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Implementing Blockchain Technology on the Food Supply Chain: A Case Study of Walmart

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INTRODUCTION



01 INTRODUCTION



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Since the food supply chain is highly multi-party and distributed worldwide, the cost of **operating the supply chain** is almost two-thirds of the final cost of goods through a complex series of processes (Kamilaris et al., 2019).

In recent decades, the frequent **global food scandals** and the massive **waste and loss** of perishable food have highlighted the uncertainty and opacity of **tracking systems** in the existing food industry (Niknejad et al., 2021).

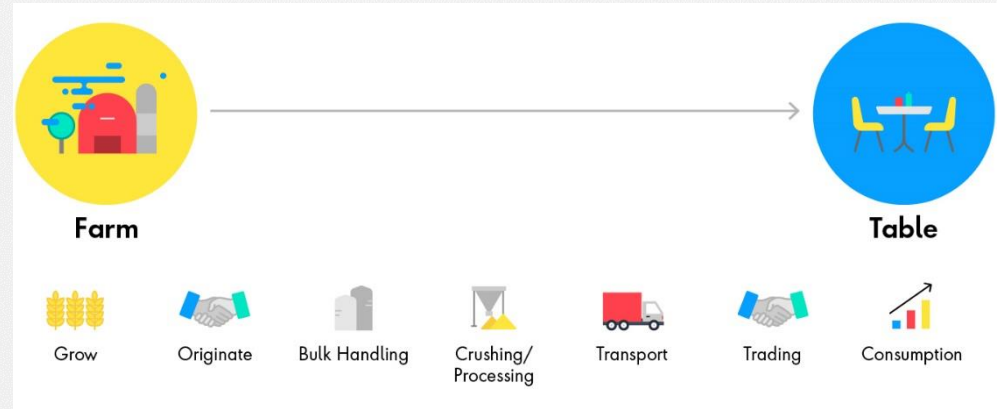


Figure 1: The entire process the of food supply chain

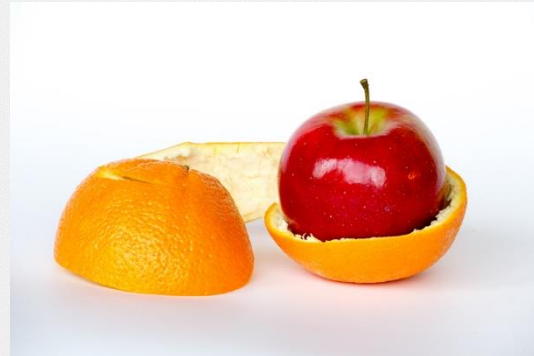


Figure 2: Food fraud



01 INTRODUCTION



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As a result, **consumers** have become much more sensitive to the problems related to food safety, which requires food companies to adjust their strategies.

Walmart has made outstanding contributions to **managing its supply chain sustainably**.

One of Walmart's competitive advantages is that it is working with **IBM** to develop a food safety **blockchain solution** to digitize the food supply chain process (Sharma & Kumar, 2021).

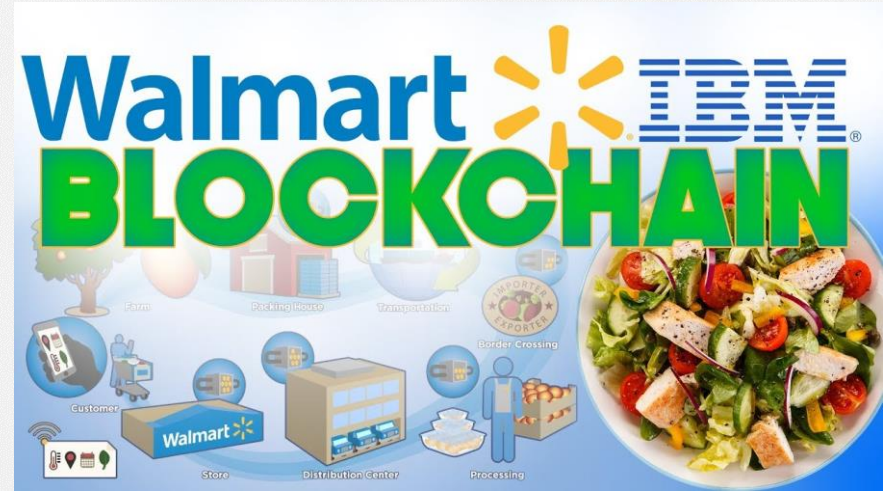


Figure 3: Walmart partners with IBM to blockchain-based food system



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Purpose of the Study



The purpose of this study is to provide a **comprehensive analysis** of implementing sustainable practices such as **blockchain technology** on the **food supply chain** including **the conundrum, the whole process, and the effect**. To fulfill the purpose of the study, the following research objectives should be facilitated:

1. From the perspective of the **sustainable multi-tier supply chain framework**, exploring the conundrum and the process of Walmart's adoption of sustainable practices.
2. From the perspective of **the triple bottom line theory**, analyzing the economic, social, and environmental impacts of Walmart's adoption of sustainable practices.





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Literature Review



1. Contemporary Food Supply chain

The food industry is extremely **complicated** and has been **the biggest manufacturing sector** in both developed and emerging nations (Krishnan et al., 2020).

Since food is a non - durable good, food systems are **growing increasingly vulnerable**, additional reasons include food inflationary pressures, kitchen wastes, food security, power and governance issues, among others (Ali et al., 2019).

2. Existing problems in the Food Supply Chain

2.1 Food Safety

2.2 Food Quality

2.3 Food Wastage



3. Potential Causes of Food Supply Chain Issues

One assumption suggests that the **COVID-19 pandemic** has exerted a significant influence on the food industry.

Another view focuses on **the traceability systems** in food supply chains, where information among participants in the supply chain is not entirely transparent (Wang et al., 2021).

Inadequate regulation from the relevant authorities is also considered to be an important cause of various food industry challenges.

What's more, **the globalization of the food supply chain** is also a factor in food counterfeiting and food fraud (Singh & Sharma, 2022).

4. Blockchain Technology

Developed in 2008, blockchain technology is **a distributed database system** that combines **transaction data** or other information (blocks) into chains (Cole et al., 2019).

5. Analysis of Blockchain Technology in the Food Industry

The food industry has made positive contributions in practicing blockchain technology, for example, **IBM** launched **Food Trust** based on blockchain technology in November 2018 (Kshetri, 2019).

Chinese e-commerce giant **Alibaba** also partnered with **Australia Post** in 2017 on a blockchain project to combat food adulteration (Xiong et al., 2020).

A report indicates that blockchain plays an important role in **reducing food safety risks** (potentially helping the food industry save \$31 billion of food fraud cases)





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Theoretical Framework

❑ Triple Bottom Line (TBL)- (John Elkington, 1994)

The triple bottom line principle is widely used to measure business performance. Companies are asked to consider **economic, environmental, and social issues** in their decision-making processes, which are the three most common dimensions used to **measure sustainability** (Martins et al., 2019).

In addition, the TBL approach looks at how companies **integrate and balance** all three responsibilities to maximize their positive impacts (Jamali, 2006).

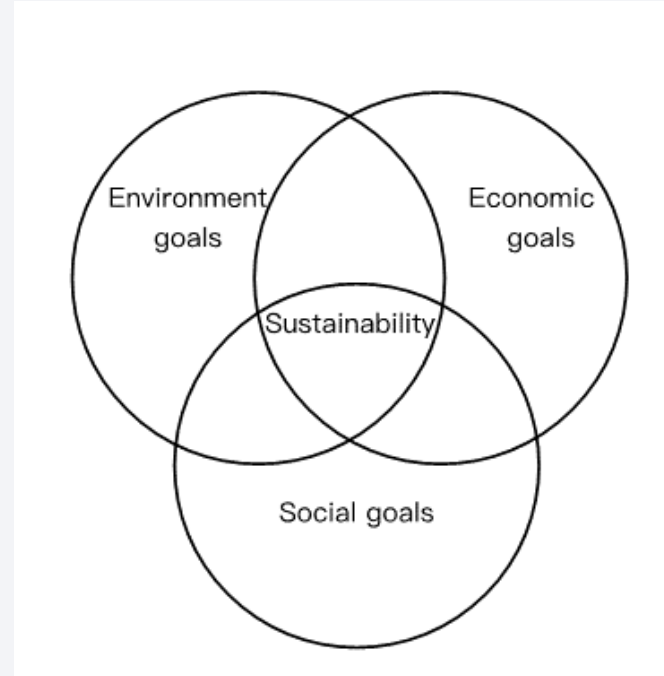


Figure 4: Theoretical Framework –TBL

□ Sustainable Multi-tier Supply Chain Framework (SMSC)- (Senyo and Osabutey ,2021)

The framework suggests that companies should **first identify sustainability challenges**, and then **combine their use of digital technologies with corporate strategies** to ensure sustainability is achieved (Senyo & Osabutey, 2021).

In addition, it is also essential to **continuously evaluate results** and address emerging issues (Senyo & Osabutey, 2021).

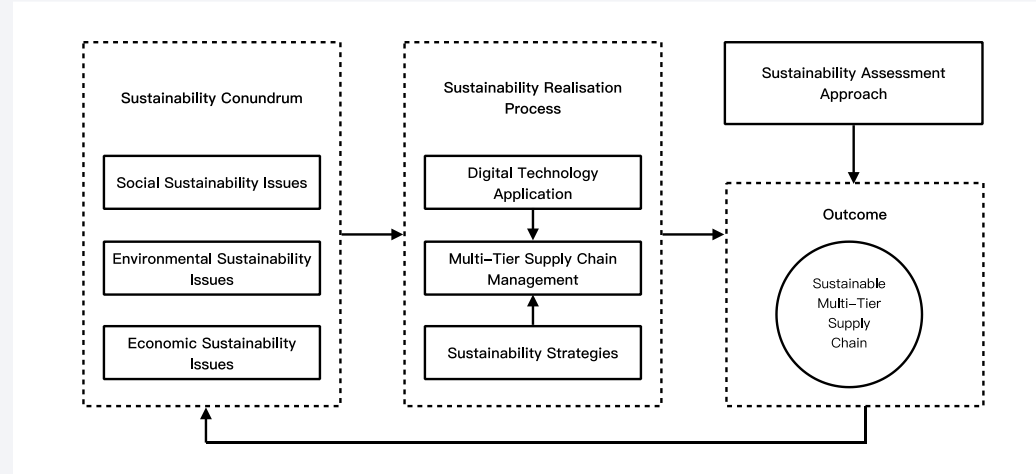


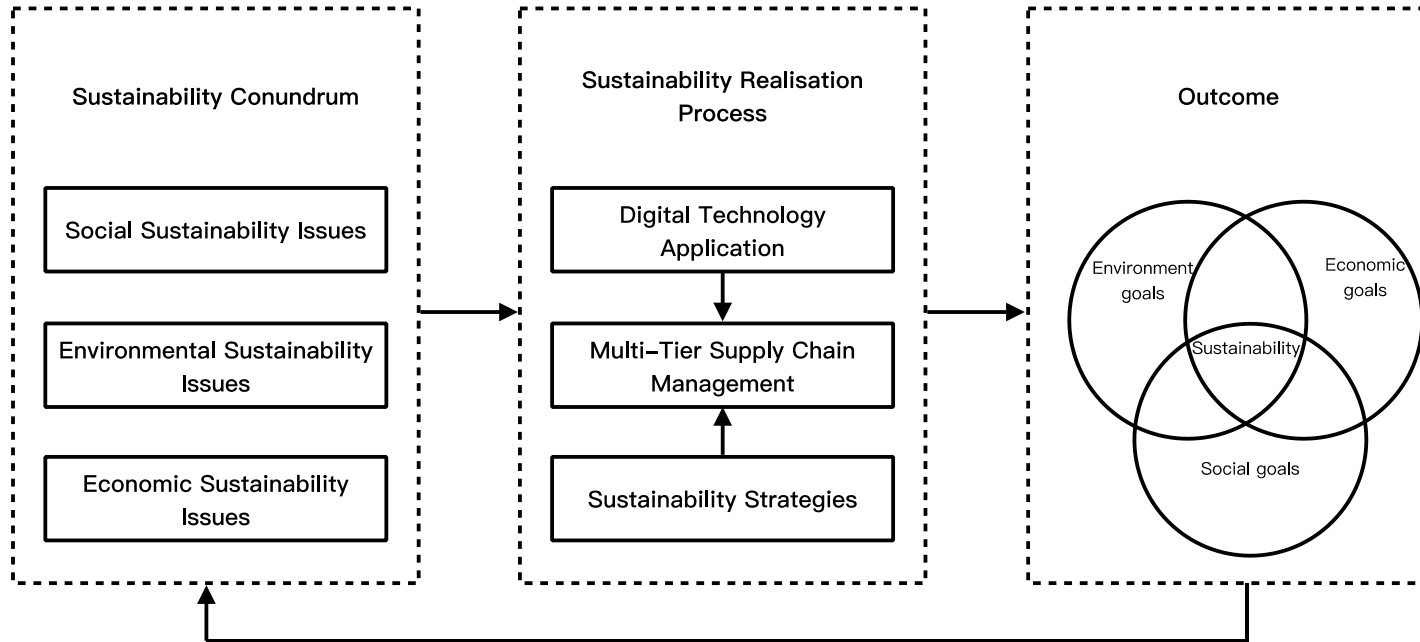
Figure 5: Theoretical Framework –SMSC



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Conceptual Framework





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Methodology



1. Research Method

Based on relevant food industry studies (e.g., Williams, 2015; Tan et al. 2018), this paper used a **desktop research approach** to **synthesize data from the documents pertaining to Walmart's activities**.

This paper focuses on **Walmart**, which is undoubtedly a mature case study because it has been employing blockchain-based solutions in its food system for more than six years and has achieved promising results.

2. Data Collection and Analysis

Data collection for this study was also divided into three specific phases.

In the **first phase**, this study chose Walmart's **official website** to find data, and "**blockchain technology**" was used as a keyword on Walmart's website, yielding **8** records.

Walmart's website has an **ESG reporting site** linked to it, it provides details on how Walmart is addressing a range of **environmental, social, and governance issues**. Similarly, "blockchain" was selected as a keyword and a total of **5** records were retrieved.



In the **second phase**, this study attempted to search for news articles from two contemporary mainstream **news websites: The New York Times and CNN (Cable News Network)**.

In the first attempt, a search on **The New York Times** using "blockchain" and "Walmart" as keywords yielded a total of **49** articles. Then, with the keywords "blockchain" and "food supply chain", the results got **30** articles. Finally, selecting "Walmart", "blockchain", and "food supply chain" as keywords, only **4** articles remained. Similarly, in the three attempts on **CNN**, it yielded **12, 7, and 2** results.

In the **third phase**, to find more documents describing Walmart's practice of blockchain technology, this study points to **two databases: Scopus and JSTOR**.

The first two keywords were set as "Walmart" and "blockchain" on **Scopus**, and **21** results were obtained. Next, the keywords "Walmart" and "food supply chain" were set for search, and **16** results were obtained. In the third attempt, the keywords "Walmart", "food supply chain" and "blockchain" were set, and **7** results were retrieved this time. Similarly, in the three attempts on JSTOR, it obtained **33, 228, and 17** records.

3. The Model to Analyze the Case Study

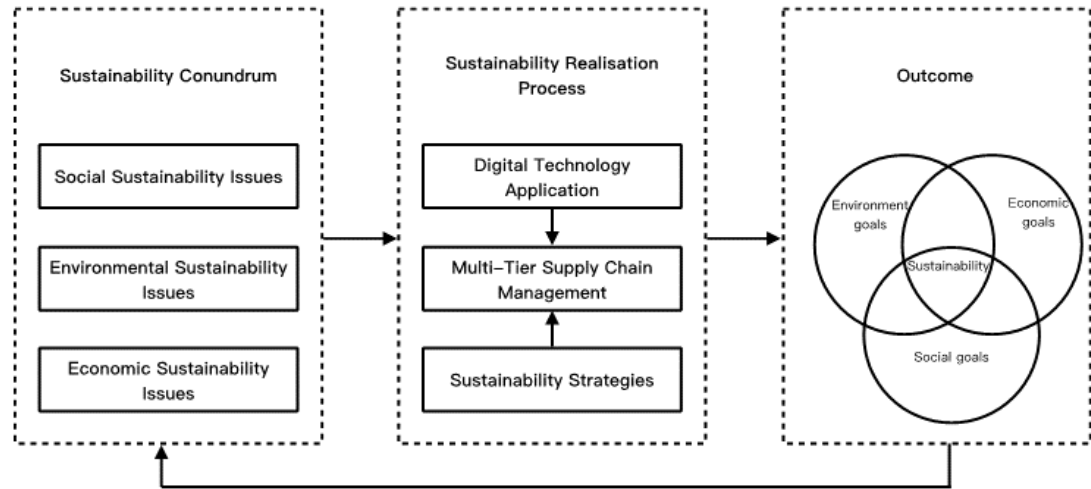
This study drew on the **SMSC framework** and incorporated the three aspects mentioned in the **TBL theory** inside the outcome section.

Specifically, the model can be divided into three parts, each with a particular focus, but the three parts are in fact closely related.

The **first** part focuses on the **sustainability conundrum**.

The **second** part focuses on the **realization process**.

The **third** part focuses on **outcomes**.





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Findings

Challenges

Economical Challenges

- I. **Food fraud costs** the global food industry \$49 billion a year (Lindley & Graycar, 2020).
- II. According to Walmart, due to the outbreak of food-borne diseases, **millions of bags or heads of lettuce had to be removed** (Hyperledger Foundation, 2021).

Environmental Challenges

- I. According to the UN Environment Programme's Report, about **17%** of global food production may go wasted, with **13%** coming from retail (Sristy, 2021).
- II. It is estimated that each year, the food loss and waste in U.S. embodies **170 million metric** tons of carbon dioxide emissions (Buzby, 2022).

Social Challenge

- I. The 2019 World Bank report indicates that in those less developed countries, the annual cost of treating foodborne illnesses is estimated at **\$15 billion** (Food safety, 2022)
- II. Slight misconduct of food can lead to contamination, which is a matter of **public health**, and the company will also **lose their reputations** (Anwar et al.,2020).



Realization Approach



Digital Technology Applied: Blockchain Technology

Business Strategy:

Walmart is committed to providing their customers with **safer and better-quality** food.

Process

Walmart's attempts began in 2016, when the company tried to **trace** a package of **sliced mangoes** to the source, following with the partnering with **IBM** to create a food traceability system based on the **Hyperledger Fabric** (Sristy, 2021).

After that, Walmart, along with JD, IBM, and Tsinghua University in Beijing, built a Blockchain ledger to track the movement of **pork** for its **Chinese supply chain** (Chen et al., 2021).

In August 2017, Walmart announced a Blockchain partnership with famous companies in the food industry such as Kroger, Tyson Foods, and Unilever to **find new applications** that could help increase food traceability (Haleem et al., 2021).

Environmental Outcomes

- i. Under the blockchain technology, Walmart can **better match supply and demand**. (Reichental, 2019).
- ii. The problem of food loss is also eased, along with the significant **reduction of greenhouse gas footprint** (Buzby, 2022).

Economical Outcomes

- i. Now consumers can find more accurate tracking details on the food through the label, thus **increasing transparency and enhancing their trust** (Zhou, 2017).
- ii. Walmart become able to **find the source** of foodborne illnesses **within a matter of seconds** (Schwarzbaum, 2018).



Social Outcomes

- After applying blockchain technology, Walmart **doesn't have to remove all** of the suspected contaminated products from its shelves, instead, they only need to recall the specific batches (U.S. Department of Agriculture, 2022).
- Blockchain can remove the need for time-consuming and potentially fraudulent document processing, which would **reduce food fraud** (Lindley and Graycar, 2020).



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Conclusions & Implications





This study investigates **the conundrum and the process** of blockchain adoption in food supply chains, using the case of Walmart. Furthermore, the diverse **benefits** of adoption are also identified.

The findings illustrate that Walmart's application of blockchain technology can help **solve some of the challenges** faced by the food supply chain, such as **food safety, food fraud, food wastage, consumers' trust and greenhouse gas footprint**.



So far, most studies have highlighted the features and benefits of blockchain technology, while the analyses focusing on one food company are not common. Although blockchain technology is thought to potentially revolutionize the food supply chain, it is not widely used in this area and the benefits it provides is still not very clear.

The findings of this study could help provide valuable information about sustainable practices like blockchain technology **for other companies** in the food industry and **encourage more use** of blockchain technology in the future.



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Future Research





In the future, the researches should include **more primary data** to increase the source of data.



Future researchers need to study **more cases** in the food industry.



More diverse data analysis tools are recommended to increase the credibility of the data than simply summarizing it.

THANK YOU!

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Please let me know if you have any questions

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