

# **Uncovering the Potential of Blockchain Technology in Enhancing Food Supply Chain Management: A Systematic Literature Review**

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Globalisation has profoundly impacted the food supply chain (FSC) in recent years, resulting in a revolution in food production and consumption worldwide (Li et al., 2021). A growing variety of foods is available to consumers, which results in a change in purchasing behavior, as well as a complexity in the food supply chain, making it more difficult to resolve issues associated with food supply chains (Vu et al., 2021).

A blockchain (BC) is an electronic bookkeeping system that is enforced by a chain of computing systems. Since BCs are decentralized, new data added to the system cannot be altered or overwritten once it has been added (Xu et al., 2022). Food supply chain management (FSCM) can benefit from blockchain technology (BCT) through traceability, transparency, information security, risk alleviation, and efficiency enhancement. The implementation of BCT in the FSC increase food safety, reduce food fraud, and build trust between stakeholders (Kumar et al., 2022). In contrast, BCT faces inadequate laws and regulations as well as high upfront investment costs in implementation. The development of new standards and regulations is necessary to ensure interoperability and to address issues related to data privacy and ownership (Cozzio et al., 2023). Therefore, there is room for further research in the implementation of BC in the FSC in terms of the above attributes.

This research attempts to draw insights into BC application in the FSC within the current context: exploring the enablers and barriers of BC adoption in the FSC with multiple perspectives from case studies and pilot applications, and analysing the

potential non-technical factors (i.e., common fragmentation among producing stakeholders, awareness and training requirements for FSC actors, enterprise interoperability with existing solutions etc.). The results of this research may contribute to the FSC literature in the following areas: To develop an in-depth analysis based on current adoption of BCT in the FSC; To identify unmet needs for BC implementation in the context of food organizations (Xu et al., 2020); Provide logical recommendations for authorities and organizations regarding BC in FSCM (Vu et al., 2021); To provide a rigorous analysis of each participant in the FSC, including their specific intentions and drawbacks related to the adoption of BCT.

A systematic literature review has been conducted using Web of Science, Scopus, and EBSCO covering publications published between 2015 and 2023. The literature has been selected according to three topics: blockchain technology, food supply chain management, and barriers and enablers to the implementation of blockchain technology in the food supply chain. FSC and BCTs are the main focus when selecting literature, especially the barriers facing FSCs in elevating the use of BCTs: regulation and standards, scalability, interoperability, and compatibility. In addition, reviewing the challenges in food safety, supply chain operational efficiency, customer trust, certification process, sustainability, waste reduction, etc. (Kumar et al., 2022). Moreover, other relevant technologies (internet of things, artificial intelligence, RFID, etc.) have also been included to broaden the scope of this research.

According to the results of this study, blockchain has the potential to revolutionize the FSC, specifically in food safety, surveillance, and productivity throughout the supply chain. In addition to considering BC applications for FSCM, barriers such as standards, regulations, privacy, etc. must also be considered. Furthermore, this study contributes to the understanding of potential nontechnical barriers to implementing BC with other emerging technologies, such as the internet of things (IoT) and artificial intelligence (AI) (Kayikci et al., 2022). A comprehensive analysis of the current BC implementation in FSCM is presented in this study. This study has provided insight into the potential enablers and barriers of BC applications in the FSC and may stimulate significant

research interest in the field of BC-enabled FSCs. Additionally, this study may be the first to provide an in-depth understanding of end-to-end processes of FSCs enabled by blockchain technology. Additionally, this study could also raise awareness of FSCM policies and regulations related to BC. Furthermore, the research can provide valuable information to industry practitioners about integrating blockchain with IoT and AI. BC adoption can be further enhanced by addressing the technical and non-technical barriers associated with the food supply chain.

The blockchain technology has the potential to revolutionize the food supply chain through increased traceability, transparency, and efficiency, as well as enhancing food safety and reducing the risk of food fraud. To achieve these benefits, it is necessary to address the challenges and limitations associated with blockchain applications, and to develop a comprehensive approach that aligns blockchain with other technologies and regulatory frameworks. An overview of blockchain applications in food supply chain management is provided in this review, demonstrating both technical and non-technical aspects of the technology. Since this study is based on a literature review, the proposed frameworks and concepts are not adequately addressed by empirical evidence. In future research, case studies and simulation modelling will be applied to develop a more comprehensive outcome.

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