

**ARIV**

International Journal of Technology

Paper ID: AIJT21022021

Vol 2 Issue 1 2021

Blockchain Technology Ensures the Safety and Quality of Food – an Investigation

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Abstract

The food falsification and increasing issues regarding food products has caused much loss to the nation's economy and has completely eroded the Customers' trust. These are persistent issues not only for Government but also for consumers and stakeholders. The most needed thing is to track the whole food supply chain in order to identify and address the sources and elements contaminating the food supply chain globally. In this regard, Blockchain can play a vital role in tracing the chronological order of food supply and making it impossible to manipulate the food supply chain. Evolution and innovation in technology has made easiness in daily life of people. People tend to work less and comfort themselves more. Same is the case with food products and their consumption. In early times, people used to cook food for themselves at home and parties, but with the advent of technology, they rely more now on food industries and delivery of food products. But at the same time, consumers care for quality and healthy food and the transparency ratio maintained by food industries. In this research paper, we investigate the implications of Blockchain technology on food industry in Sultanate of Oman. A survey was conducted online to understand the implications of blockchain technology. Majority of the participants agreed that blockchain technology will improve the quality and safety in food supply chain.

Keywords: Blockchain technology, Blockchain in Food Industry, Transparency, Blockchain in Food safety, Blockchain in Food quality

Introduction

Blockchain Technology is the term now used in IT most frequently. Blockchain technology is basically a virtual process that maintains and keeps the records of transactions and tracks the tangible (Car, Plot, land etc.) and intangible (Copyrights, Intellectual Property Rights etc.) assets. On Internet, anything that can be traded or transferred can easily be managed with the help of Blockchain technology without any need of third Party and this would reduce the cost and benefit the customer more. The data and currency used is end-to-end encrypted, it's a single data on multiple computers that increase the trust between company and customer, no third party is involved. Information is the key driver of all businesses around the world, fast and transparent information is needed by both company and its consumers to develop trust and these both things are provided by Blockchain Technology: it provides most immediate and transparent data that can only be accessed by few permitted members. This data is stored on ledger from where Blockchain can track payments, orders, transaction, location etc.

If we just trace a history a decade earlier, people used to cook food themselves for home and for parties; but now they have become more dependent on restaurants in Oman. Many now seems to use blockchain technology to avoid fraud and cheating in food products. People more and more using this technology has some implications and this report is aimed to evaluate those implications in the report based on survey.

This research is focused on blockchain technology and its implications on food industry in Oman. Blockchain is considered now the next big disruption in Technology world and being used widely in businesses and Applications. This technology not only manage records safely but also strengthens the property rights of companies and brings the transparency in complete chain of supply reduces Frauds and Cheatings in food supply in Food Industries that consequently increases the food safety measurements. So, this research answers the main questions of what type of gap is there between consumers and food industries and how that gap can be filled by Blockchain technology.

There is a huge gap of trust between food industry (i.e. food Restaurants, food companies etc.), customers are more concerned about healthy food and hygienic production and sources of food. They want to know from where food comes, what are its resources and whether it is hygienic or not? In this research these problems are evaluated with the help of a survey conducted in different areas of Oman where Blockchain technology is used and, in those areas, where Blockchain Company is not used. Following is the problem statement that is to be dealt in this research.

How many people rely over Blockchain technology and whether they are satisfied with the quality of food, transparency, and prevention of counterfeiting issues by Blockchain technology and what are overall implications of Blockchain Technology over food industry in Oman?

Blockchain technology

Blockchain technology has many advantages, some are described below:

- **Reduce the expenses** - The expense of third-party involvement is reduced; overall supervision cost is also reduced because all process is self-policed by participants of Blockchain Technology and lastly duplication efforts are reduced.
- **Time is saved** - Transaction that occur manually or other ways, they take time from hours to days. In blockchain verification by central authority is not needed so it saves a lot of time.
- **Greater Security** - Blockchain technology has strong security measures, it secures transactions, protect information from Cyber security and tempering.
- **Better Privacy** - Users can only choose which viewers can see the information. IDs and permissions are the core elements of Blockchain technology.
- **Audit ability is increased** - Since only one ledger is involved, it makes easy to maintain transactions.
- **Operational Efficiency is increased** - The blockchain technology gives complete access to track the assets, it increases the operational efficiency.

Blockchain first stores the data and then distributes it to the authorized users without third party involvement. This storage process of Blockchain can be understood by following six steps [Zheng, Zibin, 2017].

- **Shards of data are created first**

The larger data is broken up into small segments, called shards and the process is called *sharding*. After that these segments of smaller chunks are distributed to various computers or channels [Marconi, 2017]. This shredding depends upon the type of application and the used data. For example: in food industries, various customers are in contact with companies from whom they get food in order to get full information regarding the source and production of food via blockchain company. These companies first collect the larger data from their customers and then share the information after identifying particular customers. The knowledge is shared only between Food Company and consumer.

- **Each Shard is Encrypted**

These shards are totally encrypted. Owner has the full authority over it; it is shared only with those with whom owner wants to share information. In food industry, the customers that demand information about the products they buy would be provided by to only those about their particular products [6 steps to how blockchain storage works, 2019].

- **Hash is generated from each Shard**

Blockchain then generates a unique “Hash” (Output data of particular length) from Shard data that helps in making transactions

- **Each shard is Replicated**

Using blockchain technology, owner replicates the data of shard to avoid loss of stored data in any kind of accidental situation. Now this depends upon owner how many copies of Shard data he or she is going to make. The replication of data avoids data loss and helps in maintaining transparency of process by keeping records of data [Gupta, Suyash, 2018]. E.g. in food industry the relevant data is replicated in order to satisfy customers by showing them complete record of production and consumption of food products.

- **Replicated Shards are distributed**

After that those shards are shared from peer to peer (P2P) network from region to region or globally. Some companies or owners that are called farmers lease the space for data storage nodes

in return of crypto currency. On entity owns the storage, only the content owner has access to the storage.

- **Transactions are stored at the ledger**

All the transactions in Blockchain technology are stored on ledger from where they synced to different storage nodes. The record stored in ledger in relevant one, only of those transactions, such as, hash, locations, and costs etc. ledger is linked with Blockchain so it is transparent and valid. E.g. in food industries relevant transactions are stored by companies to make process transparent.

Blockchain in Food industry

Majority of the people in Oman are becoming more and more dependent on outside food. They don't bother to make their own food; but rather they depend on hotel food. But it is difficult for them to know whether it would be healthy or not, whether the production of food is safe or not or whether the sources of food are hygienic or not. However, with the help of Blockchain technology Omani People would be able to track their food products from very beginning till end, they can avoid frauds and cheatings and build trust between company and consumer [Kamilaris, Andreas, 2019]. Blockchain technology keeps all records of transactions and tracks the relevant tangible and intangible assets. In these commercial frauds, cheatings, high rates and costs and least credibility in expiry dates are avoided by using Blockchain Technology.

A survey was conducted to investigate the implications of Blockchain Technology over food industry in Oman [Ranjith, Prasanna, 2018]. The survey was done using random sampling. People who responded to the survey belonged to different age group and education level. A questionnaire was distributed to 65 participants through Internet. Besides, the information was collected from different articles and publications.

Results

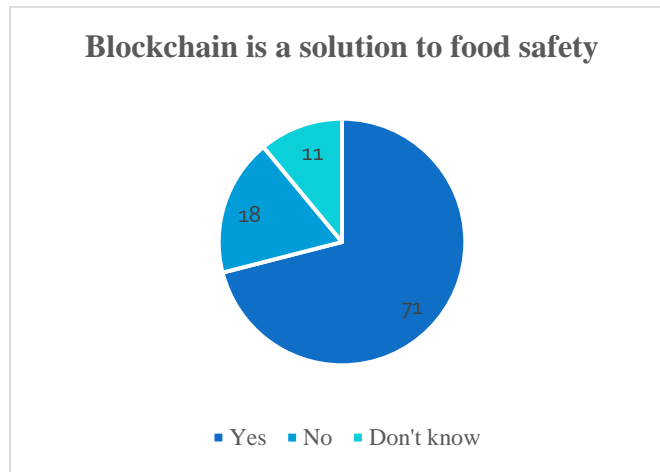


Figure 1

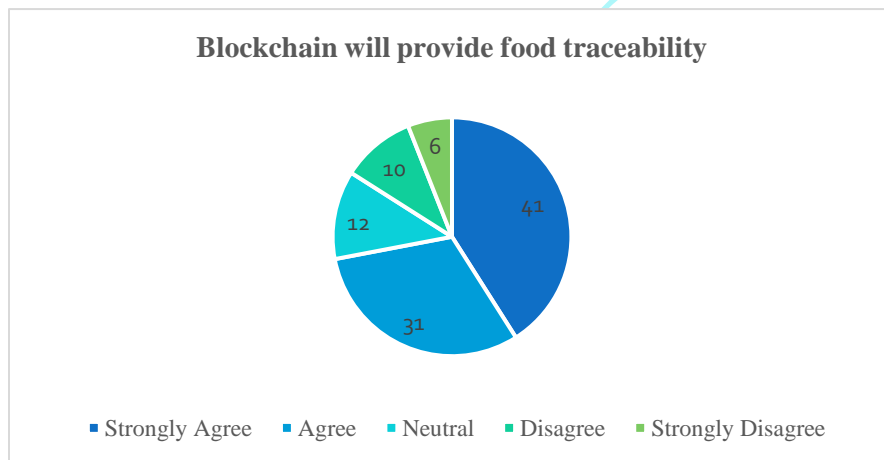


Figure 2

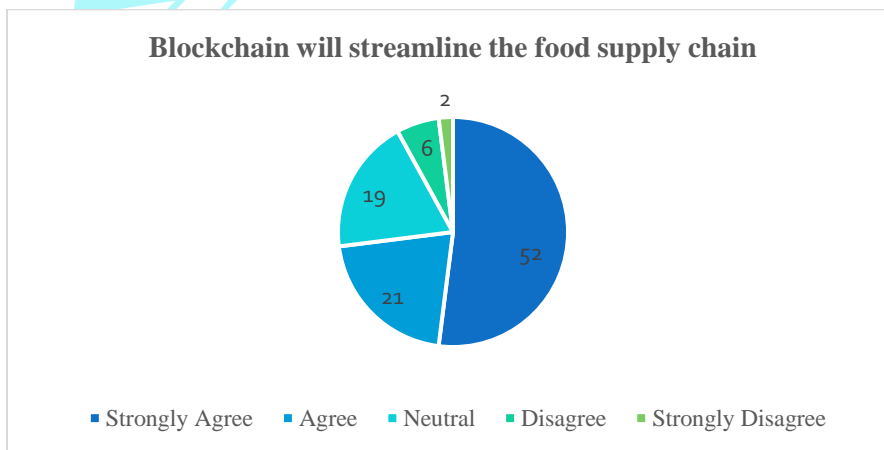


Figure 3

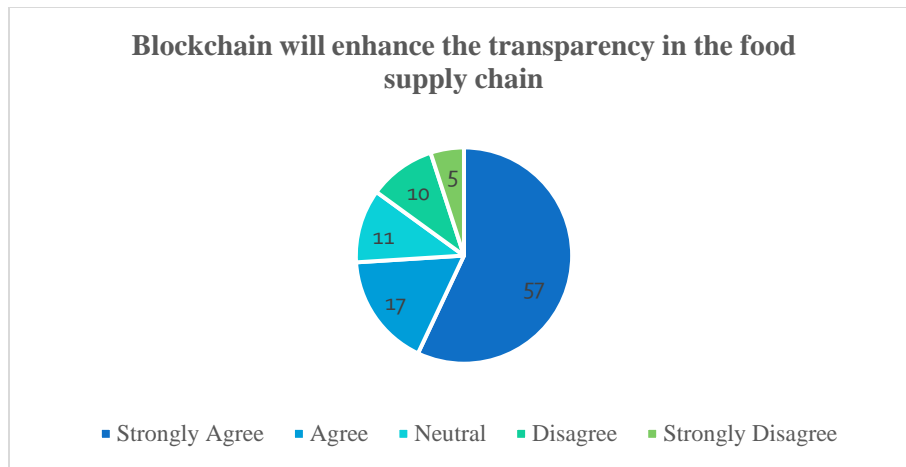


Figure 4

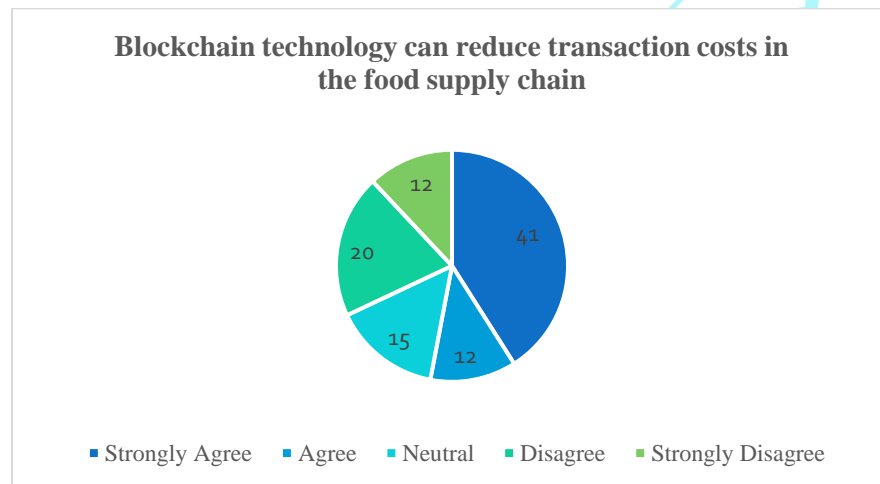


Figure 5

Discussion

Figure 1 shows that 71% of people agreed to the fact that Blockchain technology is a solution to food safety, while 18% didn't agree and 11% commented that they don't know about it. Figure 2 presents the results of whether blockchain provides food traceability. 41% of the participants strongly agreed, 31% agreed, 12% were neutral, 10% disagreed and 6% strongly disagree that blockchain provides food traceability. Figure 3 shows that 52% of the participants strongly agreed, 21% agreed, 19% were neutral, 6% disagreed and 2% strongly disagree that blockchain will streamline the food supply chain. Figure 4 shows that 57% of the participants strongly agreed, 17% agreed, 11% were neutral, 10% disagreed and 5% strongly disagree that blockchain will

enhance the transparency in the food supply chain. Figure 5 shows that 41% of the participants strongly agreed, 12% agreed, 15% were neutral, 20% disagreed and 12% strongly disagree that blockchain technology can reduce transaction costs in the food supply chain. From the above results it can be concluded that majority of the participants agreed that blockchain technology is a real solution to safeguard the safety of food supply chain.

Blockchain technology is used in food industry in worldwide in businesses. This technology manages records safely and strengthens the property rights of companies. It brings transparency and reduces frauds and cheatings in food supply. But there are some limitations for blockchain food traceability adoption too. For the blockchain to be successful, all parties and points of communication involved must be involved. In addition, data integrity lies in the hands of the data collectors and needs a validation mechanism to prevent tampering. The biggest obstacle to acceptance is providing a single structure with definitive criteria and regulations. While this new technology offers lower costs, greater productivity and better protection for governments and humanitarian actors, it also carries a range of very significant risks. The most severe of these concerns is the probability of violations of records. Although incredibly uncommon, businesses that use blockchain-based technologies have previously been hacked, and although these breaches have not revealed security weaknesses within the technology itself, systems organizations must be placed to accommodate the technology. The blockchain technology is highly recommended to food ministry and authorities working in country to avoid food falsification, manipulation of food supply chain and economic loss that occurs at the hand of filthy food supply chain. Customers can get full record of the production of food supply chain to witness the transparency in working of food supply companies.

Conclusion

Blockchain technology is very much helpful in monitoring movement of food supply and tracking. Managing the food supply chains by Blockchain technology in Oman would strengthen the food industries' working process. It would not only provide better control to food quality but will also increase the food safety. It helps consumers to trace the origins of food: from their sources till their production. So, Blockchain technology facilitates the complete development of trust between food

Industries and their customers. In Oman the trend of using Blockchain Technology is emerging, it would take some time to become fully established practice. From the survey conducted, it is evident that most of the people in Oman believe that blockchain technology is a real solution for the food safety and quality.

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