

## AN OVERVIEW OF THE EFFECTS OF BLOCKCHAIN TECHNOLOGY IN FOOD CHAIN SUPPLY: A CASE STUDY ON WALMART

Mrs. Swati Bhat, Assistant Professor  
Dr. D.Y. Patil Institute of Management & Research, Pimpri, Pune  
swbhat14@gmail.com

Dr. Shikha Dubey, Associate Professor  
Dr. D.Y. Patil Institute of Management & Research, Pimpri, Pune  
shikha.dubey26@gmail.com

Dr. Nilam Jadhav, Assistant Professor Shivaji University, Kolhapur  
nilam.khamkar@gmail.com

### ABSTRACT

Walmart is one of the world's largest firms by revenue. Such a big establishment from the retail industry has a large distributed channel of vendors and suppliers. Blockchain technology is very much popular for its application in Cryptocurrency. Blockchain is a ledger or a distributed database that is shared through computer network. It maintains secure and decentralized records of transactions. The salient feature of this technology is that it is an innovative system that guarantees fidelity and security of data without interference of a trusted third party. Apart from its use in the financial sector, it is also used for other applications such as Food Supply Chain Management. Application of innovative technology in the business ultimately results in improvement in performance. This is especially necessary in businesses that involve food and edible materials. For this research, a case study has been conducted with respect to Walmart.

**Keywords:**Blockchain, Cryptocurrency, Food Supply Chain, Walmart, E-commerce

### Introduction

Contamination source is difficult to be found out. This is because the product moves from farmer to processors, then to distributors, then to vendors and lastly to the consumer. Due to the unchallengeable and shared nature of Blockchain, tracking became easy and this also offers transparency. Therefore, it provides a trusted environment. A well-known company in the retail field viz. Walmart uses Blockchain technology in Food Chain Supply. In our research study, we analyzed the effectiveness of Blockchain technology for Food Supply Chain. For the analysis purpose, a case study of Walmart has been taken into consideration.

### Significance of the Study

The study is significant in following perspective:

Food Supply Chain (FSC) is the emerging area of Blockchain technology application and hence its efficiency needs to be analyzed. Walmart is an ideal example for implementation of Blockchain for FSC, which needs to be studied to get more insight into this area.

### Literature Review

Various research papers are available on the applications of Blockchain in various fields. But very few of them cover the area studied here. Some of them are discussed below:

Tan (2018): The four types of impacts of adoption of Blockchain on food supply chains. Michelson (2017): The study of the paper gives understanding of how food safety and quality is important nowadays. Walmart is a leading worldwide superstore chain with an increasing presence in China, and evidence advises that their supply chain policies are similar to other large superstores in the region. Chiles ,Dau (2005): Retail industry analysis and company case study analyses of Wal-Mart and Amazon.com capital investments in information technology and infrastructure, relationships with vendors, and commitment to process efficiency through product profile analysis support the efficiency, service, and asset utilization goals that they strive to balance.

Kirwan (2017): It is required to understand and access the different meanings, which are related to food supply chains. Duan (2020): Production process of food and due to globalization, the supply chain has become more delicate. Holmberg (2018): Investigates the challenges and possibilities of a possible implementation of a traceability system supported by Blockchain technology. Fortuna & Risso (2019): Resulting from research conducted jointly by supply chain actors for the purpose of developing new commercially applicable technologies, for cost reduction and increasing profits. Harsha (2020): Walmart has shown that the use of

Blockchain technology covers the way towards a more efficient level of operations within the units of the organization.

Kamath (2018): mentions the challenge for the implementation of Blockchain technology especially in food supply chain and possible solutions for the same, for increasing safety norms and waste reduction. Zhang (2019): mentions a content-analysis in implementing Blockchain technology within food supply chain.

**The Concept of Blockchain**

Blockchain is a communal, unchangeable record that is used to save the transactions. The communal means the records are shared by all participants. Also, the records only can be saved in the form of block and next information can only be appended to the previous record through a chain. Hence the name Blockchain. As Blockchain is digitally scattered publicly and not centralized, this can be used to trace the assets in a business network. Blockchain technology is an innovative database mechanism that allows translucent information sharing within a commercial network. A blockchain database stores data in blocks that are connected together in a chain. The data is chronologically reliable because you cannot delete or modify the chain without consent from the network.

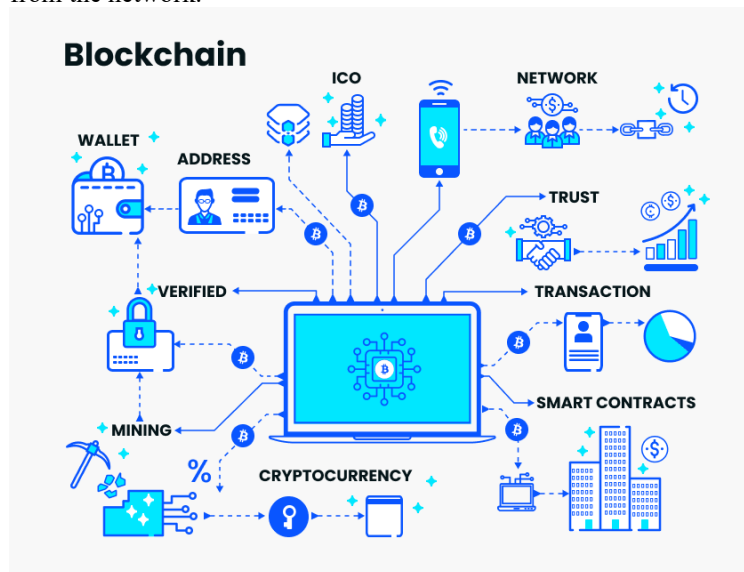


Figure 1: Blockchain Technology (Source-<https://mmcgb1.com>)

**Walmart**

Walmart is one of the world's largest firms by revenue. It has more than 10,586 stores under more than 55 company names spread over 24 countries [2]. More than 265 million customers visit these stores and e-commerce Websites. To maintain the workflow with such a big customer base is a big challenge for Walmart. Hence the company is consistently looking to optimize their supply chain.

**Food Supply Blockchain in Walmart**

Food supply chain includes all the activities that start from growing the grains in the form till its utilization by the consumers. By placing a supply chain on the Blockchain, it makes the process more transparent and traceable. Every node on the Blockchain represents an entity that has handled the food on the way to the stores, for faster and easier movement and to ensure that farmers have not sold infected batch in any location.

**Research Methodology**

Present study is particularly a case study of Walmart with respect to overview of Blockchain technology for its food chain supply, that analyses the subordinate information for estimating the impact of Blockchain technology in food sector.

Available literature doesn't have proper focus on food supply chain, though there are a few papers on supply chain management. Other details are as below:

**Scope**

The retail industry has a very broad scope. Therefore, the scope of the study is limited to specific segment of retail. This study is based on the findings of analysis of overview of Blockchain in food supply chain. The study is carried out for an eminent globalized retail company viz. Walmart

## Objectives

- The main objective of the study is to understand how to use Blockchain technology in food chain supply. Other specific objectives include:
- To study challenges and advantages in using Blockchain technology in food chain supply.
- To study how Walmart has implemented Blockchain technology for their food supply chain.

## Case Study Analysis

### Supply Chain Management of Walmart

Walmart provides service to the customers through different distribution channels. The success of Walmart is due to the fact that it has its own supply chain to cater to its requirements and to cut down its costs. Since its beginning the policy that Walmart has followed is to build Walmart stores in smaller groups. They began negotiating directly with manufacturers as well as distributors, thereby reduced middleman to further streamline the supply chain. The steps taken for products flow through distribution centers are:

- Products are sent from vendor to distribution centers
- Products are batched by retail store
- Products are distributed out by retail store

For successful conduct of this process Walmart and its merchants must cooperate well with each other to ensure that the stores have sufficient stocks as per demands of customers.

Walmart works with IBM to improve the trailing and traceability of food products, leading to better food safety. Blockchain on food supply network enables complete transparency across food-chain to maximize shelf life, increasing partner networks and increase recall response efficiency, for reduction of waste. It is possible to develop and improve food industry, Blockchain and Internet of Things (IoT) can be used. IoT facilitates monitor various stages of food production and provides factual information, in addition to taking required steps for the reduction of food-waste. IoT in food processing has started to food suppliers, processors and retailers with good opportunities for financial and operational support in the food and beverage businesses.

All functional areas in the food industry have been influenced by the solutions provided by IoT. For example, IoT in food processing enables food industries to achieve better traceability, food safety and accountability all throughout the supply chain.

### Blockchain implementation in Walmart

Walmart, a leader in supply chain management, is now using block-chain for creating automated process in invoices handling and payment systems for its 70 third-party freight carriers.

### History of Walmart's Applied Blockchain

Walmart uses Blockchain technology, which is a backbone of cryptocurrency blockchain, by improving traceability. The new technology will allow Walmart as well as the consumers to track the geographical location of food product with the help of bar code.

### History of Walmart's Food Tracing

The history of Walmart's food tracing starts from the year 2016, when there was an issue of traceability of mangoes. It took 6-7 days to trace the same. Hence, Walmart, with the help of IBM and Tsinghua University in Beijing started Blockchain ledger for the traceability of beef for the supply chain from China. In the month of September 2018, Walmart could improve the system further for better traceability.

### Use of Blockchain Technology for FSC

A Blockchain is a distributed register with growing lists of annals (blocks) that are securely linked together via crypto-graphical hashes. There are various application areas of Blockchain. As FSC is a distributed system there should be transparency among FSC transactions. The decentralized register records and protects business information shared among multiple parties. All parties authenticate the transaction by their digital signature.

The use of Blockchain offers following advantages:

- Transparency in FSC
- In case of any anomaly participants can immediately take action
- Supplier on-boarding is easy

When Walmart realized these applications, the company commenced to work on the same along with their partner IBM. Hyperledger Fabric provides a method of system that enables performance that enables data privacy. After successful implementation of the application Walmart started working with other companies such as Nestle to launch IBM food trust.

### Benefits of Blockchain in FSC

- **Transparency:** Blockchain-based supply chain registers can identify food loads that are subject to product recalls, thus, simplifying the prompt removal of unsafe food from store shelves.
- **Food Safety:** Blockchain provides a new way to bring diverse stakeholders composed to ensure food safety by providing a transparent and absolute antiquity of transactions. This transparency can enhance customer belief and brand trustworthiness.
- **Decreases food wastage:** Minimalizing food waste at the manufacturing, retail, and consumer levels. Therefore, it is important for preventing any major food crisis and meeting the increasing food needs.
- **FSC Effectiveness:** Customers can scan products to verify their genuineness, while Blockchain allows them to query digital records. Furthermore, Blockchain technology is less expensive than existing food tracking systems. Blockchain technology can be used to track exact records and provide tamper-resilient data.

### Food Supply Chain Challenges



Figure-2 Challenges in the food supply chain (Source- <https://www.ecoideaz.com>)

**Lack of superiority and security:** - With rising difficulties come the responsibility to produce more and supply more, the supply chains are exposed to fraud and forgery and food corruption. The climate crisis further drives food uncertainty.

**Lack of perceptibility:** -post-harvest loss ranges from 35-40%, which is due to insufficient storage facilities, reformer handling, bad logistics and packing. Inadequate association among stakeholders and lack of perceptibility lead to huge wastages.

Authorities need to take steps in providing a supervisory authority along with predefined standards, practical knowledge, economic support, etc. to help better the supply chain as a whole. Food systems need to follow to quality standards and ensure a harmless product.

In these days everybody is accepting the success of Blockchain in every arena and consider it trustable technology. Blockchain is a wonderful asset to make food protected from frauds and helps in tracing the defects caused by anyone and also protects money by not tracking each and every one, who distributes products in supply chain management. A few features of Blockchain technology give us frameworks to trace FSC.

### Conclusion

Walmart has excellently planned and executed Blockchain technology in food chain supply.

The main objective of the study is to understand how to use Blockchain technology in food chain supply. Other objectives are to study the challenges and advantages in using Blockchain technology in food chain supply; and to study how Walmart has implemented Blockchain technology for their food supply chain. The benefits of Blockchain technology are transparency, food safety, decreases in food waste, FSC effectiveness. To conclude customers can scan products to verify their genuineness, while Blockchain allows them to query digital records. Furthermore, Blockchain technology is less expensive than existing food tracking systems. Blockchain technology can be used to track exact records and provide tamper-resilient data.

## References

- Abubakar M., Potdar V. (2023), "Blockchain Adoption in Food Supply Chains: A Systematic Literature Review on Enablers, Benefits, and Barriers. IEEE Access PP (99)
- Alexandre A. (2018), "Walmart Awarded Patent for Blockchain-Based Medical Records System" Article, 23 June 2018
- Bechtsis D. (2019), "A Blockchain framework for containerized food supply chains Computer Aided Chemical Engineering", 46, pp. 1369-1374
- Charlebois S. (2017) How Blockchain technology could transform the food industry. The conversation, 20 December (2017).
- Chiles R., Dau M. (2005), "An Analysis of Supply Chain Best Practices in the Retail Industry with Case Studies of Wal-Mart and Amazon.com".
- Duan J. Zhang C. & Brown S. (2020), "A Content-Analysis Based Literature Review in Blockchain Adoption within Food Supply Chain". Computer Science, Business International journal of environmental research and public health 2020.
- Holmberg A. (2018), "Blockchain technology in food supply chains: A case study of the possibilities and challenges with an implementation of a Blockchain technology supported framework for traceability".
- Kamath R. (2018), "Food Traceability on Blockchain: Walmart's Pork and Mango Pilots with IBM"
- Pena M. Llivisaca J. & Guzman L. (2019), "A systematic review on Blockchain in food supply chain management (FSCM) in Ecuador", book: Advances in Intelligent Systems and Computing (pp.101-112)
- Subramanian N., Chaudhuri A. (2020), "Blockchain Applications in Food Supply Chain" (pp.21-29)
- Tan B. Yan J. Chen S. & Liu X. (2018), "The Impact of Blockchain on Food Supply Chain: The Case of Walmart": First International Conference, Smart Block 2018, Tokyo, Japan, December 10-12, 2018, Proceedings
- Tapscott D. , Tapscott A. (2018), "Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World ".(New York: Portfolio Penguin, 2018)
- Yiannas F. (2018), "A new era of food transparency powered by Blockchain", Innovations/ Blockchain for Global development. Vol.12.