The Significance of Blockchain Technology in Digital Transformation of Logistics and Transportation

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ABSTRACT

The purpose of this article is to identify blockchain’s role in achieving logistic objectives, with the aim of pointing out the significance of blockchain technology in the digital transformation of logistics and transportation. Implementation of the blockchain technology in combination with IoT elements in logistics and transportation contributes to business process optimization, supply chain traceability and transparency, and significant financial savings. There are limitations as blockchain is at a relatively early stage of development with most projects. Therefore, the approach of theory building from multiple case studies was used. The article provides a comprehensive overview of current blockchain initiatives and use-cases. This article is believed to be the first to address the role of blockchain technology in achieving logistics objectives. Results from this research indicate that blockchain technology contributes to the achievement of logistics objectives.

KEYWORDS

Blockchain, Digital Transformation, Distributed Ledger Technology, Logistics Objective, Logistics, Smart Contracts, Supply Chain, Transportation

INTRODUCTION

Blockchain technology is considered to be one of the most important innovations in the information technology field. Some benefits of blockchain technology are improved security, faster transactions, decentralization, immutability, transparency, and trust. In many industries, it replaces current technology because it immensely simplifies processes, and many operating activities become redundant. Smart contracts enable new forms of financing and insurance, process automation, and optimization of the information and documentation flow. Complex logistics environment involves many stakeholders and requires continuous process coordination and monitoring. The key logistics objectives are performance achievement, quality assurance, and cost minimization. They result from the economic goal of any company to achieve a high profit (Gudehus & Kotzab, 2009). The logistics sector is the most paper-intensive sector. Many types of forms are required for different types of logistic categories. Companies often rely on manual data entry and paper-based documentation, and for that reason, the process is susceptible to mistakes and vulnerable to frauds. Achievement of supply chain transparency is a challenge. Logistic chains often span across hundreds of geographical locations, and stakeholders have to cooperate and trust each other. It is difficult to track the origin
of items and the status of shipments as they move along the supply chain, causing friction in global trade. Providing access to a single source of truth blockchain has the potential to improve efficiency and data transparency and overcome these frictions. The immutability of blockchain data enhances trust between partners and strengthens their relationships. In this regard, blockchain technology as a distributed infrastructure guaranteeing information immutability makes a perfect ground for building new trust relations. Leaner, more automated, and error-free processes help in cost savings realization. Blockchain does not only add visibility and predictability to logistics operations but also accelerates the physical flow of goods (Dobrovnik et al., 2018; Hackius et al., 2017; Kersten et al., 2017).

This paper explores possible applications of blockchain technology in logistics and transport activities. The purpose of this study is to investigate use cases and identify blockchain’s role in achieving logistic objectives, with the aim of pointing out the importance of the blockchain technology in the digital transformation of the logistics and transportation. The study investigated the following research questions: “What are the appropriate blockchain technology applications in logistics and transportation?”, and “Can the blockchain technology contribute to the achievement of the logistic objectives?” Supporting the research questions the following research objectives were defined: (1) to determine the appropriate blockchain technology application in logistics and transportation, and (2) to find out whether blockchain technology implementation impacts the achievement of logistics objectives.

The paper explores the process of the digital transformation in logistics and transport activities, describing fundamental concepts of blockchain technology, necessary for understanding the value it brings. Due to the novelty of the subject, there are some limitations. Most projects are at a relatively early stage of development. Therefore, the approach of theory building from multiple case studies was used. The description of potential blockchain technology applications in logistics activities is given, as well as an overview of current initiatives and use cases. Use case analysis resulted in the identification of the effect of blockchain technology in achieving logistic objectives. Further research should use a quantitative method to measure the magnitude of blockchain’s impact on achieving logistics objectives.

The remaining sections of this manuscript are organized as follows. The second section presents the literature review of digital transformation, blockchain technology, and possible blockchain applications in logistics activities. The third chapter outlines the research methodology. The fourth section explores blockchain technology initiatives in logistics. The next section presents the results of the study. The paper ends with a conclusion, limitations, and directions for future research.

**LITERATURE REVIEW**

Digitalization facilitates cross-border trade and accelerates its development. Evolution of business models reflects the fact that businesses operate radically different today than at the time international tax, customs rules, and financial systems were designed. The nature of exchange is developing as the economy is becoming increasingly digitalized, so existing business models need to adapt to this new reality as new business models emerge (European Commission, 2017).

**Digital Transformation**

Emerging technologies empower companies to undertake their own digital transformation, creating innovative business models and new customer experiences. Digital transformation of a company refers to changing the value creation process by upgrading current digital technologies and implementing new ones, adjusting business strategies to fit new digitized business strategies, as well as acquiring the necessary skills and qualifications for digitization (Kersten, Schröder & Indorf, 2017, quoted in Kersten et al., 2017). Many changes inevitably cause new business risks, mostly non-transferable. Digital transformation in a global business environment requires the establishment of a continuous co-creation process among all stakeholders in the agile creation of the new value (Akholesh, 2017).
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