Chapter 1
Need, Role, and Impact of Blockchain in the Manufacturing and Logistics Industries

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ABSTRACT

Blockchain technologies have lately risen to the top of the academic and industry agendas, owing to their potential advantages across a wide range of sectors. This is due to their practical skills in resolving many problems that are presently impeding progress in different industrial sectors. These problems include securely capturing and exchanging transactional data, creating automated and efficient supply chain procedures, and improving transparency throughout the whole value chain. Blockchain provides an effective method to address these problems using distributed, shared, secure, and permission transactional ledgers. The uses of blockchain technology in the manufacturing and logistics sectors have been examined in this chapter. The study shows many possibilities for using blockchain in different industrial sectors; nevertheless, certain obstacles must be solved before this technology can be fully used. This chapter also covers case studies and difficulties encountered in the industrial and logistics sectors while using blockchain.

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INTRODUCTION

Blockchain introduces new, complex functionality to the business and industrial sectors. Many existing commercial and industrial processes can benefit from these features, which can help them improve, optimize, secure and simplify their operations. They also enable the development of new business models that were difficult to achieve just a few years ago. These new business models impact numerous industries, including banking, medical care, manufacturing and logistics. While the Internet has helped create many of today's business and service models, safe registration and ensuring commercial transactions between different parties always have problems. Companies and people may now record and preserve their contracts signed by the blockchain advent.

Blockchain uses a variety of methods to maintain a distributed ledger among users (organizations, businesses, individuals, software agents, etc.). Its content is agreed upon by all parties concerned. All transactions are safe and can't be changed once they've been added. It also enables comprehensive transaction monitoring, measuring, and tracing. Without a governing authority, Blockchain allows a group of companies to agree on a specific transaction and record that agreement. Blockchain can be used to record, secure and communicate their agreed actions. A cash transaction from one member to another, a purchase, a voting engagement, or a patient's medical lab test entry are examples of agreed upon activities. Multiple parties collaborating on a particular job, contract agreements, and supply chain logistics are just a few examples of such operations.

Blockchain technology combines the features and benefits of peer-to-peer networks with cryptographic techniques to ensure that completed agreements are legitimate. No approved or registered activity may be altered without the participation of the other participating organizations. This functionality is ideal for facilitating other commercial agreements amongst a group of organizations from various locations. In addition to preserving the sequence of events, blockchain can guarantee the accuracy of recorded transactions over time. It is virtually difficult to falsify records or reject an agreement since no one can independently change any recorded transactions. Consequently, numerous sectors and companies are contemplating adopting blockchain, and more research is being conducted to use blockchain in these areas successfully.

For the commercial and industrial world, blockchain introduces additional advanced functionalities (Nakamoto, 2008). Many existing commercial and industrial processes can benefit from these features by improving, optimizing, securing and simplifying them. They also enable the development of new business models that were previously difficult to develop. These innovative business models impact areas such as finance, healthcare, manufacturing, and logistics. While the internet has contributed to the development of many of today's business and service models, concerns remain about how to securely register and guarantee agreements between the numerous parties involved in commercial transactions. With the advent of blockchain technology, businesses and individuals can now record and preserve their transacted agreements with each other. The typical applications of blockchain technology are shown in Figure 1.

Blockchain technology, which heralds the start of a new age in decentralized information technology, is a life-changing invention. Its usefulness extends well beyond digital currencies and financial assets, as it was created as part of Bitcoin's fundamental design in 2008 (Nakamoto, 2008) . The technology is still in its infancy and has yet to be adopted by the general public or businesses. There have been numerous improvements, new use cases, and applications as the technology have risen in recent years (Bogart & Rice, 2015). The possibilities for Blockchain applications are endless, ranging from digital money to