**Impact of Blockchain technology on the Supply Chain Industry**

Introduction

Blockchain is a new software technology emerged in the last years and becoming more and more popular. Francisco, K. and Swanson, D. (2018) defines a Blockchain as an open-source, decentralized database for storing transaction information (Francisco, K. and Swanson, D., 2018, p. 1).

Transactions are recorded in blocks, crypted and attached chronologically onto the already existing blocks forming a Blockchain. The process of attaching the block is called “mining”, and integrated with a so-called hash algorithm, makes the chain and so also the data unchangeable (Scott *et al.*, 2018). The innovative fact about this procedure is that no third party is necessary for the intermediate stage. Only authorized users are able to add information to the chain and this must be acknowledged by all parties. Thus, practically eliminating trust issues (Abeyratne, S. A. and Monfared, R. P., 2016).

Applications

Blockchain technology was introduced by Satoshi Nakamoto in 2008 for recording transactions of a

virtual currency known as Bitcoin (Tribis *et al.*, 2018). Since then numerous studies and pilot projects have been carried out to implement this new technology in other sectors. Introducing Blockchain technology for different aims is driven by implementation of new regulations, customer expectation and enhancing supply chain overview. The most significant advantages of this technology in the supply chain industry are transparency and traceability. Supply chains are getting more and more complex and a centralized system for data security and transparency is not suitable anymore (Abeyratne, S. A. and Monfared, R. P., 2016). The following paragraphs summarise the impact of Blockchain on the supply chain industry.

Scott *et al.* (2018) proposed Blockchain technology as a result of the introduction of the Drug Supply Chain Security Act in 2013. It regulates the safety and security of pharmaceutical products in the USA. Additionally, a solid electronic traceability system for pharmaceutical products should be established by 2023. The aim is to reduce the circulation of illegitimate drugs. The paper highlights that in this case the safety concerns are more important than maximising the overall value. Thus, the supply chain management must be adapted respectively. Using Blockchain technology each product can be traced and the ownership history recorded (Scott *et al.*, 2018).

Similar in the EU, the new regulation “Good Distribution Practice of medicinal product for human use” from 2016 obligates to measure the temperature and other parameters during storage, as well as during shipment (Bocek *et al.*, 2017). Nowadays, to avoid any deviation from standard conditions without implementing any system of temperature monitoring, pharmaceutical drugs are shipped with expensive refrigerated trucks, even though this would not be necessary (Scott *et al.*, 2018). Bocek *et al.* (2017) mention the swiss start-up Modum.io AG and explains the use of temperature monitoring in the pharma supply chain. Regarding the article temperature sensors are placed inside the shipping package, after a track-and-trace number has been coupled to each sensor. Temperature is measured every 10 minutes and recorded onto an internal memory storage. At destination the tracking number is scanned, and all temperature data are downloaded. With the use of a smart contract all data are checked automatically, and any deviation is reported instantly. All authorized users have access to the data uploaded on the Blockchain (Bocek *et al.*, 2017).

As already mentioned, traceability is a fundamental property of Blockchain technology. Thus, it can be implemented in the food industry to provide the customers with all relevant information. Pilot projects have been carried out to backtrack fresh food, as fish and eggs, until the origin (Scott *et al.*, 2018). Traceability and transparency can also be used for ethical considerations. Scott *et al.* (2018) make aware that product labels, such as “organic”, “100% Colombian” and many others, cannot be proven to be real or fake. With the use of a Blockchain system products are traceable during the entire supply chain. Thus, making it possible to know the origin (Scott *et al.*, 2018). Furthermore, this technology can reduce human rights violation, as well as certificate Fairtrade (Scott *et al.*, 2018; Abeyratne, S. A. and Monfared, R. P., 2016). Certifiers can inspect various facilities and verify the compliance of standards and regulations (Abeyratne, S. A. and Monfared, R. P., 2016).

By identifying the exact supply chain, Blockchains can also be used as fraud detection system for luxury items like diamonds, art and wine (Scott *et al.*, 2018). Scott *et al.* (2018) summarises the project between Everledger and Barclays. Blockchain technology enables to create a digital certificate and all authorized users as insurance companies, owners and law enforcement have access to the register (Scott *et al.*, 2018).

Drawbacks

Blockchain technology is a new approach, but today’s technology is not fully mature yet. The system has shown to be vulnerable to hacker attacks more than once (Scott *et al.*, 2018). Furthermore, more research is needed for being able to apply this technology at large scale (Abeyratne, S. A. and Monfared, R. P., 2016).

Finally, data privacy must be considered as well. One of Blockchain’s strength is the immutability of the saved data. However, regarding the General Data Protection Regulation of the European Union, personal information must be removed from the database if requested by the user afterwards (Scott *et al.*, 2018). Scott *et al.* (2018) continues that personal data must be securely stored outside of the immutable blockchain, taking into account other different laws regulating where personal data can effectively be stored.

References

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