Understanding the Paradigm Shift to Fashion Big Data Analytics
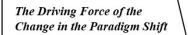
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The fashion industry is going through an undeniable paradigm shift. From 3D fashion design, direct digital manufacturing, RFID technology, virtual tradeshows, live-streaming showrooms, social media, to online shopping, massive fashion data has become one of the core competitive advantages for fashion companies throughout the entire supply chain (Zhao & Kim, 2021). The big data revolution has created both challenges and opportunities for fashion practitioners and interdisciplinary researchers. Fashion companies are embedding analytics in their everyday operations to support data-intensive strategies. Many new research questions are emerging about how to accurately predict fashion trends in the long- and short- term; how to optimize algorithms to meet consumers' needs and wants; how to plan assortment and present fashion products in a virtual environment; how to maximize the number of e-commerce or social media users seeing and engaging with the posts and content of fashion companies and fashion media, and how to understand the full picture of what happens during fashion event cycles. However, current fashion researchers have not sufficiently taken advantage of large-scale datasets and data science.

When the dominant paradigm is incompatible with new phenomena, the adoption of a new theory or paradigm can be observed (Kohn, 2012). In recent years, new perspectives are now tracking the developments in big data and fashion data analytics. An increased number of publications in fashion big data analytics has been seen in many academic journals and conferences in the fashion field. At the same time, top conferences in computer science have added new workshops named "Fashion Meets Machine Learning", "AI for Fashion Supply Chain", etc. Many new positions related to big data analytics have been created in the fashion industry. Fashion tech startups are growing at a fast pace (Mcdowell, 2020). Based on examining extensive literature and current facts in industry, this conceptual paper aims to discuss the driving forces of the paradigm shift and explore what it means for fashion research. Also, this paper will explore what kinds of scientific insights and value can fashion big data analytics research deliver in comparison to past research, and the research directions are likely to be especially beneficial for the production of new knowledge (Figure 1).

The paradigm shift is based on several distinct forces. First, Digital innovation has become the dominant theme in discussions about the future of fashion industry. The COVID-19 crisis accelerated the adoption of digital technology throughout the global fashion value chain (Zhao & Kim, 2021). Digital innovation involves the increasing deluge of data. Linking, combining, and analyzing cross-functional data from various sources is crucial for today's fashion supply chain. All parts of the fashion supply chain—design, production, distribution, marketing, customer services—can be monitored, measured, and analyzed. Analytics can be

used to surface useful information from the raw data to support the decision-making process. Second, accompanying the digital revolution, there is a need for new ways to deal with the emergence of fashion big data. Fresh ideas are generated from the interdisciplinary collaborations among data science, business management, and fashion studies. Consumer issues, social issues, design methods, or even fashion history topics can be explored by incorporating data mining and machine learning techniques (Getman et al., 2020). Third, more user-friendly and sophisticated analytics solutions are being developed to solve complex problems. Various data types such as images, videos, social media data, can be analyzed and interpreted by the current generation of data analytics method (Zhao, Li, & Sun, 2021).

The Driving Force of the Change in the Paradigm Shift

- Digital Acceleration in Fashion
- The Interdisciplinary Nature of Fashion Research
- Availability of New Tools and Analytic Approaches

The New Paradigm: Fashion Big Data Analytics

- Data Cycle in the Global Fashion Supply Chain
- Data Sources Identification
- Research Methodology
- Areas of Application

Research Directions with the New Paradigm

- Personalized Recommendation
- Smart Supply Chain Management
- Social Media Data Mining
- Visual Search in Fashion
- Ethical Issues

Figure 1: The Conceptual Model of the Paradigm Shift to Fashion Big Data Analytics.

To understand this paradigm, it is critical to draw a holistic picture of the fashion data cycle first. From idea to runway to factory, to store, consumer engagement is an integral part of the full fashion cycle. How to utilize consumer data has been a hot topic for all fashion supply chain members. Besides, new research insight arises from both new data and new methods. For fashion design, for example, artificial intelligence assistants can work with human designers to discover style trends, then achieve Style merge and Style transfer (Dubey et al., 2020). In sourcing and manufacturing, 'see now, buy now model' is a great example to reveal the change in production and buying processes. Data can be gathered in a short timeframe to cater to consumers' need for instant gratification (Newbery & Haschka, 2018). In the setting of retail, a large number of datasets now can be collected from sales or inventory data, social media monitoring data, clickstreams, RFIDs, and so forth. However, although the new approaches suggest us to study similar phenomena to what was studied in the past or study new phenomena that traditional social science research methods were not possible to investigate. It is important to compare traditional and new paradigm research to understand how big data analytics can support the traditional paradigm research and from what perspectives (fresh research questions associated with longstanding problems).

Moving forward, many areas in fashion can be explored by big data analytics. The promising research directions have been investigated by some pioneer researchers. One key area is in the personalized recommendation which fashion ontologies is explored to define stylistic rule guides and recommendations or predict specific trends (Marcelino, Faria, Baía, & Sousa, 2018). Also, through user-centered design philosophy and review/feedback mining, machine can

learn how to customize styles for consumers, recommend sizes and style matching (Garg, Sathyanarayana, Borar, & Rajan, 2018). The other area is in smart supply chain management, researchers have discovered how sales potential captures visual aesthetics (Garg et al., 2017). Cross-platform image grading and catalog replenishment are very common in today's e-commerce business. In addition, social media data mining can provide valuable insights for trends forecasting, influencer marketing, customer engagement, and many areas in fashion (Zhao & Chao, 2019). Computer vision techniques can be used to detect fashion items (Agarwal, Vempati, & Borar, 2018), build classification system (Ferreira, Baía, Faria, & Sousa, 2018), match inventory with street styles and so on. However, despite many exciting research opportunities are emerging with the new paradigm shift, there is a need for self-regulation on using the private data of consumers. Researchers may wish to proactively address consumer privacy and the corresponding ethical issue.

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