Chapter 2
Artificial Intelligence to Achieve Retail Supply Chain Resilience:
A Systematic Review And Agenda For Future Research

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ABSTRACT

In the modern retail context, artificial intelligence (AI) and machine learning (ML) techniques are crucial for optimising essential activities such as supplier management, demand forecasting, inventory management, pricing, and order fulfilment. However, they may require a better understanding of the retail sector as the application of AI and ML varies across the various sections. This chapter employs a systematic literature review to synthesise data from 62 high-quality research studies demonstrating how these technologies can indirectly improve collaboration, visibility, speed, flexibility, configuration, and awareness within the retail supply chain. Adopting AI and ML significantly boosts operational efficiency, robustness, and adaptability, reducing the disruption risk. By leveraging these technologies, retailers can build more resilient and competitive retail supply chains capable of swiftly responding to market changes and disruptions.

DOI: 10.4018/979-8-3373-0923-1.ch002

1. INTRODUCTION

1.1 Background

1.1.1 Historical Evolution and Practical Applications of AI in Retail Supply Chain

Technological progress, global disruption, and constant change in consumer demands have reshaped the application of AI in the retail supply chain (RSC). Historically, the application of AI can be traced back to the 1980s, when static expert systems based on heuristics were utilised in inventory management and to optimise warehouse operations. These systems were not sufficiently robust in the dynamic environment, as SCs have become more complex and volatile.

In the late 1990s and 2000s, the latest machine learning (ML) and data mining techniques were developed to effectively define rules in expert systems and make decisions in dynamic environments. For example, a retail giant like Walmart has leveraged AI and ML-driven inventory management systems to effectively manage seasonal products and select the right products for the holiday season (Musani, 2023).

In the post-2010 period, further development in AI was observed, particularly in Natural Language Processing (NLP), which has revolutionised real-time decision-making. Companies such as Amazon have utilised NLP and big-data analytics in their AI-based systems to better understand customer requirements, dynamically reallocate inventory, optimise delivery routes, and significantly reduce lead times (Wamba et al., 2021). Two major players in the consumer products industry, i.e., Procter & Gamble (P&G) and Unilever, have leveraged AI-based systems to monitor product quality and consistency, reduce waste, and better understand customer demand by minimising stockouts and overproduction (Taylor, 2025).

1.1.2 Disruptions and Resilience in Retail Supply Chain

The traditional retail SC consists of four main components: the suppliers, the distribution centre, the store and the customer; however, the development of e-commerce has made today's retail SC system more complex, as shown in Figure 1.