age: Chances, Challenges and Future*, vol. 84, S. I. Ashmarina, M. Vochozka, and V. V. Mantulenko, Eds., in *Lecture Notes in Networks and Systems*, vol. 84, Cham: Springer International Publishing, 2020, pp. 422–429. doi: 10.1007/978-3-030-27015-5_51.

- [6] P. Bhardwaj and S. Pathak, “Artificial Intelligence: A Boon for Online Business,” in *Applications of Artificial Intelligence in Business and Finance*, 1st ed., Boca Raton: Apple Academic Press, 2021, pp. 145–160. doi: 10.1201/9781003129639-8.
- [7] R. Sanwal, “Impact of Artificial Intelligence on the Insurance Industry,” in *Applications of Artificial Intelligence in Business and Finance*, 1st ed., Boca Raton: Apple Academic Press, 2021, pp. 203–219. doi: 10.1201/9781003129639-11.
- [8] S. Sahai and R. Goel, “Impact of Artificial Intelligence in Changing Trends of Marketing,” in *Applications of Artificial Intelligence in Business and Finance*, 1st ed., Boca Raton: Apple Academic Press, 2021, pp. 221–240. doi: 10.1201/9781003129639-12.
- [9] Reenu, S. Singh, S. Vig, and S. Dwivedi, “Impact of uses of Artificial Intelligence (AI) in Textile Industry in India,” in *2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT)*, Kamand, India: IEEE, Jun. 2024, pp. 1–9. doi: 10.1109/ICCCNT61001.2024.10725995.
- [10] “A. McFarland, ‘10 Best AI Fashion Designer Tools (January 2025),’ Unite.AI, Jan. 1, 2025. [Online]. Available: <https://www.unite.ai/best-ai-fashion-designer-tools/>.”
- [11] S. V. Akram *et al.*, “Implementation of Digitalized Technologies for Fashion Industry 4.0: Opportunities and Challenges,” *Sci. Program.*, vol. 2022, pp. 1–17, Aug. 2022, doi: 10.1155/2022/7523246.
- [12] K. Umipig, ‘What is the role of smart textile technology in modern innovation,’ Longevity.Technology, Nov. 29, 2023. [Online]. Available: <https://longevity.technology/lifestyle/what-is-the-role-of-smart-textile-technology-in-modern-innovation/>.
- [13] Fashion Reverie, ‘Global Youth Redefine Themselves through TikTok Fashion,’ Fashion Reverie, Apr. 14, 2021. [Online]. Available: <https://fashionreverie.com/?p=31762>.
- [14] S. M. Sudha and S. K. Sheena, ‘Impact of Influencers in Consumer Decision Process: the Fashion Industry,’ *SCMS Journal of Indian Management*, vol. 14, no. 3, pp. 14–22, Jul.–Sep. 2017. [Online]. Available: https://www.scms.edu.in/uploads/journal/articles/article_12.pdf.