Chapter 2
Blockchain for Transparency and Traceability in Supply Chains

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ABSTRACT

This chapter examines the possibility of the blockchain to transform the way a supply chain is, by making information accessible, transparent and audit friendly between manufacturers, suppliers, distributors and ultimate consumers in real-time. It explores core concepts of the blockchain or what is called as a distributed consensus, smart contracts, and cryptographic security and shows how these capabilities enable organizations to track and document the origin, authenticity, and condition of products, goods and materials, all the way to the point of sale.moreover, the chapter discusses the implementation of blockchain in such fields as food safety, pharmacy, luxury trading, and logistics mentioning the practical examples of the

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industrial giants such as Walmart, IBM and Maersk. The combination of blockchains with emerging technology such as edge computing and IoT is also analyzed as a possibility of offering sensor based tracking and automatized updates.

1. INTRODUCTION

1.1 Need for Transparency and Traceability

In the past ten years, supply chain operation has been greatly changed due to the globalization of trade, digital transformation, and sustainability movements. Traditional linear supply chain which was mostly opaque and fragmented has turned into an ecosystem with a series of actors at different regions. The report prepared by IoT Analytics (2021) revealed that already over 12 billion connected devices produce petabytes of real-time data, but the most significant issue persists, the ability of this data to be safe, transparent, and reliable when it comes to heterogeneous systems. The rising count of fraud cases, fake products, information asymmetries, and so on reflects the necessity to implement verifiable transparency measures (Abeyratne & Monfared, 2016).

Global understanding of transparency and traceability came into light following numerous downsizing experiences in the food industry because of contamination and unethical sourcing efforts in the global supply chain, which exposed the vulnerability of world supply chains. Organizations have understood that digital transformation should not all be the solution to the underlying lack of trust between suppliers, manufacturers, logistics providers, and regulators. Since the cryptographic immutability and distributed trust of blockchain technology form the foundation of a transformative solution to assure the integrity of and accountability of data in various stakeholders, blockchain technology has since been in the spotlight of demand as a solution to the same.

Although there is increased interest in the area, majority of the existing researches are more conceptual than making the empirical evidence of the effectiveness of blockchain in improving supply chain performance. The empirical dilemma is gauging the extent of quality management approach and efficiency of the entire supply chain within the spectrum of blockchain-based transparency. The gap that needs to be bridged by the study is discussed by analysing 390 participants with Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modelling (SEM) in order to develop a validated framework.