Chapter 5
AI in Supply Chain Optimization

Hamza Aboudiar
http://orcid.org/0009-0006-3970-8286
University "Abdelmalek Essaadi", Morocco

Ouail El Imrani
http://orcid.org/0000-0003-0080-0975
University "Abdelmalek Essaadi", Morocco

ABSTRACT

The integration of artificial intelligence (AI) in supply chain chains has led to a significant transformation, moving from a focus on individual businesses to a holistic view of supply chain operations. AI plays a crucial role in optimisation of the supply chain, improving competitiveness and operational efficiency. It offers instant transparency and improved product flow management through technologies like blockchain and IoT, enabling better operational performance and predictive optimization. However, integrating AI presents a technological and organizational challenge, requiring meticulous management of processes, data, and interdependent actors. AI-based supply chain optimization relies on advanced technologies to improve performance and respond quickly to market fluctuations. Despite challenges related to data quality, cybersecurity, and operational training, the benefits of AI, such as improved decision-making and operational efficiency, are indispensable. Businesses must invest in training and risk management strategies to maximize the benefits of this technology.

DOI: 10.4018/979-8-2600-0439-5.ch005

INTRODUCTION

The integration of AI into supply chains has revolutionized modern economics, shifting focus from individual firms to holistic operations (Meng, 2015). This transformation emphasizes strategic restructuring of production chains, supplier diversification, and distribution channel expansion. To meet global competition and rising consumer demands, firms must adopt competitive strategies enabled by technology-driven information exchange, ensuring seamless coordination. Supply chain optimization has become crucial to address growing quality standards, regulatory compliance, and shortened delivery timelines.

Research on AI's role in the supply chain highlights its importance as a catalyst for development and business-to-business cooperation. AI has transformed the supply chain, enabling increased resilience, predictive, and efficient optimization. It provides transparency across the entire supply chain, facilitating improved product flow management and rapid reaction to contingencies. However, AI integration presents both challenges and opportunities for organizations. It involves a heterogeneous set of processes, data, and interdependent actors with various objectives.

This chapter explores the multiple facets of integrating AI into supply chains, analysing the historical evolution of logistics and defining supply chains. It examines different types of supply chains and key functions such as procurement, production, storage, distribution, and sales. Additionally, it assesses the impact of emerging technologies like AI, IoT, Big Data, and blockchain on supply chain management and optimization, while exploring related challenges and future trends.

BACKGROUND

What Does the Term “Supply Chain” Mean?

Although researchers struggle to establish an official classification in the field of supply chain management, Croom et al. (2000) note that all the definitions found in the literature focus on the external environment of an organization, with the boundaries of the organization traditionally defined in terms of a legal entity. However, this does not offer an accurate understanding of what constitutes a supply chain. Furthermore, Croom et al. (2000) point out the lack of consensus on a universal definition, which is due in part to the way the concept of the supply chain has been developed in recent decades as well as the fact that it can be viewed from several different perspectives and angles.

The supply chain (SC) is often perceived as a simple matter of logistics. Yet, the supply chain is broader and strategic. It encompasses not only logistics, but also the