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From farm to fork – how to combine food safety with blockchain

Hi guys,

Welcome back to our LogBlog! After our exams, we're finally back in business and keen on exchanging information about food safety on the blockchain. We hope you survived your exams and are excited about our new blog post!

As you all know, blockchain is on everyone's mind. Just to catch up, here are the most important facts you should know: blockchain is an unrestricted and decentralized collective data base. And all parties who have access to the chain are registered and their information is chronologically and immutably saved.¹

Every year, nearly 600 million people become ill due to contaminated food. The reason for this is a lack of food security.² To improve the situation, one tool is RFID (Radio-Frequency Identification) in combination with blockchain. A RFID-tag is interfaced with each product. Through these tags an exclusive cryptographic code connects the product to the blockchain. A product information profile is then generated.³

Especially considering meat, consistent tracking is important to prevent food-contamination. The basis of this tracking is the 3T principles: time, temperature, and tolerance.⁴ Let's look at an example: One technique are biocapsules which trace real-time data of livestock while they are on the farm such as body temperature, daily drinking cycles, and the amount of physical activity. This data is always available for all registered parties including web or mobile software. Having the data in mind enables the farmer to provide best meat quality.⁵ Not only are the living conditions tracked, but also the entire supply chain. All parties with access to the blockchain can add new data to generate transparency. In the illustration below, you can find a visualization of the stakeholders in the supply chain. Trustful information that can be added

¹ Cf. Nakamoto (2008), p.1f

² Cf. Whitworth (2018)

³ Cf. Feng (2017) p.4

⁴ Cf. Feng (2017) p.6

⁵ Cf. Iftekhhar (2020) p.3

to the blockchain include storage temperatures and shipping details. All of this data is attached to the RFID-tag and flows directly into the blockchain.⁶ To generate more transparency for the customer Carrefour, a French supermarket, integrated QR-codes on their product labels. This enables the customer to gain a deeper insight into the products' origin during their shopping tour.⁷

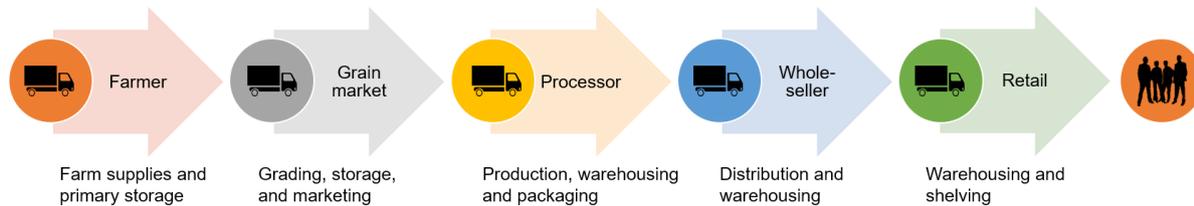


Figure 1: Stakeholders in the supply chain (Cf. Iftkhar [2020], p.4)

One advantage of using blockchain in the food industry is traceability. In case of a foodborne disease outbreak, an effective recall of contaminated food is possible. By using RFID technology, the company has the possibility to concretely identify individual products that must be removed from the sales floor.⁸

Another benefit of the blockchain is the increase in product quality. Especially through the irreversibility of the blockchain manipulating the data is impossible. Instead, the blockchain enables users to follow a real-time tracking of operational information. By doing so, an increase in reliability and quality of perishable food and fresh products is created.⁹ Furthermore, not only can the product quality be secured, but also the labour conditions can be influenced as well. This means all contracts are uploaded visibly, working hours are traced, and the payment streams are shared with the whole organization.¹⁰ Having this data in mind enables the company to fight against problems related to ineffectiveness, transparency and tampering. One clear result of implementing this technology is that companies can demonstrate their readiness for innovation and boost their reputation.¹¹

Nevertheless, this technology also faces challenges. In general, blockchain know-how is rare. Out of two million Indian software developers only 5.000 have the knowledge about blockchain technology. This leads to a significantly high cost of hiring blockchain developers. Additionally, this skill shortage is especially worrisome in Africa and China, where most of the food production takes place. Basic infrastructure, such as internet and access to technology are key

⁶ Cf. Kamath (2018) p.49

⁷ Cf. Canellis (2019) p.64

⁸ Cf. Smith (2018) p. 153

⁹ Cf. Sander, Semeijn, Mahr (2018) p.153f

¹⁰ Cf. Widdifield (2020) p.24

¹¹ Cf. Higginson, Nadeau, Rajgopal (2019)

challenges. Accordingly, only large companies have the financial capacity to invest in blockchain-based solutions.¹²

Furthermore, it should be considered that there are no worldwide legal standards regarding the blockchain. Currently, regulations and standards are conflicting between the countries. To solve this issue, the countries should specify their law regulations. But as long as a uniform and nationwide system does not exist, these standards cannot be implemented on a global scale.¹³

Moreover, a general problem of blockchain is transaction speed. While the VISA system can handle up to 47.000 transactions per second, blockchain technology is limited to 7 transactions per second. The reason for this is the restricted size of the block and the 10 minutes that it takes to confirm each block. In comparison, VISA can manage a similar process in only seconds. This leads to a big disadvantage for blockchain.¹⁴

Okay, so that's enough of hard facts. But what do we think about this topic? In our opinion blockchain is a great tool to improve food safety. It offers transparency and plentiful detailed information about all stakeholders in a private blockchain where sensible data can be shared. Moreover, blockchain offers the food industry plenty opportunities for customer loyalty and sales growth. Additionally, crisis situations can be handled smoothly due to an easy identification of the source and a specific recall of the certain products.

Next to all the positive aspects, the following points should also be considered. Because knowledge of this complex technology is still very limited, the implementation costs are high. This makes blockchain very exclusive for revenue-generating companies. So far, this technology is only applied to high-end products, which are more profitable because of a higher revenue margin.

In a nutshell, blockchain has a high potential for the future. Especially the implementation of RFID offers great opportunities to track the supply chain more easily and in more detail. In general, the government should invest more money into research and general implementation of judicial regulation. Another challenge is to first gain a greater understanding of blockchain itself to develop firstly more educational background during primary education and secondly retraining of employees. This does not only benefit the economy but improves public health. We think Mr. McDermott is absolutely right with his statement: "Blockchain is not solving a technical problem, it is solving a social problem".¹⁵

¹² Cf. Agarwal (2018)

¹³ Cf. Iftekhhar (2020) p.11

¹⁴ Cf. Feng (2017) p.4

¹⁵ Cf. McDermott (2017)

What about you? What is your opinion about blockchain in the food industry? Let's discuss this in the comments! We're looking forward to hearing from you!

Until then, stay safe! 😊

Jessi & Selina

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We hereby allow Carola Schulz to publish this article on her HHN webpage.

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