

Hyper transparency practices using blockchain in food systems

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OVERVIEW OF BLOCKCHAIN TECHNOLOGY IN TRACING FOOD SUPPLY CHAIN.

In contemporary civil societies, consumers have far greater access to food items despite the season or location. Such lengthened food supply chains from farm to fork have resulted in consumers' and citizens' alienation from the journey of their food. As a consequence of such disconnection to the land, people and resources level in the developed countries¹. As we experience the 4th Industrial revolution, where the boundaries between the physical, digital and biological are blurring, innovative blockchain technology is able to demystify the opacity in the food supply chain.

WHAT IS BLOCKCHAIN?

A blockchain is a decentralized approach where peers can communicate and validate transactions without depending on a centralized entity. This change from centralization to decentralization makes blockchain invaluable in the current scenario². With customers becoming more knowledgeable and demanding transparency, it is imperative for organisations to make data – such as of price, source, authenticity, or even social obligations – accessible. Blockchain-based solutions can provide assurance to digital generations by creating access to trusted, secure, and unaltered information³. Image 1 depicts how food supply chains are managed in the present and what they can look like by adapting blockchain technology.

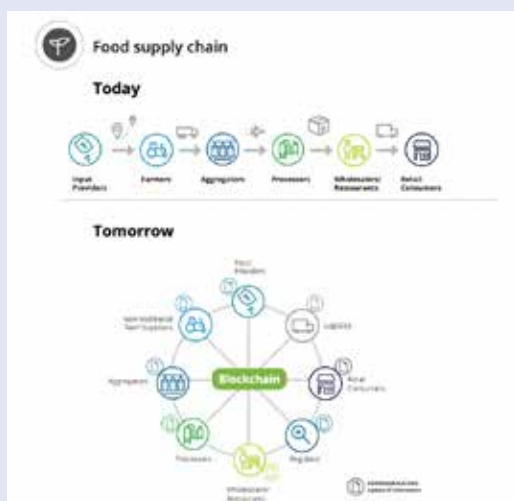


Image 1. Source: Deloitte

¹ FAO (2016)

² 101 Blockchains (2020)

³ Deloitte (n.d.)

HOW DOES IT WORK?

A decentralised blockchain-based supply chain works by digitising the assets of the supply chain that carry a unique identification number with vital information such as storage temperature, processing date, expiration date, factory, batch number, transport routes, and so on⁴. Once the data is confirmed to be stored, either by consensus or by third party certification, it cannot be modified. This ensures that end users do not have to suffer from counterfeit goods, and if there is any contamination, the batch can be easily be identified and removed from the system.

BLOCKCHAIN USE CASE

Developments applying blockchain to food systems are being implemented around the globe. In the US, Walmart in collaboration with IBM Food Trust has successfully launched blockchain hyper transparency for several food items ranging from fresh produce to dairy to poultry and even multi-ingredient products. Also in Europe, French retailers – Carrefour has launched blockchain information for 20 food items in collaboration with IBM. In Cambodia, Oxfam is working towards building rice traceability for the welfare of farmers who can get cashless payment upon a successful purchase of their produce. Another example is TE-FOOD system who are working on the traceability of meat in Vietnam. Image 2 depicts a list of real world companies that are using blockchain for supplychain.



Image 2. Source: 101 Blockchains (2019)

COMPONENTS OF BLOCKCHAIN IN SUPPLY CHAIN

The following are the important components of an open blockchain based solution⁵:

⁴ 101 Blockchains (2019)

⁵ IBM FoodTrust (2019)

API: Application Programming Interface serves as the programmatic version of the UI-based modules, so trusted data can be used in a self-developed environment. APIs can also be used for 3rd party integration, such as Inventory tracking, Consumer apps, Supply chain management apps, Temperature monitoring, Industry group applications.

Smart Contracts: Smart Contracts use pre-defined business rules or pre-agreed terms with transaction partners, and they reduce extraneous dispute resolutions needed based on trusted and immutable data. Smart contracts run in a private channel where only the parties interested in maintaining the contract have access, as data in that channel is unencrypted.

Trust Anchors: Trust Anchors are participants of the Food Trust network, such as retailers and food suppliers, that are collectively responsible for maintaining integrity of the shared ledger and assisting on meeting security, as well as privacy and permission guarantees.

So far, tokens have not been of high relevance in blockchain in the context of the food supply chain. Blockchain tokens have been mainly used as a financial engineering instrument, particularly for raising funds and engaging stakeholders⁶.

A blockchain enterprise is crucial for implementing blockchain⁷. There are several large enterprises out there, the one suitable for the use case of supply chain are Hyperledger, for its high scalability and performance. In addition, Enterprise Ethereum allows both public and private chains. Last, but not the least, Quorum, by J.P. Morgan is explicitly designed to handle all the pressures of enterprises like supply chain management.

TURNING BARRIERS INTO ENABLERS

While blockchain technology embodies a versatile range of benefits, it is a nascent technology. There have been concerns regarding risk of cyberattacks, data ownership and most importantly the sustainability aspect of blockchain. Each of these concerns have been acknowledged and possible mitigation methods are being devised.

Deloitte's Blockchain Readiness Framework has developed mitigation strategies for these concerns. It suggests counteracting cyberattacks by building robust cyber defence strategies which use blockchain's capabilities to provide data confidentiality, integrity and availability. The second concern related to the risk of data ownership by a third party could be prevented if suppliers are incentivised to share data and use of blockchain in conjunction with their internal local data system⁸.

Last but not the least, there is a rising dilemma over the sustainability value of blockchain technology due to its nature of high energy consumption of the distributed ledger. However, technological advancements exist to thwart high energy usage. One such alternative is hardware and software integrated with distributed applications such as in GPS devices to make computation energy-efficient. The second alternative is RFID (radio frequency identification) or NFC (near field communication). Image 3 shows how RFID can be used for smart shopping using blockchain. These do not require a power source and are already being used for other applications such as cattle identification. Third, devices could be powered by zinc-air batteries as a future possibility to have the minimal energy requirement⁹.

⁶ Dasaklis et al. (2019)

⁷ Hasib Anwar (2019)

⁸ Deloitte (n.d.)

⁹ Bumblauskas et al. (2020)

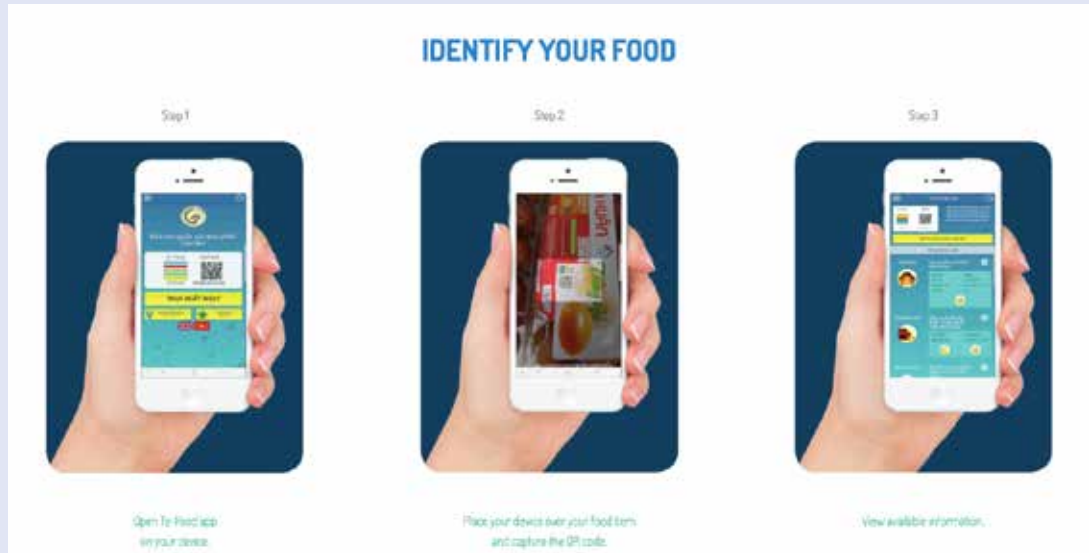


Image 3. Source: Bumblauskas et al. (2020)

OUR RESEARCH

In our research project with ATARCA, our team is conceptualizing experiential use cases of block chain. Retail groups in Finland are developing and implementing block-chain traceability for regionally and culturally popular food items such as coffee and local fish to mention a few. The aim of our project is to reach a focused stakeholder group such as higher education students through cafeterias such as Unicafe. Since the menu at the cafeteria changes every day, we are working toward implementing transparency for the traceability of protein sources in different meals. Some of the common proteins served at the cafeteria include chicken, chickpea, pulled oats.

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LINKS TO USE CASES AND OTHER ENTERPRISE

Walmart: <https://www.hyperledger.org/learn/publications/walmart-case-study>
 Carrefour: <https://www.reuters.com/article/us-carrefour-blockchain-idUSKCNIT42A5>
 TE FOOD system: <http://te-food.mx/> , Oxfam: <https://www.ledgerinsights.com/oxfam-blockchain-cambodian-rice-farmers/>
 Hyperledger: <https://www.hyperledger.org/learn/publications/walmart-case-study>
 Enterprise Ethereum: <https://ethereum.org/en/enterprise/>
 Quorum, by J.P. Morgan : <https://consensys.net/quorum/>