



# Research on Digital Transformation and Upgrading of Fashion Industry Under the Background of Big Data

Ruoan Ren, Lei Shen<sup>(✉)</sup>, and Han Xu

School of Design, Jiangnan University, Wuxi, China  
6200706020@stu.jiangnan.edu.cn, 1403426170@qq.com

**Abstract.** With the advent of the 5G era, the digital application of big data technology has become the future development direction of various industries. The integration of digital and fashion has changed all aspects of the fashion industry from design, manufacturing to sales, and brought revolutionary changes. Aiming at the problem that the digital development of traditional fashion industry is relatively lagging behind, the method of literature analysis, case analysis and generalization is used to build the digital transformation and upgrading path of fashion industry by using VOS viewer, government released policy analysis and focus group discussion in the context of big data, and summarize the 4 kinds of fashion design digitalization, fashion marketing digitalization, fashion supply digitalization and fashion consumption digitalization strategy methods. The aim is to provide theoretical reference for the digital transformation and upgrading of the fashion industry under multi-dimensional demand, and to expand the direction of the digital development of the fashion industry under the background of big data.

**Keywords:** big data · fashion industry · digital fashion · consumption upgrading · digital transformation · knowledge graph · focus group interview

## 1 Introduction

As an emerging concept in recent years, digital fashion is the product of the mutual influence and penetration of digital technology and fashion industry [1], which is embodied in the digitization of fashion industry and virtual fashion [2]. The digitalization of fashion industry improves the efficiency of production, circulation and management within the fashion industry through digital technology, and promotes the sustainable development of the fashion industry [3]. The performance of virtual fashion includes clothing, apparel, accessories and other fashion products designed by digital technology that exist in the virtual world, as well as other pure digital forms of fashion such as virtual fashion show.

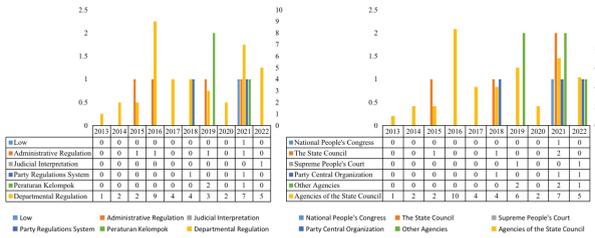
For the high-quality development of the fashion industry, digital information technology with big data as the core has gradually become one of the important driving forces [4]. Through the “end-network-cloud” architecture based on big data, the digital-based fashion industry can more accurately grasp the consumption needs of consumers.

The parallel, online, daily and social characteristics in the collection, storage and application of trace data play a special role in the resource integration, sharing and efficiency enhancement of the fashion industry [5]. With the global spread of COVID-19, digital fashion with obvious virtual features has developed rapidly [6]. Virtual fashion show and digital fashion week are widely used, and virtual clothing realizes economic value with the support of blockchain technology. In general, virtual fashion rejuvenates the fashion industry [7]. At present, many domestic and foreign fashion brands have gradually begun to build virtual scenes and carry out virtual clothing design and marketing to attract young consumers who like the virtual world.

There are various understandings and perceptions of digital transformation in the fashion industry. According to Song Yi, the intervention of digital technology will affect the way of thinking of designers to solve problems. For example, sustainable innovation ideas in fashion systems can be expanded [8]. Ding Zhaochen believed that the epidemic promoted the transformation of fashion brands (especially luxury goods) in digital transformation. In recent years, “digital life” has redefined the relationship between consumers and clothing and accessories. Traditional fashion designers pay more attention to technological innovation and explore the development of digital fashion and sustainable fashion after understanding the different industrial models and consumption behaviors [9]. Jiang Chunzhong pointed out that the vigorous digital economy promoted the leap-forward development of the fashion and creative industry, and digital fashion became a new model of industrial development [10]. In Zhang Yu’s view, the development of the digital economy can affect and change consumer behavior. Both consumers and producers can get complete fast fashion product information. With the development of the digital economy, the fast fashion retail business model has evolved, which is reflected in the vertical integration of supply chain strategy, new media marketing, big data application, and artificial intelligence application [11]. In the study of Verhoef et al., the emergence of online channels and new digital channels is considered to change the retail business model [12]. The digital marketing research framework proposed by Kannan and Li emphasized the touchpoints in the marketing process and marketing strategy. Furthermore, they stated that digital technology did and will continue to have a significant impact [13].

Under the wave of digitalization, the fashion industry breeds innovation and great change. In this case, industrial digitization has become an important breakthrough point in the transformation of traditional business models [14]. This paper discusses the impact of digitalization on the development of the fashion industry, analyzes the new characteristics and trends of the development of the digital fashion industry, and proposes the development path of the Chinese fashion industry under the rapid development of the digital economy, aiming to provide inspiration for the structural upgrading and sustainable development of the fashion industry.





**Fig. 2.** Policy effectiveness level and issued sector for digital transformation in the government fashion industry

Congress, the State Council, the Supreme People’s Court, the various agencies of the State Council, and the departments of the Party Central Committee) and other agencies were visualized and displayed in chronological order, such as shown in Fig. 2.

Through the Peking University Law Database, currently valid government documents were categorized and manually summarized. According to Fig. 2, the types of policies for digital transformation of the fashion industry are mainly departmental rules and regulations issued by various agencies of the State Council. There is no full legal documentation for digital transformation of the fashion industry until 2021. At that time, the development of fashion industry was mainly in accordance with the departmental rules and regulations of various ministries and commissions of the State Council. In 2021, the adoption and implementation of the 14th Five-Year Plan for the National Economic and Social Development of the People’s Republic of China and the Outline of Vision for 2035 by the National People’s Congress marks that digital transformation of the fashion industry has become one of the important industries currently developing in China. The digital transformation of the fashion industry has become unstoppable.

### 2.3 Key Element System Construction of Digital Transformation of Fashion Industry

There is currently no complete theory and practice of digital transformation and upgrading research in the fashion industry for reference [17]. Thus, the construction of key system elements of digital transformation requires the interviewed experts to have a certain understanding and cognition of fashion industry and digital transformation [18]. The interviewees included 5 company executives and 5 university professors related to the fashion industry. In the form of focus group interviews, the early big data was analyzed, and the knowledge graph was shared with government documents. It should be noted that the interviewees are provided with sufficient background information on the interview content. The interviews were recorded with the consent of the respondents. After the conclusion, the interviews were manually consolidated and screened. Initial concepts with word frequency repetitions of 5 or more times were entered, as shown in Fig. 3. (Concepts repeated 5 to 9 times are sub-core demand points, and concepts repeated 10 times or more are core demand points.)

It can be seen from Fig. 3 that there are 3 core codes and 22 open codes in the focus group interview. The entered core demand points and sub-core demand points were converted to obtain the core and sub-core upgrade paths. There are 5 core upgrade

Core Code	Frequency /times	Secondary elements	Frequency /times	Yes /no	Point of Need	Upgrade Paths
Government Support	17	Financial Allocation	2	no	/	/
		Taxes	1	no	/	/
		Lower interest rates	1	no	/	/
		Bank Loans	5	Yes	Fashion industry development needs funding	Improve bank lending mechanism
		Land Resources	2	no	/	/
		Talent Introduction Policy	6	Yes	Low number of talents in the fashion industry	Implementation of talent introduction incentive mechanism
Industrial upgrading	89	Internet of Things (IoT)	13	Yes	Precise control of industrial production and sales	Industry Digital Upgrade
		Smart Factory	8	Yes	Linkage market precision production	Traditional factory upgrade
		Digital Marketing	12	Yes	Precise positioning of consumer groups	Use big data to locate
		Smart Store	2	no	/	/
		Virtual Reality	6	Yes	Consumer display and fun to use	Upgrading industry technology
		3D Design	9	Yes	Consumer personalized consumption	Product development using 3D design
		Augmented Reality	4	no	/	/
		Sustainability	11	Yes	Green Upgrade and Environmental Protection	Keeping the fashion industry green and upgraded
		3D simulation technology	7	Yes	Consumer visual display	Upgrading industry technology
		Big Data	15	Yes	Data Storage & Extraction	Build enterprise database
		Artificial Intelligence	10	Yes	Analyze market demand and control production	Digital upgrade of the fashion industry
		Digital Fashion	28	Virtual Fashion	9	Yes
NFT	9			Yes	Digital Fashion Product Collection	Improve the fashion product design chain
Three-dimensional measurement	5			Yes	Easy and accurate measurement	Improve the accuracy of product measurement
Digital Cropping	3			no	/	/
Virtual Idol	2			no	/	/

Fig. 3. Visual map of fashion industry digitization

paths, including Internet of Things, sustainability, big data, digital marketing and artificial intelligence, as well as 8 sub-core upgrade paths, including bank loans, talent introduction policies, smart factories, virtual reality technology, 3D design, 3D Simulation technology, virtual fashion, NFT, and 3D volume. Phrases with word frequency less than 5 times in open coding were not included. In this study, the core and sub-core upgrade paths in the focus group interview under the background of big data were taken as the key elements of the digital transformation and upgrading of the fashion industry.

### 3 Upgrading Path of Digital Transformation of Fashion Industry

For the current fashion design in China, the application of digital technology needs to be further deepened [19]. In terms of fashion product marketing, digital marketing link needs to be further opened up, and online and offline marketing needs to be further integrated [20]. As for the supply of fashion products, the fit between supply and consumption still needs to be further improved. In terms of fashion product consumption, digital fashion consumption still has broad room for growth [21]. In the future, the development of China’s digital fashion industry should get rid of the traditional development model, such as strengthening “digital fashion thinking” and promoting “transformation and upgrading”. The specific path is as follows:

#### 3.1 Digitization of Fashion Design

Through digital technology, the problems existing in traditional design are solved, such as long process cycle, low efficiency, and high cost. Furthermore, businesses are empowered to better respond to consumers’ changing and personalized consumption needs. Compared with traditional design methods, digital design has more intuitive expression of design intent, more convenient modification and improvement, more convenient data sharing, and more efficient design. Through digital drafting technology, designers

can quickly draft and adjust design drawings. 3D simulation technology is beneficial to quickly solve the human body fitting problem in the design. In digital design, the number of prototypes and samples used is reduced, resulting in significant savings in development time, increased development efficiency, and reduced development costs.

Digital technology can improve the ability to collect, organize, analyze and judge fashion trends. Most of the traditional analysis and prediction are based on the subjective consciousness of designers, which lacks the precise capture and detailed analysis of consumer demand. As such, it cannot keep up with the fragmented, diverse, and ever-changing trends of fashion in the digital age. In the face of today's highly developed social media, companies cannot ignore the high level of engagement and deep influence of consumers on fashion trends. Through the application of big data, artificial intelligence and other technologies, enterprises can fully identify and deeply mine the trend of consumers, which helps to predict more accurate trends. In the meanwhile, the application of digital technology is conducive to refined consumer group portraits and accurate consumer data analysis. Through the precise positioning of the target group, the design can meet the ever-changing consumption preferences and personalized consumption needs of consumers, and even attract the direct participation of consumers.

### **3.2 Digitization of Fashion Marketing**

- 1) Improve global digital sales channels. Focusing on consumer demand, a cross-channel and cross-platform online and offline global coverage system is built, which can realize digital intelligent marketing of all channels, all media, all links, and all fields. Appropriate public and private domain operation strategies are formulated, which link public domain and private domain operations to increase traffic and extend the entire life cycle. Through the integration of various online and offline scene resources, the constraints of time and space are further broken through. By establishing a more diverse and effective communication mechanism between people and products, consumers can obtain a convenient online and offline consumption experience, thereby significantly improving consumer satisfaction.
- 2) Improve digital sales scenarios. Through continuously upgraded digital means, smart stores and digital stores are established. Through the full use of new-generation information technologies such as 5G, AR, VR, and Internet of things, a digital immersive fashion consumption space is created, which is conducive to promoting fashion consumption from "partial immersion" to "on-site experience". On the one hand, the digitization of the overall link of arriving at the store, visiting the store, purchasing, leaving the store and after-sale service can realize in-depth understanding of consumer demands and real-time grasp of store operation status, which can assist brands in product selection analysis, store operation analysis and precision marketing. On the other hand, the technology and entertainment of physical stores can not only better reflect the brand culture and provide a better consumer experience, but also can establish a brand image, deepen brand awareness, and closely connect with customers.

### 3.3 Digitization of Fashion Supply

With digitization, intelligence and networking as the driving force for innovation and development, profound changes in management models and production methods are promoted. By building a value creation system with data as the core driving factor, consumer insight and flexible supply capabilities are improved, and the fit between supply and consumer demand is improved. In order to adapt to the personalization and segmentation of consumer demand, new intelligent manufacturing with functions of self-perception, self-learning, self-decision, self-execution, and self-adaptation is promoted, and the rapid response mechanism of “small batch, multi-variety, high quality and fast delivery” is established. For the needs of experiential and interactive consumption, RF sensing technology is strengthened. Through the application of emerging information technologies such as Internet of things technology and cloud computing technology in fashion consumption scenarios, the aggregation of social stickiness has been achieved in various aspects such as content, social interaction, experience, and scenarios, thereby improving fashion service functions and shopping experience.

The industrial Internet process of the textile and clothing industry is accelerated. Industrial Internet is a new type of infrastructure under construction during the key layout of “the 14th Five-Year Plan”. The industrial Internet of the textile and clothing industry is the key path to realize the digital and intelligent transformation of China’s textile and clothing industry. China has the most complete textile and clothing industry chain in the world, with a long industrial chain, many links and fine division of labor. In addition, the process is complex and there are many processes, covering fiber, spinning, weaving, dyeing and finishing, fabrics and garments. Based on the digitalization of textile equipment and information interconnection, the construction of the industrial Internet in the textile and clothing industry is promoted, so as to realize the precise connection between the external supply chain and the internal production system of the enterprise, the improvement of production efficiency, as well as the intelligent and flexible production methods. promote.

### 3.4 Digitization of Fashion Consumption

The breadth and depth of the penetration of the digital economy in the fashion industry is further enhanced. New formats such as live broadcast economy, platform economy, sharing economy, and community economy are cultivated, and new consumption models such as smart retail, cross-border retail, unmanned retail, and green retail are developed, thereby promoting consumption upgrading. Through the full use of digital technology, fashion is integrated into clothing and accessories, consumer electronics, urban planning, cultural communication, marketing and other fields as a key element. Innovations in circulation formats, shopping scenarios and service experience can realize the rapid commercialization of fashion creativity, the multi-channelization of fashion communication and the popularization of fashion consumption, thereby effectively improving the scale and efficiency of the fashion economy. By cultivating a group of fashion consumption enterprises that carry out digital transformation and building new brands of digital consumption, the new driving force of digital consumption is stimulated. Through the use of digital technology, the new consumption mode and consumption space of “digital + life service + fashion personality” is developed and expanded.

## 4 Conclusion

This paper explores the strategies of digital transformation and upgrading of fashion industry in the context of big data through literature analysis, generalization and case study, provides corresponding strategic methods for fashion industry for different industrial upgrading methods, summarizes and summarizes the roles, methods and characteristics of different digital transformation and upgrading strategies, and solves the problems of unclear layout and unfocused input of fashion industry in digital transformation in the context of big data. Digitization has transformed the entire fashion industry, including design and marketing. The combination of games and fashion marketing enhances the fun and interactivity of marketing. Through live interaction and online fashion shows, the interactive atmosphere and interactive scenes are optimized, which is conducive to product recommendation and consumer cultivation. This new sales model enhances consumer experience and consumer stickiness. Moreover, digitalization profoundly affects the manufacturing process of the fashion industry. Through the organic combination of the original standardized large-scale production and the personalized customization needs of consumers, the scale economy of clothing production is transformed into the common growth and development of scale economy and scope economy. Considering that the digital transformation of the fashion industry is related to the future development of the entire industry, the digital transformation and upgrading of the fashion industry requires full-link collaboration. In the digital age, value creation in the fashion industry is full of difficulties and obstacles. Only by completing industrial transformation and upgrading as soon as possible can people keep pace with the times.

**Acknowledgment.** This work is supported by the 2019 National Key R&D Program Key Special Projects (grant number 2019YFB1405700).

## References

1. Sen A (2008) The US fashion industry: a supply chain review. *Int J Prod Econ* 114(2):571–593
2. Nikolic D, Kostic-Stankovic M (2022) Improving the economic sustainability of the fashion industry: a conceptual model proposal. *Sustainability* 14
3. Remme A, Stange SM, Fagerstrm A et al (2022) Blockchain-enabled sustainability labeling in the fashion industry
4. Min D, Xz B, Lk B et al (2020) An interactive knowledge-based recommender system for fashion product design in the big data environment. *Inf Sci* 540:469–488
5. Bertola P (2021) Fashion within the big data society: how can data enable fashion transition towards a more meaningful and sustainable paradigm?
6. Frenken K (2008) Firm entry and institutional lock-in: an organizational ecology analysis of the global fashion design industry. *Ind Corp Change* 20(4)
7. Wenting R (2008) The evolution of a creative industry: the industrial dynamics and spatial evolution of the global fashion design industry. Utrecht University
8. Kozłowski A, Searcy C, Bardecki M (2018) The reDesign canvas: fashion design as a tool for sustainability. *J Clean Prod* 183(MAY 10):194–207
9. Wang BZ, Chen Y (2014) The effect of 3D printing technology on the future fashion design and manufacturing. *Appl Mech Mater* 496–500:2687–2691

10. Ermer C, Schwarzkopf J (2021) Critical Thinking in fashion design education - New learning approaches for a systemic change in the fashion industry. In: Design Culture(s) - Cumulus Conference Roma 2021
11. Qiu J, Ma L (2021) Fusion mode and style based on artificial intelligence and clothing design. *Math Probl Eng* 2021
12. Volino P, Cordier F, Magnenat-Thalmann N (2005) From early virtual garment simulation to interactive fashion design. *Comput Aided Des* 37(6):593–608
13. Zhao L, Liu S, Zhao X (2021) Big data and digital design models for fashion design. *J Eng Fibers Fabr* 16(1):50–54
14. Luo Y, Deng K (2021) Sustainable Fashion Innovation Design for Marine Litter. *J Phys: Conf Ser* 1790(1):012098
15. Longo F, Padovano A, Cimmino B et al (2021) Towards a mass customization in the fashion industry: An evolutionary decision aid model for apparel product platform design and optimization. *Comput Ind Eng* 162:107742
16. Clayton ND, Olson CM, Lee JJ et al (2021) Computer process for generating fashion pattern from an input image of a design element. US20210259340A1
17. Ban L (2020) Sustainable solutions for fashion design: adjusting the fashion design process for a more sustainable industry
18. Elavia S (2014) How the lack of copyright protections for fashion designs affects innovation in the fashion industry
19. Lee KM, Sun JH (2014) The trends of the digital media convergence experiential marketing in the fashion industry - centered on domestic and foreign store-type fashion retail shop. *CONTENTS PLUS* 12(1):129–144
20. Liu, X (2020) Eastward-moving fashion industry boosts industrial upgrade with digital technologies. *China's Foreign Trade* 580(04):42–43
21. Brunius C, Lind I (2017) Lowering entry barriers in a digital era: a qualitative study about the Swedish fashion industry's international expansion with Affiliate Marketing

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

