**The impact of Blockchain Technology on the Supply Chain Industry**

1. **Introduction:**

A countless number of goods and items are being transported and distributed worldwide. These daily products' traffic is following long journeys from the suppliers of raw materials before coming to the hands of end-users. There is an increasing need to know, document and analyze the different information related to this chain of transport and distribution to protect and support the life cycle of any product (Abeyratne and Monfared, 2016).

A significant number of studies described the management of products' life cycles. However, this paper is focusing on the blockchain technology and its impact on supply chain management. The first section of this essay defines the concept of the supply chain in the industry. The second part gives an overview about of the blockchain technology, and the third section discusses the implementation of blockchain systems to solve the challenges of the supply chain.

1. **Supply chain:**

The supply chain involves all operations of transportation, procurements, storing, manufacturing and distribution of a product from the first supplier of raw material to the end-users passing by wholesalers, traders, manufacturers, and transportation agents or companies. Due to the globalization, supply chains are becoming more complicated more expanded. The production and delivery of goods are incredibly related and depended from several parties situated in different continents. This ultra-dependency makes outcomes of any problem in supply chain detrimental for companies and individuals (Abeyratne and Monfared, 2016).

1. **Blockchain Technology:**

Blockchain is a newly implemented technology that uses mutually distributed ledgers based on an innovative series to organize and digital data. According to Seebacher and Schürit, “A blockchain is a distributed database, which is shared among and agreed upon a peer-to-peer network. It consists of a linked sequence of blocks (a storage unit of the transaction), holding time stamped transactions that are secured by public-key cryptography (i.e., “hash”) and veriﬁed by the network community. Once an element is appended to the blockchain, it cannot be returning a blockchain into an immutable record of past activity.” (Seebacher and Schüritz, 2017 cited in Francisco and Swanson, 2018)

This method converts physical materials and intangible resources into a digitally encoded data that can be recorded, traced, and exchanged with private key on a provided block chain.

Firms are using this digital revolution to generate algorithms and programs that can be partially or entirely automated. These programs are known as "smart contracts" that need to be activated through the fulfillment of one or multiple requirements demanded by different parties. This complex and decentralized network offers different advantages that can be used to solve the defies of the supply chain in the industry (Francisco and Swanson, 2018).

**4. Application of the Blockchain Technology on the supply chain Industry:**

A significant number of projects have been implanted during the last decade to solve the previously mentioned challenges in supply chain management. This part of the essay illustrates a few examples of projects in which the blockchain was able to bring value in this area.

* 1. **Traceability and safety:**

In many situations, especially in the food and pharmaceutical industries, there is a safety challenge related to the sensitivity of products. Therefore it is mandatory to maintain certain conditions during the transportation of goods.

Indeed, the distribution of pharmaceutical products follows several strict regulations to guarantee the safety of end-users. One of the challenges that face drug companies is to maintain stable temperature during the transportation of products since they are generally thermo-sensitive. Any high deviation in temperature can lead to deterioration of the medicines. For this reason, the European health authorities implemented a new law that forces companies to report any temperature variation. Therefore, pharmaceutical companies are using refrigerated trucks, even for medicines that are stable at ambient temperatures (between 15 and 25 °C). This operation is generating high costs.

A start-up named Modum® implement a project pilot in 2016, in which drugs were transported and used a modem sensor that monitors the temperatures of the drugs, and the data is sent to the Ethereum blockchain.

Afterwards, a system was used to compare smart contract and check whether regulatory conditions were fulfilled. If so, the medicines will be released (Scott et al., 2018).

* 1. **Ensuring transparency and detecting fraud:**

Many companies are protecting the transparency of the supply chain and ensuring the authenticity of its items by using blockchain systems. This technology permits to register data about different intermediate agents (Bocek and Strasser, 2017).

An excellent example of the block chain in the supply chain to prevent fraud was shown when Ever ledger® created a block chain-enabled traceability application that reveals any fraud or counter fed related to luxury items. The project consists of providing digital certificates that serve as proof of the asset registration and avoid any risk of insurance fraud. Furthermore, the ledger prevents any risk of unethical procurement of luxury goods such as obtaining of diamonds from conflict regions (Scott et al., 2018).

* 1. **Minimizing bureaucracy:**

One of the significant challenges in the supply chain is the complicated and time-consuming administration procedures that transportation companies face when transferring goods from country to another, such as the registrations and obtaining authorities' stamps etc. Managing and simplifying these operations is the goal of the majority of supply chain experts.

For instance, the company Maersk® has implemented a partnership with IBM® to create blockchain technology that facilitates the different transport transactions and to face the challenge of bureaucracy. They succeed to track the shipment of goods between different continents and countries. During these operations, they recorded almost 200 interactions and approvals made by 30 agents (Scott et al., 2018).

1. **Conclusion**

The supply chain is a fundamental part of product management. Different challenges can be faced during this process that can lead to harmful outcomes such as high costs, legal problems or distracting the reputation of the company. Blockchain is a technology in different fields such as in baking to solve the challenge of bureaucracy, transparency, and to deal with the undesirable effects of centralization (Francisco and Swanson, 2018).

This essay has illustrated through different examples of how the blockchain technology can reduce bureaucracy, increase transparency and ensure security during the different steps of the supply chain.

References

Abeyratne, S.A., Monfared, R.P., 2016. Blockchain ready manufacturing supply chain using distributed ledger. International Journal of Research in Engineering and Technology 5 (9), 1–10.

Bocek and Strasser (Ed.), 2017. Blockchains everywhere-a use-case of blockchains in the pharma supply-chain. IEEE, 772-777.

Francisco, K., Swanson, D., 2018. The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency. Logistics 2 (1), 2.

Scott, T., Post, A.L., Quick, J., Rafiqi, S., 2018. Evaluating feasibility of blockchain application for DSCSA compliance. SMU Data Science Review 1 (2), 4.