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# Impact of Blockchain technology on the Supply Chain Industry

## Introduction

Thousands of manufacturers are producing billions of products every day. Therefor the use of complex supply chains all around the world are necessary. Nevertheless in most of the cases there is almost no knowledge about these products, concerning the way they were produced, where their origins are and how they were used through there live time. To handle that lack of transparency there is at least one centralized third party in the supply chain who manages all data which can only be conducted with a great deal of trust by all participants and leads to further concerns about potential misuse and single point of failure. (Abeyratne and Monfared, 2016)

The integration of blockchain technology might help to solve these problems. As a consequence this paper will point out several constraints of the supply chain industry, define the blockchain technology, show some applications of blockchain and then discuss the benefits and drawbacks of the implementation of blockchain to illustrate the impact of this technology on the supply chain industry. In the end there will also be a short conclusion.

## Theory Section

### Constrains of the supply chain industry

Over the last decades the amount of participants being part of a supply chain rose significantly due to several reasons like the globalization, the increase of competition and the outsourcing. (Kshetri, 2018, p. 81)

In addition many different factors like people, physical resources, knowledge, processes and financial contracts which are part of the supply chain makes the hole process even more complex. As a consequence it is a huge challenge to manage these information. In most of the cases there is only a very limited access for the participants like the customers to the overall data which were hosted by a single centralized third party or are distributed to several locations. As a result the transparency of the supply chain does not really exist and the actors have to trust each other without a reasonable basis. (Francisco and Swanson, 2018)

Whereas in the past the transparency through the supply chain was less interest as long as the product in the end fitted the requirements of the customer, nowadays the end users are more concerning about the origin of their products including supply sources and complete manufacturing history. (Francisco and Swanson, 2018)

One example for this evaluation is the E.coli outbreak at Chipotle Mexican Grill outlets, which led to negative press, followed by a massive reduce of sales caused by a lack of reliance in the supply chain. (Kshetri, 2018, pp. 80–81)

To improve the transparency of the supply chain and create a fundament of trust the integration of the blockchain technology could be a possible solution. Therefor this technology will be presented in the next chapter.

### Definition of Blockchain

Blockchain first occurred in 2008, invented by Satoshi Nakamoto, who created a publicly distributed ledger by collecting data of transactions into blocks which are sorted in a chronologically chain. Due to a hashing algorithm the data in a blockchain cannot be changed by a single participant but by the consensus of all implemented nodes of the network. Consequently the blockchain is a decentralized virtual peer-to-peer public ledger that is not reliant to a centralized third party. Although the blockchain technology was first used in the financial sector as a part of the source code of the cryptocurrency Bitcoin in 2009, there are many possible ways to applicate this technology in the supply chain industry. (Scott et al., 2018)

To get an impression of the possibilities of using blockchain technology in the supply chain industry the next chapter will illustrate some examples.

### Applications of Blockchain in Supply Chain

Despite of occurring for the first time in 2008, the integration of blockchain technology in the supply chain industry has only be mentioned since 2015, which is a fact for the novelty of this thematic. (Youness Tribis, Abdelali El Bouchti, Houssine Bouayad, 2018) However there are already many applications that were realized recently.

One of the first applications was conducted in 2016 when the complete way of yellowfin and skipjack tuna were tracked from the fishermen to the consumer. Thereby it was also possible for the end user to comprehend all information of the product and how and from whom it was manufactured by using an app on their smartphone. (Francisco and Swanson, 2018)

A similar application was already invented concerning the traceability within the global diamond industry. By using the blockchain technology a database of over a million diamonds was created enabling all actors of the supply chain to ensure the diamonds are from “conflict free” regions. (Francisco and Swanson, 2018)

Another industry where the blockchain technology has been applied is the medical sector. The transport of medical products is highly quality related and strictly regulated. That is why a start-up called modum.io combined Internet of Things sensors with blockchain technology to track the temperature during the supply chain and surveille the whole transportation to ensure that all regulations are fulfilled and prevent fraud as well as reduce costs. (Thomas Bocek, Bruno B. Rodrigues, Tim Strasser, Burkhard Stiller, 2017)

Although the blockchain technology has not been applied in the oil industry, it is argued that this could be a large market for this technology due to the fact, that there are usually up to 13 supplier layers. As a consequence the blockchain technology might be dominating this sector if some of the oil firms showed positive results by using it. (Kshetri, 2018, p. 87)

## Analysis Section

### Benefits of Blockchain

The explanations and illustrated applications in the other chapters leads to many advantages that can be achieved by the use of blockchain technology in the supply chain industry. First the decentralization of the networks removes the need of a third party and consequently the single points of failure which creates a higher durability and reduces possible access from malicious. Then the transparency of the supply chain increased significantly due to the real time access of each node on the network to the blockchain. This encourages the trust of every participant from the suppliers over the manufacturers up to the costumer. Although the access to the blockchain is granted, there is a high immutability of the data due to a validation process including other nodes and also the traceability of conducted changes. (Abeyratne and Monfared, 2016)

### Problems of Blockchain

Although it is argued that blockchain technology is a great digital innovation, it is also discussed that this technology could disturb the industry in an unseen way. (Kshetri, 2018, p. 81)

First of all due to the many suppliers within a supply chain, located all over the world, the compliance of a great variety of different laws, regulations and institutions have to be considered for the implementation of the blockchain technology. Depending on the number of participants and their cultural background this can be crucial. Specially concerning the fact, that all actors have to comply and adopt this new technology.

Moreover despite the fact that the blockchain technology would increase the traceability and transparency of the supply chain which also includes a redundance of fraud, this is all related to the digital world. There will be anyhow many ways of manipulate products through the supply chain in a physical way, which would not be recognized by the blockchain technology. In addition due to the need of a digital network as a requirement for participating in a blockchain this could be very challenging for suppliers who are located in developing countries. As a consequence the full potential of this technology could not be reached due to the missing nodes of the supply chain industry. (Kshetri, 2018, p. 88)

## Conclusion

The examination of blockchain technology through the supply chain industry provides the information that despite of being invented already 12 years ago, the implementation of this technology in the supply chain industry is rarely new. Although there are many examples for the application of blockchain, most of them are in a prototype level and there are not very much experiences. In addition the integration of the blockchain technology in the supply chain industry faces several possible obstacles that have to be considered. However the demonstrated advantages like an increase of durability, transparency and trust connected with the reduction of possible frauds and malicious access can change the supply chain industry in a significant way.

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