

# Study on the Modernization of Supply Chain Management of the Luxury Industry in the Context of the Digital Economy

Yue Lin<sup>1,\*</sup>, Jun Yu<sup>2</sup>

<sup>1</sup> Institute of Western Languages and Cultures, Beijing Language and Cultural University, Beijing, 100089, China

<sup>2</sup> School of Economics, South China Business College of Guangdong University of Foreign Studies, Guangzhou, 510545, China

\* Corresponding author: Yue Lin (Email: katyalin@163.com)

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**Abstract:** As a field with both traditional and modern characteristics, the luxury industry has been profoundly affected by the wave of the digital economy. The luxury industry, characterized by tradition and modernity, has been profoundly affected by the wave of the digital economy. The luxury industry has relied heavily on the traditional offline sales model, but with the outbreak of the COVID-19 epidemic, offline sales worldwide have been severely impacted, and the prosperity of the industry once had faded. Under such circumstances, a transformation of supply chain management in the luxury industry is imminent. This study first introduces the development status of the luxury industry in the context of the digital economy; then analyzes the problems and shortcomings of the traditional supply chain model; and finally examines the application of digital tools such as AI, blockchain technology and sustainability in the luxury supply chain. Using a case analysis approach, we aim to provide insights into innovative supply chain management applications in the luxury industry and to reveal how these tools can improve the supply chain's efficiency, transparency and sustainability through real-life case studies.

**Keywords:** Digital Economy; Supply Chain; Luxury Industry.

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## 1. Introduction

### 1.1. Research Background

The luxury industry has been known for its exquisite craftsmanship, unique design and scarcity. However, with the rise of the Internet, mobile technology and social media, consumers' shopping behavior, brand perception and consumption channels have fundamentally changed. Emerging models such as online sales, social e-commerce and personalized customization are increasingly leading the market trend. As a result, the luxury goods industry, which has traditionally relied excessively on tourism consumption and offline transactions, finds a profound discrepancy between its traditional sales model and the requirements of the digital economy era. At the same time, the outbreak of the epidemic has pushed the luxury industry to an unprecedented crossroads, forcing the industry to shift from traditional offline sales to other innovative paths.

The traditional supply chain model in the industry has already revealed deficiencies in information transfer efficiency and demand forecasting, which are further exacerbated by the emergence of the digital economy. Therefore, the objective of this study is to deeply explore supply chain management and innovative applications in the luxury industry, with the hope of addressing the following core issues:

**Supply chain management issues:** Under the background of the digital economy, what new challenges and problems does the supply chain management of the luxury goods industry face? How have the shortcomings of the traditional supply chain model affected the development of the industry?

**Innovative strategies:** In response to the changes brought about by the digital economy era, has the luxury industry adopted any innovative response strategies in supply chain management? To what extent are digital tools such as artificial

intelligence, blockchain technology and sustainability applied in the luxury supply chain?

Based on the above issues, this study aims to reveal the impact of the digital economy on supply chain management in the luxury industry through in-depth theoretical analyses and practical case studies, explore innovative supply chain management strategies, and evaluate the effectiveness of the digital tools mentioned. Through these efforts, we hope to provide valuable insights and guidance for developing the luxury supply chain.

### 1.2. Literature Review

This paper mainly reviews three types of literature.

From the perspective of research on the inadequacy and transformation of traditional supply chain models: Meng (2006) pointed out the differences between e-commerce supply chains and traditional supply chains in terms of operation modes and other aspects, emphasizing that the e-commerce supply chain model is a crucial driver of corporate revenue and socio-economic growth.[1] He et al. (2008) pointed out the mismatch between the traditional supply chain system and the emerging industry's mode of operation.[2] Qin (2020) analyzed the significant challenges brought by blockchain technology to the development of supply chain management and looked forward to the possible applications of emerging technology in supply chain management. [3]

From the perspective of research on new technologies for supply chain reform in the context of the digital economy: Rohit et al. (2022) proposed a research framework that will help academicians and practitioners identify current research patterns of AI in SCM. [4] Lu et al. (2023), based on the comparison and analysis of supply chain decisions under three supply chain power structures, concluded that the product's greenness is highest when the manufacturer is dominant. In contrast, the supply chain is most profitable and

favorable to the consumer when the manufacturer is not dominant.[5] Dong (2023) noted the need to continue exploring a systematic, standardized, efficient, and intelligent supply chain to achieve green goals.[6]

From the perspective of research on applications of supply chain digitalization in the luxury industry: Choi (2019) emphasized the value of blockchain technology-supported (BTS) platforms for diamond certification and authentication. [7] Xue (2022) concluded that the necessity of introducing blockchain for luxury goods manufacturers depends on the relationship between the consumer preference coefficient for luxury goods information traceability and the cost coefficient of blockchain investment.[8]

## 2. Development under the Impact of the Digital Economy

### 2.1. Definition and Characteristics of the Digital Economy

It is generally believed that the concept of the digital economy was first formally proposed by American scholar Don Tapscott in his book "The Digital Economy: Promise and Peril in the Age of Networked Intelligence" published in 1996. Since then, from 1998 onwards, the U.S government has successively released reports such as "The Emerging Digital Economy" (July 1998), "The Emerging Digital Economy II" (June 1999), "Digital Economy 2000" (June 2000), and "Digital Economy 2002" (February 2002), further expanding the attention and influence of the digital economy.[9]

There are different understandings and interpretations of the definition of the digital economy. Although various views are inconsistent, they can sum up into two perspectives: the narrow one can briefly summarize as "economic activities based on digital elements" or "economy derived from digital inputs" (limited to digital-related economic activities); the broader one can summarize as "economic activity that is significantly enhanced by digital elements" or "online economic activity" (although this has also been questioned as potentially encompassing the entire economic activity).

In addition, the content of the digital economy varies from country to country. Currently, there is more general agreement with the definition adopted by the G20 Hangzhou Summit in 2016: "The digital economy refers to a broad range of economic activities that include using digitized information and knowledge as the key factor of production, modern information networks as an important activity space, and the effective use of information and communication technology (ICT) as an important driver of productivity growth and economic structural optimization." [10]

Distinctive and ever-expanding features characterize the digital economy.

**Rapid growth.** Currently, the growth rate of the digital economy is 3.5 times that of the general economy, and the ROI of the digital economy is 6.7 times that of the general economy.

**High integration.** The digital economy is characterized by borderless, cross-regional, and cross-domain development. This integration is reflected in the profound fusion of digital technology and economic entities, considering both online and offline economic development.

**High interoperability.** An intelligent digital platform is based on computing power, observing everything, and interconnecting everything. It can break down barriers between industries and help realize high-level connectivity

within and between them.

**High mobility.** Data elements flow rapidly and can be directly transformed into a contribution to economic growth. At present, the contribution of data flow to global economic growth has exceeded that of traditional international trade and investment.

### 2.2. An Overview of the Development of the Luxury Industry in the Digital Economy Era

In 2022, the global consumer market faced many risks and challenges, including recession, intertwined inflation-interest rate hike cycles, rising prices, and the energy crisis. However, with the resumption of tourism, the rebound of holiday spending and the revival of key markets globally, the vitality of the luxury market is rapidly recovering at the global level. At the same time, changes in the macro-environment and consumption concepts are driving the development of digital technology and the innovation of brand communication, bringing new opportunities for the luxury industry.

The luxury sector received a big shock at the start of 2020, with the global personal luxury goods market losing nearly a quarter of its sales. Most reports predicted that the market would not recover until 2023. However, the luxury market has shown far greater resilience than any other sector, returning to normal levels in 2021 and even slightly exceeding the size of three years ago.[11]

**Table 1.** Global Luxury Goods Market Size and Growth Rate, 2017-2021



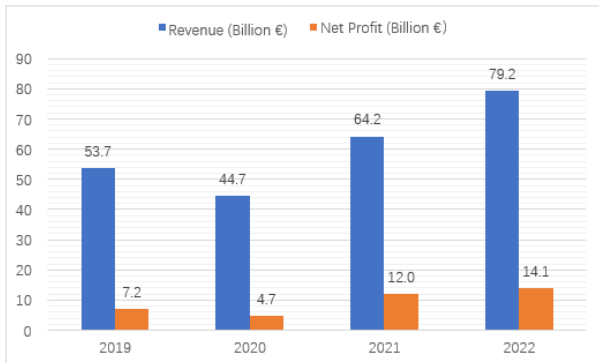
Source: The data are from GF Securities Development Research Center and are preliminary summary data.

Taking the LVMH Group as an example, in fiscal year 2022, the Group's sales increased by 23% year-on-year to €79.2 billion, with significant growth in the performance of all major regional markets. The Asian market still steadily contributes the major sales, accounting for 30%. In 2022, LVMH's premium product proliferated. Most brands have increased their prices and achieved double-digit or even higher growth, providing substantial financial support for implementing the Group's marketing and sales strategies. With the addition of Tiffany, the Watches and Jewelry division saw its revenues increase by a whopping 18% to €10.58 billion in 2022. [12]

As new sales models such as online shopping and live streaming have optimized the supply of the consumer market, more and more consumers are accustomed to cross-device shopping and buying goods from all over the world online anytime, anywhere. The luxury industry, which has relied on tourism consumption and has a large share of offline transactions, has been significantly and negatively affected by

digital change in recent years. According to BCG data, in 2022, 64% of consumers believe that luxury brands tend to lag in the digital marketplace, and 67% believe that the digital experience needs to be revised to the standard of the in-store experience. [13] Some luxury brands are implementing new initiatives to compensate for the failure of digital channels to deliver a great sensory experience.

**Table 2.** LVMH Group Revenue Status 2019-2022



Source: The data are from LVMH Group and are all preliminary data.

### 2.3. Analysis of Digital Consumer Behavior

Demographically, luxury consumers are typically young people with high education levels and income and are predominantly female. As far as China is concerned, 29% of the people involved in the digital consumption of luxury goods are men, and 71% are women. Regarding age, luxury consumers are characterized by youthfulness, with an average age of only 28. Among them, consumers under the age of 30 accounted for 76%. [14] This is related to young people's tendency to make impulsive purchases and the increasingly advanced pre-consumption concept of young consumers.

At the present stage, the purchase channels of luxury consumers are diversified and digitalized. The purchasing behavior of luxury consumers can be divided into discovery, research, purchase, payment, delivery, and after-sale. Thanks to the development of the Internet, there are multiple options for realizing each process, with digital paths dominating.

Notably, the online research offline purchase method (ROPO) has become the essential purchase path for luxury consumers. In 2020, about 1/3 of offline purchases in China came from ROPO, while 45% of online consumers will eventually choose to buy luxury goods overseas after research. The main reason for the popularity of ROPO is that in the face of new luxury goods, consumers will search for information before entering the store, and there are many types of online information and a wide range of information sources, so consumers will generally compare and analyze online.

Regarding participation mode, the current platform mode is the mainstream mode in the luxury online market, but socialized shopping has risen rapidly in the luxury industry with a greater energy density. With the maturity of the Internet industry, the demographic dividend is gradually disappearing. In China, traditional e-commerce companies, including Alibaba, face problems such as rising customer acquisition costs and declining growth rates of active users. Social e-commerce combines social traffic and e-commerce transactions, gathering attention through various social platforms and monetizing the attention in the e-commerce model. Socialized e-commerce coordinates e-commerce enterprises with social media networks and simultaneously

completes brand marketing, product promotion and even sales based on online trading platforms.

## 3. The Dilemma of Traditional Supply Chain Management in the Luxury Industry

### 3.1. Characteristics and Drawbacks of Traditional Supply Chain Management

#### 3.1.1. Characteristics of Traditional Supply Chains

##### (1) Linear structure

The links in a traditional supply chain are connected in a linear sequence, with information and goods flowing unidirectionally between these links (from the procurement of raw materials to the delivery of the final product to the consumer). The links in a traditional supply chain are connected in a linear sequence, with information and goods flowing unidirectionally between these links (from the procurement of raw materials to the delivery of the final product to the consumer). The linear structure means that information exchange in the supply chain could be more efficient, and customer feedback should be promptly transmitted up the supply chain. Therefore, many companies are turning to more modern and digital approaches to supply chain management to improve the efficiency and flexibility of their supply chains.

##### (2) Functional segmentation

In traditional supply chains, different departments or partners handle different links. This kind of vertical management might lead to information silos and decision-making lags. In addition, due to functional segmentation, there may be coordination difficulties among the various links in the supply chain, thus affecting the overall efficiency and performance overall.

##### (3) Forecast-driven

In a forecast-driven supply chain, companies typically manufacture products in advance and store those products in inventory to meet future demand. This approach relies heavily on past sales data and market trends. However, changes in market demand are often uncertain, and forecasts may not be accurate, which may lead to possible inventory backlogs or stock-outs.

##### (4) Inventory peak

Inventory peak is a major feature of the traditional supply chain management model. Due to forecasting uncertainty, traditional supply chain management enterprises must stockpile large inventory to cope with possible demand fluctuations or unexpected events. When companies rely on historical data and market forecasts to plan production and procurement, they tend to over-forecast demand due to the volatility and uncertainty in market demand.

#### 3.1.2. Drawbacks of Traditional Supply Chain Management

##### (1) Forecast uncertainty

In the post-epidemic era, the instability and unpredictability of market demand have become an essential challenge for traditional supply chain management. The outbreak and spread of the epidemic led to global economic turmoil and fluctuations in market demand. At the same time, consumer purchasing behavior and living habits have also undergone tremendous changes. Therefore, companies must adopt more flexible and agile supply chain management methods incorporating real-time data analytics and intelligent

forecasting to better adapt to unstable market demand and improve supply chain flexibility and adaptability.

(2) Insufficient supply chain visibility

Many traditional supply chains still need more supply chain visibility. Poor information flow leads to a lack of timely and effective communication and coordination among the various links in the supply chain, limiting the ability of companies to make accurate decisions. Inadequate supply chain visibility is a notable challenge in traditional supply chain management. Many organizations still need help with accurate access to real-time data and information throughout the supply chain, thus limiting a comprehensive understanding of supply chain operations.

(3) High inventory costs

Due to forecast uncertainty, traditional supply chains tend to require extensive inventories to cope with possible demand fluctuations, which leads to inefficient capitalization and increased inventory costs. Due to the uncertainty in forecasting market demand, many enterprises tend to stock a large inventory to ensure they can meet potential demand fluctuations or emergencies.

(4) Lack of flexibility and agility

Traditional supply chain management faces the vital challenge of more flexibility and agility. Traditional supply chains are usually linear and rigid, making it difficult to quickly adapt to market changes, new technologies and trends. When the market changes or the demand suddenly increases, the supply chain is often unable to adjust and respond quickly, resulting in supply shortages or inventory backlogs.

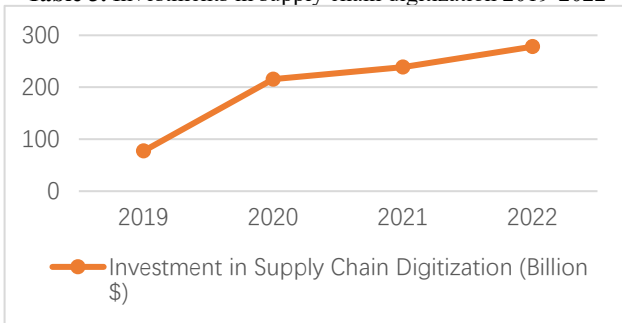
(5) Vertical management and information silos

Functional segmentation makes each link in the supply chain the responsibility of different departments, leading to information silos and decision-making lags, hindering the collaborative operation of the overall supply chain. For example, the sales department may need help communicating changes in market demand to the production department on time, while the production department may not be able to accurately understand inventory levels and the actual status of the supply chain. This situation affects an organization's ability to respond quickly to market demand and may lead to problems with overstocking or stock-outs.

### 3.2. The Impact of Digital Economy on Traditional Supply Chain Management Model

#### 3.2.1. Traditional Supply Chains Urgently Transform to Digital

Table 3. Investments in supply chain digitization 2019-2022



Source: The data are from IDC Corporate and are all preliminary data

Investment in supply chain digitization is growing yearly as more and more companies recognize the importance of

digital technologies in supply chain management and hope to optimize and improve their supply chain operations through digital transformation. According to the International Data Corporation (IDC), global investment in supply chain digitization reached \$2.1 trillion in 2020 and is expected to grow to \$3.4 trillion by 2024. [15]

Digital technology can enhance supply chain visibility. Through digital platforms and real-time data analytics, companies can monitor the operation of the entire supply chain in real time, and every link from raw material procurement to product delivery can be tracked and monitored in real time. This enables companies to understand each link more accurately in the supply chain, identify potential problems, and make timely adjustments and decisions. At the same time, digital technologies can also improve the efficiency of the supply chain by automating and optimizing many processes and tasks in the supply chain. For example, IoT devices and sensors can automate logistics tracking and warehouse management, reducing human errors and delays. These advantages enable companies to better respond to changes and challenges in the market, improve supply chain flexibility, responsiveness, and efficiency, and provide customers with better products and services.

#### 3.2.2. Increased Supply Chain Visibility

Supply chain visibility is an essential aspect of supply chain management. According to a survey by logistics management consulting company Capgemini, 70% of companies believe that digital technology is very helpful in improving supply chain visibility.

Digital transformation provides companies with powerful tools and technologies that enable them to monitor the entire supply chain process in real time, allowing global visualization and management of every step, from raw material procurement to product delivery. By introducing IoT devices and sensors, companies can monitor and track all aspects of the supply chain, collecting large amounts of data to understand the status of logistics and transportation, warehousing, and production. This data can be analyzed to gain valuable insights that help companies better understand supply chain operations, identify potential problems, and make timely decisions.

Improved supply chain visibility enables enterprises to respond more sensitively to changes in market demand and risks in the supply chain, thereby improving operational efficiency and reducing costs. Global visualization management also promotes information sharing and collaboration among different departments, breaks down information silos, enables the entire supply chain to operate more collaboratively, and enhances the flexibility and competitiveness of enterprises.

Overall, digital technologies have brought about a tremendous change in supply chain management, improving supply chain visibility and efficiency and helping companies to meet market challenges better and deliver quality products and services.

## 4. Digital Supply Chain Management Development Model for the Luxury Industry

### 4.1. Application of Artificial Intelligence in Luxury Supply Chain

Amidst global demand fluctuations and macroeconomic

pressures, inventory optimization and allocation across multiple locations and channels without excess stock pose a challenge for fashion businesses. However, generative AI has the potential to transform core processes in the luxury sector, including supply chain and logistics, helping luxury brands improve warehouse operations and inventory management, according to a report by management consultancy BCG and Italian luxury association Alta-gamma. By analyzing data related to suppliers, production capacities, lead times, and transportation logistics, generative AI models can help brands make data-driven decisions about sourcing, production planning, and inventory allocation. This enables luxury brands to streamline their supply chain processes, reduce costs, and improve operational efficiency.

More and more luxury companies are now applying generative AI to the demand side, where the technology is mainly used for demand trend analysis and personalized customization.

The biggest opportunity for Gen AI in inventory management is the ability to fulfill real-time needs and substitute manual human process steps (e.g., analysis of supply chain or inventory data) with intelligent automation and connecting systems, substantially speeding up the whole inventory management process. Accurate demand forecasting is crucial for luxury brands, as backlogs can lead to unnecessary discounts and dilution of the brand's exclusive image. Gen AI-powered predictive tools analyze historical sales data, consumer trends and external factors such as seasonal variations and economic indicators to generate accurate demand forecasts. This enables luxury brands to optimize inventory levels, reduce the risk of stock-outs or overstocking, and ensure that customers always find their desired products. Generative AI enables luxury fashion brands to analyze vast amounts of data from various sources, such as fashion shows, street styles, social media, and influencers. The newest Gen AI Large Language Models (LLM) can summarize, combine, reason, analyze, and evaluate unstructured text sources to fulfill specific needs. They can use tools (e.g., pricing platforms, calculators, google search) and answer analytical business questions for a given dataset.

In terms of customization, Gen AI models can be used to analyze customer data, including purchase history, preferences, and demographics, to offer personalized recommendations and customized products. Luxury fashion brands can leverage Gen AI to understand individual customer preferences, create tailored shopping experiences, and optimize their inventory assortment accordingly. As well as improving customer satisfaction, this approach reduces the chances of excess inventory and markdowns.

British fashion brand Burberry was one of the first in the industry to focus on the application of AI. Since 2006, Burberry has offered data-driven personalized product recommendations online and in-store.[16] These programs had allegedly led to a 50% increase in repeat purchases by 2015. Burberry launched Facebook chatbots during the 2016 London Fashion Week. Like Amazon's Alexa, these "smart assistants" offered dynamic 1-on-1 interactions with patrons, with key functionalities including selling products from the latest collection and showing behind-the-scenes inspirations.[17] To elicit voluntary data sharing from its online community, Burberry has developed an advanced data platform integrated with Facebook and Twitter, to which consumers are encouraged to upload photos of themselves in

Burberry products.[18] These data will enable the brand to customize further the products and experiences they offer.

Gen AI will change luxury fashion inventory and supply chain management in every imaginable way. Burberry has announced plans to continue investing in machine learning across front- and back-end functions. The company's SVP of IT discussed plans to use machine learning to automate supporting functions (e.g., development and operations, testing), improve scenario modeling for planning and logistics, and improve security and fraud prevention through machine learning applications.[19]

## 4.2. Application of Blockchain Technology in Luxury Supply Chain

Blockchain is a technological solution for collectively maintaining a reliable database through decentralization and de-trust. It does not rely on third parties and stores, verifies, transmits, and exchanges network data through its distributed nodes.

Simply put, blockchain technology allows everyone to participate in data recording. All systems have a database behind them, and it becomes important who keeps track of data. However, in a blockchain system, everyone can have a chance to participate in the record. If there is any change in the data within a certain period, everyone in the system can keep track of it, and the system will judge and keep the best content of all records and update the content to everyone in the system for backup. This way, everyone in the system has a complete and timely-updated database.

Blockchain technology relies on cryptography and mathematically ingenious distributed algorithms and is the most disruptive technological innovation since the invention of the Internet. On the Internet, where a trust relationship cannot be established, participants can reach a consensus without the intervention of any third-party center. In this way, the problem of reliable delivery of trust and value can be solved at a meagre cost.

Traditionally, the luxury industry has been associated with the upper class. Driven by limited distribution and celebrity endorsements, competitive price points are set to return to pre-epidemic conditions. The luxury apparel and accessories market has carved out a niche for itself, focusing on luxury-loving consumers and has segmented the market around them. According to Statista, the global luxury goods market is expected to increase from US\$354.8 billion in 2023 to US\$418.9 billion in 2028, at a CAGR of 3.4%.[20] Many multinationals specialize in luxury goods with brands such as Louis Vuitton and Kering, whose goal is to maintain product availability and exclusivity in a highly competitive market. In 2020, Francois-Henri Pinault, President and CEO of Kering, stated that his group's revenues have reached 13.1 billion euros.

While it sounds positive for the luxury industry, it faces significant challenges, particularly regarding counterfeiting. Blockchain technology can solve this problem. Tokenizing on the blockchain allows expensive luxury goods such as bags, shoes, or luxury watches to be given a unique identity that cannot be tampered with. The product's identity is recorded in the blockchain ledger and tracked all the way to the final consumer. At the same time, consumers can learn more about the brand culture by understanding the production routes. This technology eliminates the wasteful processes companies use to counteract counterfeiting practices and other environmentally harmful processes.

Take the case of a major global luxury brand as an example: HUMBL has adopted blockchain technology to develop a new product line called "Guarantee of Origin" through NFT (Non-Fungible Token). The technology also helps address some of the challenges that could hamper the expected growth of the global fashion industry: HUMBL Marketplace recently partnered with Hollywood celebrity photographers Smallz + Raskind to tokenize and register luxury prints on the blockchain, ensuring that customers receive a certificate of authenticity and a digital signature with a QR code that tracks the product's lifecycle.

### 4.3. Application of Sustainability and Green Supply Chain Management

Globalization and increasing reliance on networked relationships have led to a renewed focus on supply chain management (SCM) to improve competitiveness. However, the exploitation of resources in globally decentralized supply chains leads to many environmental and social problems. One of the biggest challenges facing global companies with fragmented supply chains is integrating social and environmental protection in business.

In today's fashion industry, sustainability is becoming an increasingly important topic. As consumers become more aware of their purchases' environmental impact, they seek brands to reduce their carbon footprint and minimize waste. For luxury fashion brands, this can be a tricky balancing act. On the one hand, they want to appeal to environmentally conscious consumers, but on the other hand, the industry traditionally traded upon premium quality, craftsmanship and exclusivity; they often use controversial raw materials such as fur and leather from precious animals, and at the production stage, careful selection leads to the creation of large quantities of waste materials.

Lack of environmental information and technological backwardness are two common problems plaguing supply chains, especially for the luxury fashion industry. Due to the high price competition, upstream companies have little incentive to invest in improvements. Downstream players, such as powerful brands and retailers, will hardly take the initiative to encourage upstream companies to prioritize sustainability, as they have little stake in it. These factors have led to a stagnation in supply chain development and an inability to respond to the pressing issue of reducing the industry's carbon footprint.

The lack of infrastructure platforms for supply chain data collection leads to insufficient transparency of environmental data and information. In 2023, 52% of major fashion brands only disclose their Tier 1 list for the first time, while nearly half (45%) have yet to disclose any information; 88% of brands still do not disclose their annual production volume, masking their overproduction scale.[21] Most carbon emissions are generated in the supply chain, and the inability of companies to monitor and track this data means that even if they wanted to improve their carbon footprint, they would need help knowing where to start. In addition, the industry supply chain is reluctant to upgrade its technology, partly because of low operating margins and production inefficiencies.

However, the outlook is not entirely pessimistic. Green finance and digital technologies can fill the gaps in environmental data and improve the productivity of supply chains, thereby contributing to a sustainable transformation of the luxury industry.

There have been some promising cases of green finance in the luxury industry. Traditional lenders have begun issuing green bonds and granting sustainability loans. In November 2019, Prada became the first luxury company to sign a sustainability loan with Credit Agricole for €50 million.[22] Under the terms of the loan, Prada can receive a lower interest rate on the loan if it meets the relevant target requirements in terms of the number of LEED Gold or Platinum-certified stores, the length of employee training, and the use of Prada Re-Nylon in commodity production.

Digital technology will play a key role in addressing information transparency and environmental reporting in the luxury industry by facilitating data collection along the supply chain. Luxury giant Kering Group has launched an app called My EP&L that tracks carbon emissions, water consumption, and pollution produced in its supply chain and educates designers and students on sustainable design principles. In 2020, Stella McCartney and Google Cloud announced a partnership to measure the environmental impact of various raw materials.[23] All these efforts help facilitate data collection at different points in the supply chain, enabling the industry to achieve unprecedented transparency.

## 5. Conclusion

The traditional supply chain model of the luxury goods industry is inefficient in information transfer, making it difficult to cope with the ever-changing market in the digital age. Information inequalities in intermediate processes such as logistics can lead to imperfect client services, negatively affecting corporate revenues and brand image. The rise of the digital economy has triggered significant changes in the luxury industry. The impact of the COVID-19 epidemic on the traditional offline sales model and changes in digital consumer behavior has forced the luxury industry to accelerate its digital transformation and re-examine its supply chain management and sales strategy to ensure corporate profitability.

Fortunately, the luxury industry, which has traditionally despised the e-commerce model, has begun its digital transformation. Digital leaders in the luxury industry have tried to apply artificial intelligence technology, blockchain technology and sustainability concepts to supply chain management. This paper shows how these tools can improve supply chain efficiency, transparency and sustainability and demonstrates how these technologies are currently used in luxury supply chains through case studies of brands such as Parda and Burberry.

The current application of these technologies in the luxury goods industry is not perfect and is only beginning to be applied in practice. Nonetheless, the future of a modernized supply chain is promising, and over time, technological revolutions will exponentially increase productivity. Therefore, luxury companies should cherish the opportunity for technological breakthroughs, practice boldly, face up to the challenges, and gradually improve and perfect their supply chain management.

## Author Contributions

This paper was jointly completed by Yue Lin and Jun Yu. Both authors have made equal efforts in the research of this topic, and their contribution to the paper is average. It is hereby explained.

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