


Chapter 29

Artificial Intelligence in the Fashion Industry—Reality and Prospects



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Abstract Research aims to determine the AI impact on fashion companies. The author uses systemic and comparative analysis with an integrated approach for determining the nature of change in AI usage and new trends in consumer behavior. The research objects are AI applications used by fashion companies structured by application. The research tasks suggest a detailed comparative analysis of what companies have applied the most interesting AI solutions for the fashion industry and how new technologies based on AI can change the business operations of fashion companies. The author identifies the main areas of utilization of AI by large fashion companies and AI applications factors: big advances in data collection, further high-tech research, growing competition, and deep changes in consumer behavior. The author concludes that the main trend is in the combination of different technologies of AI by a growing number of fashion companies. Based on the analysis of the usage of AI applications by fashion companies, the author concludes that new segments of the fashion market are influenced by a growing number of AI applications that have become essential tools of fashion firms.

Keywords Artificial intelligence · Fashion industry · Fashion TNC · Big data analytics · Machine learning · Expert systems · Globalization · Consumer behavior · Fourth industrial revolution · Fashion forecasting · Computer vision · Machine learning · AI

JEL Classification L67 · Q53 · Q55

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273

29.1 Introduction

With the emergence of globalization and the digital revolution, the markets have undergone a deep transformation, largely determined by the operations of the biggest multinational companies, which have organized and structured global value networks far beyond the boundaries of the firms (Vladimirova et al., 2020). As one of the biggest global industries, the global fashion industry is dominated by transnational corporations from developed countries, mainly from the USA and Europe (Konina, 2018). The author understands the global fashion industry as a complex segment of the global economy comprising the textile, apparel industry, specialized retail, and e-commerce, with estimated revenues of around \$3 trillion in 2019, roughly equivalent to 2% of the global GDP. The formation of global markets employs a wide range of digital tools, including artificial intelligence (AI), which has been increasingly used lately (Konina, 2021b).

AI is an attempt to make intelligent machines based on machine learning and deep learning, used in various applications, from robotics to voice recognition and every mapping from the translation and natural language processing to intelligence and expert systems (Barro & Davenport, 2019; Guo et al., 2011; Nayak & Padhye, 2018). Fashion companies utilize AI to improve global value chain operations, including styling, apparel production, fabric control, ready-made garments storage, distribution, logistics, and customer interactions (Giri et al., 2018). AI application is connected with the creation of digital platforms, big data analytical tools, and other advanced technologies (Acharya et al., 2018). For handling complicated global value chains, decision support is researched through the lenses of AI algorithms (Ngai et al., 2014).

29.2 Methodology

The methodology is an integral part of the research, which examines the correct way to conduct the analysis. The author used a systemic approach and analysis of the most important qualitative characteristics, considering previous studies.

The authors reflect different approaches to AI implementation in the fashion industry, being, in many cases, combinations of different AI technologies. An integrated approach is applied to analyzing applications of AI by fashion brands. The leading research method is systemic and comparative analysis. The author applied the systemic approach, making it possible to consider comprehensively several diverse elements that were previously studied separately. The author collected and prepared data for analysis from scientific databases, Web of Science, and Russian e-library.ru. Additionally, the study used news articles, annual reports of transnational fashion corporations (TNCs), press releases, and regional economic publications.

29.3 Results

Despite the active development of AI research in recent years, a unified approach to AI has not yet been achieved. The author understands AI as a set of algorithms, software and artificial systems to perform activity similar to the activity of the human brain and with typical human abilities to autonomously pursue a specific goal, making decisions that up to this point were usually entrusted to humans and their integration, trying to mimic a set of human mental processes that provide an adequate reflection of the surrounding reality.

There are two leaders in the global AI market—the USA and China (Chui et al., 2018). These countries have managed to establish leading centers of excellence in this area. In the USA, the corresponding R&D has been carried out since the mid-1960s. In China, a breakthrough in this direction has been made over the past decade.

World leaders in the development of solutions and implementation of AI technologies have already proven the effectiveness of long-term investments in AI, overcoming in capitalization dynamics other companies not so active in AI.

The factors that contribute to the active growth AI use industry include:

- Abundance of data available;
- Growing availability of the Internet and smart devices;
- Growth of computing power;
- Development of the relevant areas: high-tech R&D, mathematics, biology, psychology, economics, etc.;
- Reduction of the cost of solutions based on AI technologies.

Being simulation of human by machines that make it possible to quickly and easily complete tasks, AI has led to significant changes in retailing of fashion apparel (Shankar, 2018). On the one hand, AI is driving change in the fashion industry by improving customer experience and the overall manufacturing process. On the other hand, AI can improve the understanding and processing of data to optimize business processes in the global fashion industry. This leads to resource optimization, previewing, and finding the best approach for problem-solving, automation, forecasting, and real-time management of major production, distribution, and process and operations quantification and optimization problems (Konina et al., 2020).

Artificial intelligence as a technology has existed since the mid-1950s, but only in the last 7–8 years has it been dynamically developed in relation to the fashion industry in order to reduce costs, automate repetitive routine operations and more successfully cope with an ever-increasing amount of data.

The most prominent fashion companies deploy AI, including Dior, Macy's, Alibaba, H&M, Levi's, Nike, Zalando, Nordstrom, etc. There are several ways these brands incorporate AI into their marketing and management practices. The use of AI technology, such as augmented reality (AR) applications, virtual assistants, and AI-powered chatbots, considerably influences competition in the fashion industry, turning fashion retailers who have not adopted AI on the verge of bankruptcy.

From a technology perspective, AI in the fashion industry can be classified into several groups: machine learning, decision support systems, rule-based expert systems, optimization algorithms, image recognition and vision, neural networks, and robotics. By type of deployment, AI systems are on-premises and cloud, with growing importance of cloud deployments due to minimum installation and maintaining problems at affordable prices.

Virtual Assistants and AI chatbots based on NLP technology serve for improved direct communication with customers. The AI-powered Macy Shopping Assistant, an on-call chatbot tool based on NLP, was first launched in July 2016, aimed to improve the in-store shopping experience, helping to navigate offline retail stores. Chatbots used by fashion brands (e.g., Burberry, Tommy Hilfiger, and Levi's) are useful for collecting information about customers' desires and prospective purchases.

Amazon is actively developing Alexa, moving much of the functionality of Echo Look to the Amazon Shopping app, including Style by Alexa, which includes AI that offers fashion pointers. Echo Look first appeared in 2017 and has gained new features over the years, including a collection tool, curated content from Vogue and GQ, and support for voice profiles.

Several brands have launched personalized apps to help users make online purchases similar to in-store purchases. For example, VF Corporation's The North Face launched the Expert Personal Shopper program in 2015 in partnership with IBM Watson. PTTURNS.ai has launched an AI-powered trading tool designed to interact with shoppers intelligently.

AI can potentially be applied to significant cost savings in fashion companies by reducing errors in the selection of clothes, increasing personalization, in particular, improving brand recommendations for fitting products on a real figure, since all companies sew clothes on some abstract average figure, which really very different from the real bodies of consumers, improving quality control in the production process and optimizing the supply chain, and marketing. The importance of AI for different segments of the fashion industry naturally varies. For manufacturing companies that are part of the global value chains of the world's leading brands and have production facilities in Asia, the use of AI in manufacturing is of greatest importance, for example, for sorting fabrics and linens, controlling the production process through computer vision, and then controlling the quality of finished products, which estimates can give savings of 5–15% of the cost of manufacturing products. AI helps fashion companies to streamline their supply chains and 3–29 words unconditionally maintain a more personalized relationship with their customers by keeping as much information as possible about customer preferences based on previous purchases or browsing history and offer more personalized clothing online with better results than traditional methods (Konina, 2021a).

One of the most problematic and controversial areas of AI is the creation of new clothing models. Fashion is founded on the anticipation of trends, based on the effort to process billions of pieces of information. Companies such as Heuritech use fashion AI in combination with all the data available for trend forecasts (e.g., colors, styles, textures).

Important progress in AI was achieved by research of Carnegie Mellon University based on the processing of tens of millions of images from Instagram. Another interesting project is of MIT, when application took into account the characteristics of already existing clothes, such as sleeve length or waist width. Despite the developments that have already appeared, the hybrid work of AI and people will probably be the most desirable. The use of AI will speed up the process of creating new garments, however the participation of human designers with their intuition and talent to select and adjust designs seems essential.

AI can improve product discovery in online shops across the customer journey through personalized recommendations. AI smart mirror permits to try on clothes without undressing. Visual search AI as LykDat uses reverse image tool method to help buyers find fashion goods using photographs.

Product recommendation systems that can predict and match products according to customer likes and dislikes, such as deep learning AI offered by the Indian startup Stylumia or the Japanese company Neural Pocket, are gaining popularity in the mass fashion market.

Expectations for the success of AI applications are often overstated and more focused on capturing customer attention than commercial success. That remark is applicable to Alibaba's highly publicized launch in July 2018 of the first Fashion AI store on the campus of Hong Kong Polytechnic University. Utilizing an AI neural network trained on 500,000 fashion images selected by Taobao designers and Tmall partners, customers could use the AI to select products from the Guess collection for them.

One of the companies that are very active in the AI fashion field is Amazon. Amazon's first fashion AI project was launched by Israeli researchers in 2017 to apply machine learning for determining how fashionable the product is. The next AI project came from Amazon Lab126's "AI designer" in 2017 and later Amazon patented manufacturing system to make clothes on demand. The last Amazon AI initiative is connected with the first Amazon Style store opened in Los Angeles in 2022 using a wide range of new technologies including AI and Amazon Style.

Swedish global fashion retailer H&M also seeks and tries to use AI and advanced analytics, new technologies, and supply chain management to make profit and freely do business in the entire network, totaling 4288 stores worldwide. In 2018, H&M applied big data technology with AI (Self-Learning Algorithm) to optimize supplies to one trial store in Stockholm instead of the same set of standard products, thus reducing 40% of stock-keeping units without dropping sales. According to H&M, the self-learning AI system already knows how to use the information from the internal data of the company and the "outside world" through analysis and blogs, inquiries in search engines, and social networks (Chaudhuri, 2018).

An important area of AI application in the fashion industry is the decision-making aimed at optimizing clothing production based on the use of robotics and computer machine technology, which reduces the amount of labor and improves quality (Duan et al., 2019).

Zara, Top Shop, and H&M utilize AI to optimize their supply chains and reduce delivery times and shipping costs while providing up-to-date inventory information

basing on analysis of big complex structured and unstructured data. AI has big potential to improve operational efficiency, anyhow, it is still in its infancy. Among the first prototypes is software in combination with supporting hardware called the Juki Advanced Network System (JaNet), which collects production activity data. This software makes it possible to use AI in automated apparel production and total quality control of mass-produced items. Fashion companies have started using AI in their manufacturing. For example, a computerized system for detecting fabric defects and fabric color Cognex ViDi can guarantee the quality, thereby saving time. Cognex ViDi is an AI platform based on the visual detection of fabric intended for graphics, such as weaving, knitting, printing, bead embroidery, and textile finishes, using predefined images.

Companies like ASOS and Nordstrom are experimenting with AI to visualize customers' ideas.

Discussion

In a highly dynamic, volatile, and competitive market, the accessibility of big data coming from RFID tags and Bluetooth data create big potential for the use of AI.

Enthusiasts for using predictive AI models in fashion say that AI models based on big data should help online merchants better understand consumer preferences and minimize inventory.

However, analysis of the market condition of some highly publicized companies that have applied AI suggests otherwise. Current AI models are still far from perfect and do not yet bring the necessary impact in predictive analytics. US company Stitch Fix uses an online application for the simulation based on machine learning to personalize garments depending on the client's size, budget, and style preferences. Stitch Fix widely uses AI to create garments in "hybrid design" (Wilson et al., 2016). In 2022, according to the report, it faced a drop in its customer base from 4.18 million people in October 2021 to 3.7 million people in October 2022, with the average purchase per consumer stagnating from \$524 to \$525, with nearly 10% inflation. These facts indicate that consumers are moderately satisfied with the level of personalization offered by Stitch Fix AI. This conclusion is based on the fact that while company sales grew to \$1.95 billion in 2022, the growth of operating costs led to Stitch Fix's net loss for the year of \$261 million.

Manufacturing fashion companies have started to use AI to get feedback on the feasibility of development and estimate costs and production times, potentially saving months of talks with suppliers and gaining necessary agility (Babu et al., 2022).

Applying AI in the fashion industry will lead to a change in information search and ranking in the search engine for fashion sites. AI remembers the characteristics of a person when searching. Under AI scrutiny, clients will automatically be classified under their desires and preferences.

AI personalization and product information help reduce the percentage of products returned and improve customer satisfaction.

Deep learning technologies combined with big data and business analytics help fashion companies to better understand new fashion trends and prevailing customer intentions regarding styles. Germany-based online fashion retail platform

Zalando participated in an experiment launched in 2016 with Google in Project Muze, using AI to improve clothing designs based on the customer's preferred colors, textures, aesthetic parameters. The Muze project neural network algorithm was trained on the Google Fashion Trends Report and design and trend data from Zalando. In 2021, Zalando implemented AI based on NLP model on its website.

AI styling service start-up Intelistyle provides styling tips such as overall look recommendations based on previous purchases and the best possible available alternative fashion products. The use of AI helps online shoppers to understand what clothes look like and how they will look on them, in particular by projecting clothes onto their real body, taking into account color, texture, and accessories.

AI tools can help fashion businesses identify their most popular (and worst) products and plan their inventory accurately. In October 2022, Levi Strauss launched the use of AI technology patented under the name BOOST to optimize order fulfillment in online sales.

Artificial intelligence has significant potential in the field of textile and clothing production, quality control and inventory management, optimization of logistics, improvement of communication with consumers and marketing, including multi-channel sales.

29.4 Conclusion

The fashion AI market can grow at an average annual growth rate of + 40% over the nearest years (2020–2027). Through product personalization or better design, AI and machine learning technologies impact the operations of fashion companies, enabling them to understand rapidly changing customer needs and expectations. The influence of tools and technologies based on AI will increase on the activities of the biggest fashion firms, dealing with numerous clients in highly competitive markets.

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