Chapter 5
Blockchain and Big Data Integration for Transparent and Traceable Supply Chains:
A Literature Scoping Approach

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DOI: 10.4018/979-8-3373-6896-2.ch005

ABSTRACT

This chapter explores the integration of blockchain and big data technologies to enhance transparency and traceability in modern supply chains. Drawing on sociotechnical systems theory, this chapter examines how decentralised ledgers and real-time analytics can collaboratively address challenges such as fraud, inefficiency, and lack of visibility across supply chain networks. Using the PRISMA methodology, a systematic review of peer-reviewed literature from 2015 to 2025 was conducted to identify trends, gaps, and empirical evidence supporting the integration of these technologies. Key findings reveal that blockchain ensures data immutability and provenance, whereas big data enables predictive analytics and operational optimisation. The synergy between the two technologies fosters trust among stakeholders and supports regulatory compliance. The chapter concludes with recommendations for policymakers, technologists, and supply chain managers, emphasising the need for interoperable platforms, data governance frameworks, and capacity-building initiatives.

INTRODUCTION

Transparency and traceability have become critical at a time of globalised trade and more intricate supply chains (Zreik, 2024). Particularly in industries such as manufacturing, medicine, and agriculture, supply chains are susceptible to fraud, inefficiency, and interruptions. Real-time visibility and reliable data across numerous stakeholders are frequently not possible with traditional solutions. Promising answers to these problems can be found in emerging technologies, namely, blockchain and big data analytics. Because blockchain technology offers previously unheard-of openness and traceability, two essentials for today's intricate global supply network supply chains are progressively changing (Bukhari, 2024). Every stage of a product's journey, from raw ingredients to the final customer, may be documented in a tamper-proof digital record that is available to all authorised stakeholders by utilising blockchain's immutable and decentralised ledger. By ensuring that the provenance of items can be verified, this lowers the possibility of fraud, counterfeiting, and mistakes while increasing consumer and partner trust (Gul et al, 2024).

Blockchain improves transparency in supply chain management by making data freely accessible, verifiable, and auditable in real time (Seidelson, 2024). A thorough and unchangeable record of product handling and transactions is produced by the blockchain, which time-stamped and cryptographically secures every transaction or movement of items. Stakeholders are better able to recognise and address supply chain problems, including fraud, contamination, and delays, because of this