

Chapter 10

Impact of Data Analytics on Sustainability in Apparel Supply Chain Management

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ABSTRACT

Over the past few decades, advancements in data analytics and artificial intelligence, particularly machine learning, have underscored the significance of data-driven applications. Retailers in the textile industry now leverage predictive software for operational decision-making. This chapter examines the manufacturing data analytics of retail businesses, introducing a scalable business intelligence framework based on a graph data model and its management system. It also emphasizes how big data technologies and tools, including the Internet of Things, facilitate the real-time capture, storage, processing, and sharing of data. This capability allows companies to make quicker and more effective operational decisions. To illustrate the analytical potential of the graph database model for business intelligence, the chapter presents an algorithm designed to extract insights from stored business data.

INTRODUCTION

Textiles and clothing are a significant part of the world's economy (Pal & Yasar, 2020). In 2000, the world's consumers spent around one trillion United States currency on clothing – split roughly one-third in Western Europe, one-third in North America, and one-quarter in Asia. Seventy per cent of total world exports are in clothing and textiles. Significant parts of the sector are dominated by developing countries, particularly in Asia (Pal, 2023). However, in recent years, the textile and clothing business world has been disrupted by the coronavirus pandemic (COVID-19). This global crisis has led to a move to remote working, digital customer experiences revolutions, ongoing clothing retail business turmoil,

and an economic slowdown. Textile manufacturers are coming across unprecedented changes in cost reduction and performance improvement.

However, the digital economy has experienced significant growth in recent years, primarily due to disruptive technologies that have transformed corporate practices and consumer behaviour. These advancements have influenced various aspects, including technology, the economy, and sociocultural dynamics, leading to a substantial shift in traditional commercial transactions. The term “digital economy” emerged in the 1990s and was formalized at the 2016 G20 Summit in Hangzhou. It is characterized by an economy that operates through networked intelligence and relies heavily on information technology, with modern networks serving as its operational backbone.

In this digital age, the transformative power of big data, artificial intelligence, machine learning, cloud computing, and virtual reality is reshaping the business environment. These technologies are not just disrupting markets, but also creating opportunities for established enterprises to evolve and meet changing customer expectations. Companies are rethinking their marketing tactics and communication methods in the digital economy, aiming to enhance efficiency and performance. This wave of digital transformation offers a promising future for the textile and clothing industry.

Discussions about the digital economy often focus on two key themes: the potential of information and communication technologies (ICTs) and their impact on sustainability. Sustainable development seeks to improve human welfare, assessed through metrics such as satisfying basic needs, adherence to human rights, security, interpersonal connections, and freedom of choice. The technologies embedded in the digital economy play a crucial role in promoting sustainable development by offering innovative solutions that enhance the quality of life and employing advanced strategies to protect the environment while supporting organizational financial health.

The digital revolution has introduced sustainability challenges concerning consumer protection, privacy, and cybersecurity. Consequently, businesses face the complex challenge of harnessing the opportunities the digital economy presents to promote sustainable development while addressing potential obstacles. Many textiles and clothing companies have relied on and continue to rely on timely decision-making with the help of business operational data, interpretation, and decision-making by using artificial intelligence (AI) techniques, which guide them to navigate uncertain times. However, while having data and the right technology in place is essential, the ability to turn data into insights and insights into action is where businesses see value begin to materialize. Additionally, textile and clothing companies harnessing AI's power to augment data-driven decision-making further enhance their capabilities, drive more value, and maximize business impact. This way, data analytics transforms the apparel supply chain, driving sustainability through actionable insights and strategic decision-making.

Some of the pivotal areas where data analytics make a significant impact are:

1. **Maximizing Resource Efficiency:** Analyzing resource usage—water, energy, and raw materials—can help companies identify inefficiencies, optimize consumption, and reduce waste and environmental impact.
2. **Enhancing Supply Chain Transparency:** Data analytics gives businesses visibility across the entire supply chain. Tracking materials and processes in real time ensures that sourcing practices meet sustainability requirements and ethical standards.
3. **Improving Demand Forecasting:** Effective demand forecasting minimizes overproduction, a key contributor to industry waste. By examining past data and trends, brands can align manufacturing with real market needs, preventing surplus.

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