

Challenges and Opportunities of Block-chain Technology in Food Supply Chain in Egypt

Habiba S. Elrouby*

Graduate Teaching Assistant, AASTMT, Alexandria, Egypt
E-mail: habib.roubi@aast.edu

Ahmed Ismael

Deanery of Admission and Registration of Post Graduate Studies, AASTMT, Alexandria,
Egypt

*Corresponding Author

Abstract:

Purpose: Consumers have become more aware of healthy food and the ingredients that make up the foods they consume. Recently, the Egyptian government has discovered a farm which supplies a huge number of restaurants, this farm provided customers with donkey meat instead of beef. In response to polluted food scandals in Egypt, investigating the challenges and opportunities of adopting blockchain technology in Egypt's food Supply chain.

Research design and methodology: Information Technology became a vital tool in the process of problem-solving used by most enterprises. Accordingly, this research aims to propose a method using blockchain as one of the IT tools to enhance the transparency and visibility of the food supply chain in Egypt; through conducting interviews with experts in the food supply chain sector to know the challenges and opportunities about applying this technology in Egyptian markets using SWOT analysis during the year 2020. Accordingly, this research will be an action research paper.

Findings: The research findings were gathered from four interviews conducted with experts in the academic and food sectors and the findings can be summarized as follows: the prospective benefits of adopting blockchain technology in the Egyptian food sector are enhancing trust, improving food traceability, and reducing counterfeiting. However, there is a several number of potential challenges like lack of awareness of this technology in the Egyptian market, impacts uncertainty, and the need for intensive collaboration between partners.

Research limitations: This research is limited to enhancing the food supply chain in Egypt specially the meat sector. For further research, another researcher could try adopting smart technologies either in different food sectors like dairy products or in different sectors such as medicine or agriculture sectors, by using different tools.

Originality: This research paper can be considered as the first paper to bring up the idea of adopting blockchain technology in the Egyptian meat sector.

Keywords: Block-chain Technology, Food Supply Chain, Traceability.

Category: Applied Paper

1. Introduction

In 2019 the World Health Organization (WHO) estimated that “600 million persons, which about 1 in 10 people in the world, fall ill after eating contaminated food and 420,000 die every year, resulting in the loss of 33 million healthy life years”. Contaminated food or unsafe food resulted from a wide range of sources like harmful bacteria, viruses, parasites, or chemical substances, and it causes more than 200 types of diseases to human health.

Globally food scandals have increased in previous years, like supplier fraud as in the case of the horsemeat scandal in Europe as four suppliers have deceived consumers into buying meals containing horsemeat instead of beef and tainted milk formula for babies in China (Willsher, 2019).

Locally, The Egyptian authorities have intensified their inspection campaigns on stores that sell food, which has led to the detection of many incidents of fraud and the sale of materials unfit for human consumption. Recently, they re-seized three stores selling donkey meat instead of beef in one area. This was not the first food scandal as recently the Egyptian government has discovered a farm which supplies a huge number of restaurants, this farm provided customers with donkey meat instead of beef also. Moreover, in 2020 an Egyptian pastry-maker jailed for stuffing a popular dish with donkey meat instead of beef (Sherbini, 2020).

According to what has been discussed before, it can be observed that the food supply chain is vulnerable and supply chain visibility become an essential tool for guarantying food quality, safety and have enhanced control in case of food contamination situations through being able to refer to the source to take corrective action. This could be achieved through smart technology solutions.

Smart technologies like (Big Data Analytics, Cloud Computing, Internet of Things and Blockchain) being used in Logistics and Supply Chain Management (SCM)) and they are playing a vital role in supply chain visibility (El Mesmary and Said, 2019). Many companies used a blockchain solution for enabling supply chain visibility and the major example was found in literature was the U.S retailer “Walmart” which adopted blockchain technology to track pork’s supply chain imported from china. There also another major driver for companies which push them to invest in blockchain solution in their supply chain is customer demand about getting all the 2-information related to knowing the origin of products which they buy. Hence, this research aims to design a theoretical framework by using blockchain technology to enhance beef supply chain visibility in the retailing sector in Egypt.

2. Literature Review

The term blockchain refers to “a distributed ledger forming a distributed consensus on a history of transactions. The idea of blockchain first emerged into the public sphere with the Bitcoin P2P cryptocurrency, however, its applications go far beyond the scope of the financial sector”. (Mahmoud et al.,2019). Moreover, Awwad et al., (2018) have defined the term blockchain as a chain of records or information that are stored in the forms of blocks which are controlled by no single authority and once a piece of information is stored on a blockchain, it is extremely difficult to change or delete it.

Supply chains are complex as they encompass various processes like sourcing, procurement, manufacturing, distribution, and logistics. Each process should be done or carried in a way that adds value to the customer. Accordingly, Supply chain managers face some challenges like lack of traceability, stakeholder distrust, and Limited transparency (Zhang, 2019). Recently blockchain technology plays a vital role in logistics and supplies chain management (SCM) by enabling a

traceability system to track products in each stage throughout the whole supply chain from the product's origin till its final destination this was according to Awwad et al., (2018).

2.1 Food Supply Chain

Food supply chain management (FSCM) refers to the process of managing and controlling the activities related to food from production, distribution, storage until the final consumption with taking into consideration managing food safety and quality, this was according to Bristow et al., (2002). Besides, Charan & Panghal (2018) said that traceability become a crucial topic in food news as in recent years the concentricity on food safety and quality has increased globally, and this was due to the continuous illness of people from polluted food or reaching the maximum level of using chemicals which near to be above the allowable point. On the other hand, adopting traceability requires huge investments from companies to be adopted. Galvez et al. (2018) have mentioned three elements that describe the importance of blockchain in FSCM. They are transparency, efficiency and security, and safety.

2.2 Application of Blockchain technology in the food supply chain

In 2017 Walmart cooperated with IBM to successfully apply two block-chains first one was on pork in China, and the other was on mangoes in the Americas. Walmart used this technology to track imported mangos to be aware of each step from the day the mangoes were harvested, the location of the farm, the fertilizers used to grow these mangoes, and the temperature degree to which these mangoes were shipped until the day the shipment arrived at the Walmart store. This information is stored in the blockchain and all supply chain partners can view them even the final customer can check this information by scanning the Quick Response (QR) code provided on the mangos, which they are willing to buy. Walmart before adopting blockchain technology it took 7 days to track mangos origin. However, it now took only 2.2 seconds which extremely a huge difference (Kamath, 2018). Moreover, a blockchain solution was used for pork aiming to have full visibility of the process from its very beginning until it reaches the final customer's hands. This was under the approach "from farm to fork".

Moreover, a Chinese retailer called Jindong has collaborated with a beef supplier located in Mongolia, to use blockchain technology to collect virtual product information such as farm data, batch numbers, factory and processing details, expiry dates, storage temperatures, and shipping information. Their systems allow customers by using their devices to monitor details about frozen meat, such as the gender, weight, and feeding system of cows, as well as the location of farms, by scanning the (QR) code on the package.

Furthermore, the Alibaba website has announced a partnership with several Australian and New Zealand-based food producers and suppliers to use blockchain technology to limit the spread of counterfeit food throughout China. This was according to (Rajeb et al.,2020).

2.3 Egypt beef veal supply chain

Buffalo meat is considered one of the main sources of food for Egyptians. Egypt is ranked as the fifth in buffalo meat production with 390 thousand tons (El Sheeri, et al., 2017). The beef veal supply chain goes across many supply chain members, from livestock producers, traders, butchers, wholesale meat dealers, and retailers.

Swot Analysis

SWOT analysis is a strategic planning tool used to evaluate the strengths, weaknesses,

opportunities, and threats of any organization, as shown in table (1). SWOT analysis aims to Build on our strengths, minimize our weaknesses, seize opportunities and counteract threats. A SWOT analysis is used to explore possibilities for new solutions to a company problem. Make decisions and identifying our opportunities for a company. Determine where change is possible. If we are at a turning point, an inventory of strengths and weaknesses can reveal priorities as well as possibilities (Arslandere and Öcal, 2016). Opportunities and Threats emerge from the analysis of the external organizational environment. In contrast, strengths and weaknesses emerge from the analysis of the internal organizational environment (Vlados, 2019).

Figure 1 shows the different stakeholders in the veal supply chain in Egypt.

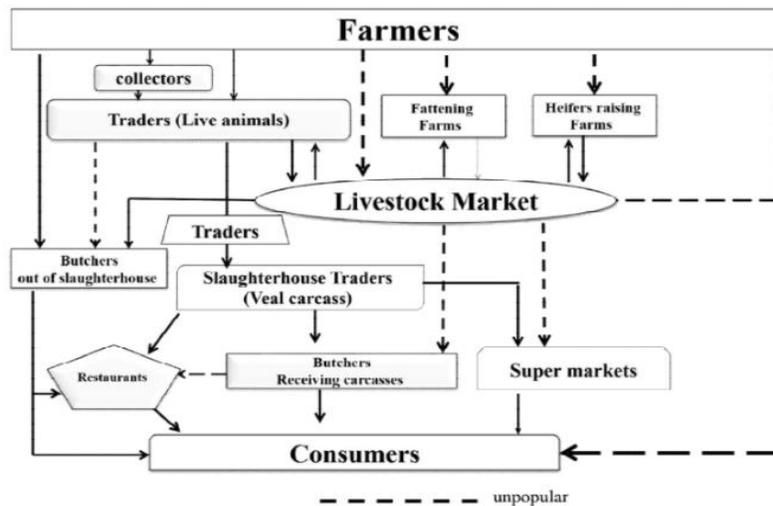


Figure (1): Map of different stakeholders along veal chain in Egypt.
 Source: (Elsheeri, et al., 2017)

Table (1) SWOT Analysis framework.

	<i>Helpful</i>	<i>Harmful</i>
<i>Internal</i>	Strengths	Weaknesses
<i>External</i>	Opportunities	Threats

Source: by the author.

Tippins (2019) outlined the basic SWOT process, also explained how SWOT fits into the larger strategic decision framework and articulates some of the common mistakes associated with using SWOT Analysis. Most managers used SWOT by listing the company strengths and do the same for weaknesses, after that they begin to think about threats and opportunities, which leads to those useless efforts and a lot of documentation (Vlados, 2019). In contrast, for making useful outputs,

they have to start with the external factors first opportunities and threats (Tippins, 2019). Gürel and Tat (2017) aimed to literature review on SWOT, qualitative and descriptive by nature. They examined SWOT Analysis in a historical, theoretical as an effective situation analysis of requiring strategic planning. They include an international sportswear brand's SWOT includes an international sportswear brand's SWOT analysis advantages-disadvantages and the limitations of SWOT analysis.

3. Research Methodology

The qualitative approach will be followed in this study through conducting interviews with experts in the food supply chain sector to know the opportunities and challenges of applying blockchain technology in Egyptian markets. This will be achieved through using SWOT analysis.

SWOT analysis is one of the most important tools for strategic analysis, and it is considered the first stage of preparing and designing plans within enterprises, and it also helps people to make and make decisions that affect their lives, and it is also an easy and very important way. Where it should not be ignored or not used in the work environment, and the importance of SWOT analysis is summarized according to the following points.

Moreover, SWOT can be used to deal with threats and obstacles and provides appropriate means to take advantage of the available opportunities, and reduces the control resulting from the elements of weakness affecting the efficiency of the facility's work. It provides information on all its elements, including threats, strengths, opportunities, and vulnerabilities; to apply a useful analysis of the enterprise to arrive at its competitive advantage. This was according to Gürel, E. and Tat, M, (2017).

Sampling is a process or a technique of selecting a suitable sample or a representative part of the population. The sampling designs can be divided into two main types, probability sampling, and non-probability sampling. Probability sampling is based on the concept of random selection in choosing the elements. Whereas non-probability sampling is 'non-random' sampling, in this type of sampling, items for the sample are selected deliberately by the researcher, non-probability sampling is also known by different names such as deliberate sampling, purposive sampling and judgment sampling (Neuman, 2014). According to this research approach, the sampling type used is non-probability sampling, "purposive sampling", because the researchers are interested in enhancing the Egyptian meat sector.

There are five interviews have been conducted. Three of them were with experts in the academic field who have good knowledge about blockchain technology, and other two interviews with Egyptian retailers who provide the customer with meat.

Selecting the respondents was based on their expertise in the academic field also, they have good knowledge about blockchain technology, and the other respondents were selected because they are Egyptian retailers who provide the customer with meat.

All the respondents of the interview have good knowledge and experience in their field. The interview questions were designed to explore the different strengths, weaknesses. Opportunities and threats that may face Egyptian retailers when adopting blockchain technology in the food sector. the interviewee's names or their organization's names were kept confidential.

4. Findings and Discussion

Based on the interviewee's responses a SWOT analysis was designed to explore the strength, weaknesses, opportunities, and threats of applying blockchain technology in the Egyptian meat

sector.

Figure 2 highlights the SWOT analysis of applying blockchain technology in the meat supply chain in Egypt. The results of the interviews were mentioned in Figure 2, which indicates the opportunities of applying this technology in the Egyptian food supply chain. Most of the respondents agreed that Blockchain technology would enhance the supply chain process optimization through the transparency and the visibility of products move; therefore, supply chain processes optimization would lead to reducing the cost of the meat supply chain process and enhance the traceability process. However, lack of awareness about the technology between food supply chain entities in Egypt would be an obstacle of applying such a technology, also the respondents confirmed that blockchain technology is a very complicated tool to be applied in the Egyptian food market as the main driver of blockchain is the complete data sharing between supply chain partners and this can be the major challenge for applying this technology in Egypt.

Although, some of the respondents mentioned that applying blockchain would improve customer shopping experience as the customer will be able to track the meat origin which they are willing to buy in addition to being updated by other information like slaughter date and transportation conditions. But- according to the respondents- some of the companies that will consider applying this technology would bear high costs represented in a high investment cost which may result in increasing the final product cost. Hence, this may cause inconvenience from the customer's side. Blockchain technology would increase product safety, traceability, and build trust with customers as it will reduce counterfeiting. The respondents confirmed that applying this technology would achieve customer satisfaction and build a long relationship quality with them.

Most of the respondents have agreed that the main obstacle of applying blockchain technology in the Egyptian market will be the lack of awareness of this technology either from the consumer's side or from the meat supply chain member's side. Moreover, they mentioned that traceability and transparency in the coming years would be mandatory and not a choice for supply chain members. Finally, since that blockchain technology is not applied in the Egyptian market yet, therefore, the respondents mentioned that they cannot expect the impacts of applying this technology on the Egyptian market and consumers either as it may have positive or negative impacts.

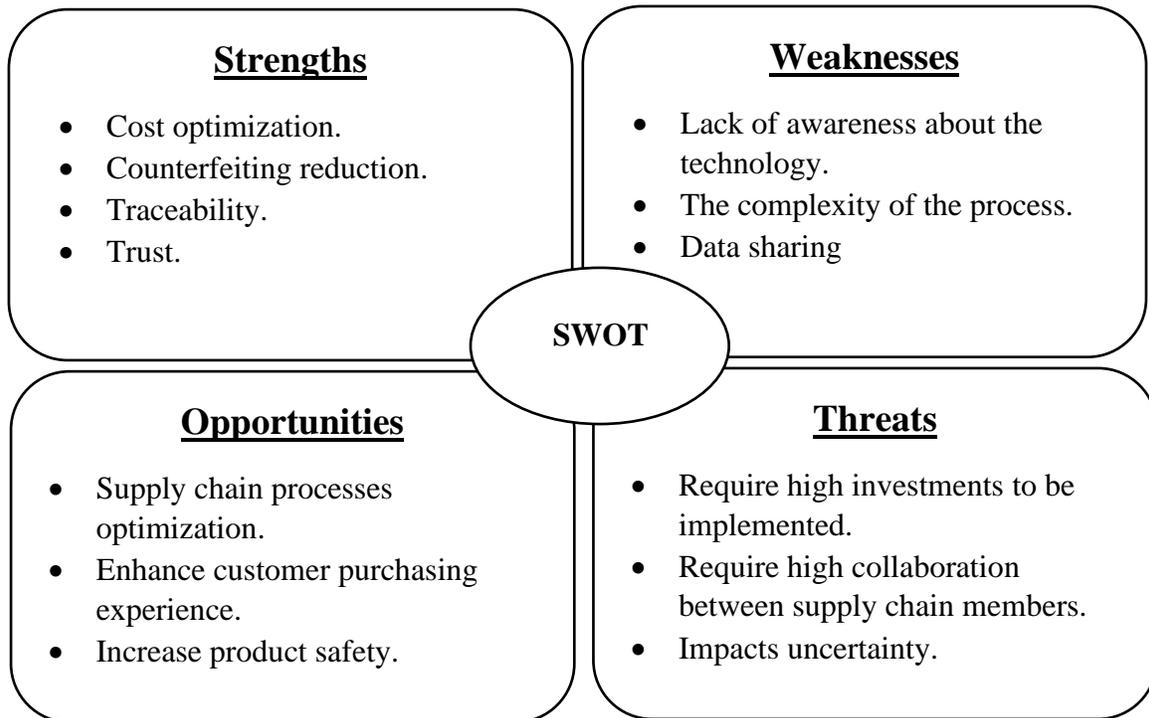


Figure (2): by the author

5. Conclusion

This paper provides a holistic picture of the possibility of applying blockchain technology in the Egyptian meat sector; this was through conducting interviews with experts in the food sector. The respondents were optimistic about the idea of applying this technology in the Egyptian meat sector, especially to avoid counterfeiting cases and to provide the consumer with a detailed picture of the process. However, they mentioned some obstacles that may hinder the application of this technology in Egyptian markets like (lack of awareness, high initial cost, complete data sharing between meat supply chain partners, and bureaucratic culture in terms of fear of change.

6. References

- Arslandere, M. and ÖCAL, Y. (2016). SWOT Analysis As A Tool For Strategic Management And An Implementation In A Firm In Machine Industry, *1 st International Academic Research Congress*, 3-5 November.
- Awwad, M. A., Reddy, S., Airpulli, V. K., & Zambre, M. S. (2018). Blockchain Technology for Efficient Management of Supply Chain. *International Conference on Industrial Engineering and Operations Management*, (pp. 440-449). Washington DC, USA.
- Bristow, G., Banks, J., & Marsden, T. (2002). Food Supply Chain Approaches: Exploring their Role in Rural Development. *Journal of the European Society and for Rural Sociology*, 40(4), 424-438.

- Charan, S., & Panghal, A. (2018). Importance of traceability in food supply chain for brand protection and food safety systems implementation. *Annals of Biology*, 34(2), 111-118.
- ElMesmary, H., & A. Said, G. A.-N. (2019). Smart Solutions for Logistics and Supply Chain. *International Journal of Recent Technology and Engineering (IJRTE)*, 3(2), 2996
- Elsheeri, A. et al., (2017). CHARACTERIZATION OF BUFFALO VEAL SUPPLY CHAIN IN VILLAGES AROUND CAIRO. *The Egyptian Society of Animal Production*, 52(2), pp. 105-109
- Galvez, J., Mejuto, J. C., & Simal-Gandara, J. (2018). Future challenges on the use of blockchain for food traceability analysis. *Trac Trends in Analytical Chemistry*, 107, 222-232.
- Gürel, E. and Tat, M. (2017). SWOT ANALYSIS: A THEORETICAL REVIEW. *The Journal of International Social Research*. (10)51.
- Kamath, R. (2018). Food Traceability on Blockchain: Walmart's Pork and Mango Pilots. *The Journal of The British Blockchain Association*, 1(1), 1-12.
- Mahmoud, Q. H., Lescisin, M., & AlTaei, M. (2019). Research challenges and opportunities in blockchain and cryptocurrencies. *Internet Technology Letters*, 2(2), e93.
- Neuman, W. L. (2014) "Social Research Methods: Qualitative and Quantitative Approaches", 7th ed. Pearson.
- Rajeb, A., Keogh, J. G., Zailani, S., Treiblmaier, H., & Rajeb, K. (2020). Blockchain Technology in the Food Industry: A Review of Potentials, Challenges and Future Research Directions. *Logistics*, 26.
- Sherbini, R. A. (2020). Egyptian pastry-maker jailed for stuffing popular dish with donkey meat, U.A.E: Gulf news.
- Sharma, R., Zhang, C., Wingreen, S. C., Kshetri, N., & Zahid, A. (2019). Design of Blockchain-based Precision Health-Care using soft systems methodology. *Industrial Management & Data Systems*.
- Tippins, M. (2019). Revisiting SWOT Analysis: A Widely Misused Decision-making Tool. *The Journal of Global Business Management*. (15)2.
- Vlados, C. (2019). ON A CORRELATIVE AND EVOLUTIONARY SWOT ANALYSIS. *Journal of Strategy and Management*. 12(3). 347-363.
- Vlados, C. (2019). On a Correlative and Evolutionary SWOT Analysis. *Journal of Strategy and Management*. (12)3. 347-363.
- Willsher, K., (2019). *Horsemeat scandal: four on trial in Paris accused of fraud*, United Kingdom: The Guardian.