Chapter 4
Emerging Horizons in Supply Chain and Industry 4.0:
Leveraging Advanced Technologies for Sustainable Value Creation

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ABSTRACT

This chapter explores the integration of Industry 4.0 technologies into supply chain management, focusing on their transformative impact on efficiency, sustainability, and value creation. The study targets supply chain professionals, industry practitioners, policymakers, and researchers, providing insights into the role of AI, IoT, blockchain, and big data analytics. Using a mixed-methods approach, the chapter

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evaluates technological advancements, implementation challenges, and best practices in supply chain automation. The findings highlight significant benefits such as enhanced visibility, cost reduction, and operational efficiency, while also addressing concerns related to cybersecurity, workforce adaptation, and regulatory compliance. The chapter concludes by emphasizing the need for strategic investment, workforce upskilling, and policy support to ensure sustainable and resilient digital supply chains. Future research directions include SME adoption strategies, long-term impacts of digital transformation, and ethical considerations in automation.

1. INTRODUCTION

1.1 Background of Supply Chain and Industry 4.0

Three main drivers have made real the transformation of supply chain management from something quite different until recently: globalization, consumer demand, and the technological shoot. The supply chain was put under rigid frameworks so as to maximize efficiency with respect to production, transportation, and inventory. But some other path has been drawn-the Industry 4.0 era-giving vast disruption from the latest generation of technology including IoT, AI, and Big Data Analytics, sparing some of the benefits we once deemed impossible to in-crease efficiency, visibility, and automation to the whole supply chain. Industry 4.0 integrates cyber-physical systems (CPS) with digital platforms facilitating communications among these objects and enabling these ones to adapt quickly and flexibly whenever need arises interms of constantly changing market conditions. In these terms, the burden of Industry 4.0 has been most appropriately assigned, but necessarily beyond the last mile to ensure competitiveness so directing as to take firms through the maze of today (Bennett et al., 2007; Wang et al., 2016).

1.2 Importance of Advanced Technologies in Supply Chain Management

The present-day advanced technologies represent a key element in addressing complex supply chain problems. The amalgamation of AI and blockchain technology has transformed organizations into demand forecasters, logistic managers, and product authenticators. AI analytics render demand forecasting accurate and hence expend less in waste and operational efficiency, while blockchain provides an immutable record of transactions that increase transparency and build trust with stakeholders. IoT ensures the real-time tracking of goods to ensure that deliveries are made on time, thus minimizing losses due to delays and mismanagement. It may look like a