

Implementation of Block Chain in Supply Chain and Logistics

Capstone Exit Paper



Master of Science - Engineering Management

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Abstract

Supply chain is an eternal process industry that flourishes on the basis of accuracy and smooth flow that it brings to any process that it is applied to. The paper explores Blockchain and the assistance it provides to the supply chain industry. The 13 areas of the logistics, manufacturing and retail businesses which blockchain could bring about revolutionary changes with its robust and democratized data availability are discussed in detail. In order to see blockchain play its part in a real-life business, taking the example of the logistics giant company- DHL. DHL recently prototyped a blockchain application to tackle one of the ever-pressing issues of the logistics industry, that is delivering counterfeit goods to consumers. Counterfeit goods, especially in industries like pharma can cause heavy damage to the patients by putting their lives on risk and in turn to the reputation of the goods' distribution partners, in this case, DHL. The applications of blockchain are limitless at this time, given the ever-increasing ledger of information it maintains. Harnessing this technology in supply chain and logistics would benefit the businesses immensely as it would close the loop for majority anomalies by providing real-time up-to-date information.

Introduction

What is Blockchain?

The blockchain is an undeniably ingenious invention – the brainchild of a person or group of people known by the pseudonym, Satoshi Nakamoto. A blockchain is, in the simplest of terms, a time-stamped series of fixed records of data that is managed by a cluster of computers not owned by any single entity. Each of these blocks of data (i.e. block) is secured and bound to each other using cryptographic principles (i.e. chain). The blockchain network has no central authority — it is the very definition of a democratized system. Since it is a shared and immutable ledger, the information in it is open for anyone and everyone to see. Hence, anything that is built on the blockchain is by its very nature transparent and everyone involved is accountable for their actions (Rosic, 2019).

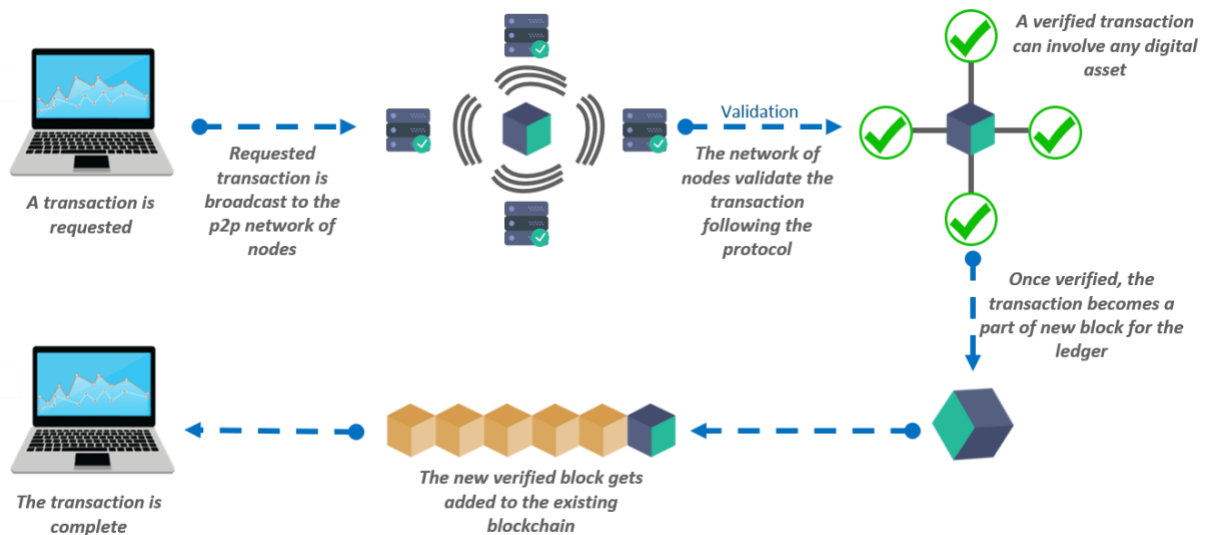


Figure 1 How Blockchain works? (Shashank, 2019)

Benefits of Blockchain

Blockchain gives all the companies in the industries opportunities to:

- Execute many operations automatically
- Extremely advance Security
- Trusted and interconnected business networks
- Increase the grade of production by reduction of human errors
- Access to digital assets management (n.d.)

What is Supply Chain Management?

Supply Chain Management is the management of the flow of goods and services and includes all the processes from the beginning of raw materials to the end/final products. Its main objective is to create maximum customer value and staying ahead in the competitive market by making the supply side activities most efficient and streamlining all the processes.



Figure 2 Supply Chain Management (Rouse, 2019)

Benefits of Supply Chain Management

The basic benefits from supply chain management is that all the process gets streamlined which results in increase in efficiencies, increase in profits, reduction in waste, reduction in cost. supply chain management gives opportunities to companies to manage and maintain their inventory, keep the production cost down, meet the customers requirement and demand in most effective and efficient way. With proper usage of software many operations can be automated which will improve the efficiency and reduce the costs.

Transformation of Supply Chain Management by Blockchain

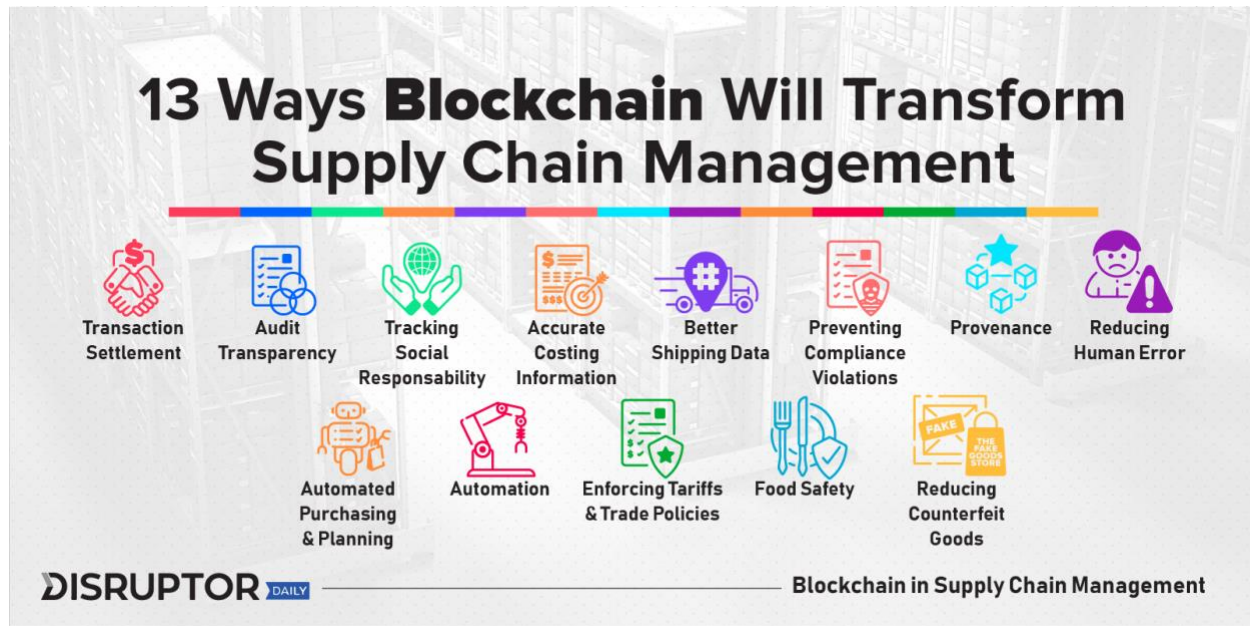


Figure 3 Blockchain transforming Supply Chain Management (Mire, 2019)

1. Transaction Settlement

Cross-Border payments are highly time consuming in most supply chains. The efficiency of the financial flow of supply chains are low and that incurs a high cost. The blockchain implements faster transaction settlements by:

- Payment processing directly from peer to peer, thus ensuring that no 3rd party is involved
- Keeping the ledger up to date
- Both ends of transactions are executed simultaneously

These factors paired with lower computer power costs, fewer intermediary fees and reconciliation requirements reap the benefit of decreased costs as well as speed of transaction.

2. Audit Transparency

Auditing in supply chain is a very vital practice in order to keep the companies aware of the possibility of breakdowns so that they can be prevented before happening. In order to streamline supply chain processes, and to create sustainability and savings, clear systems for auditing are absolutely necessary.

The blockchain is interoperable and if extended to all participants in a supply chain, can provide a transparent view of where inefficiencies exist, while preserving pseudo-anonymity for each account. This combination of openness, accountability and relative confidentiality helps auditors to do their work in a cost-effective, thorough way, and the blockchain can serve as a

resource for finding and resurrecting inefficiencies without disturbing the flow or everyday supply chain process. Simply put, blockchain would assist supply chain auditors to understand what suppliers to audit, work efficiently by figuring where to invest auditing resources and choose the most effective findings to their recommendations on.

3. Tracking Social Responsibilities

Most customers claim that they expect the companies to provide goods which are more sustainable and do not make them feel bad about their purchases.

In one of the articles by Forbs it has been mentioned that Millennials are the ones who are driving the market and companies to be more sustainable. With the help of the blockchain it is very much possible to track the entire supply chain of the products manufacturing and where the raw materials are coming from (Landrum, 2017).

4. Accurate Costing Information

APCIS new center states that inadequate technology and software are the prime issues of maintaining useful costing information. (n.d.)

The issues can be rectified and minimized by usage of blockchain technology. With the confirmation of all the parties that they are willing to embrace the change. A single, shared record of costing information upon which costing data can be stored and accessed would represent the adequate technology supply chain managers desire, while also serving as the necessary break from external financial records systems to an interoperable one to which all necessary parties have access and oversight.

5. Better Shipping Data

The image of the brand is directly proportional to the shipping accuracy and shipping the product on time. One Survey states that 89% and 83% consumers worry about receiving a product late and the arrived product to be damaged respectively. (Weissman, 2016)

Blockchain can be used to improve on this problem stated above by having the real-time data and better information sharing systems are needed for this. The blockchain is a decentralized ledger technology and is just the chap needed for the job, providing a uniform mode of recordkeeping that is interoperable by all players in a supply chain and can be updated in real time.

6. Preventing Compliance Violations

High compliance cost in shipping and toeing the line is very dubious but disregarding the cost can result in heavy fines which are immoral. In 2013, the largest-ever fine for non-compliance related to shipping was levied upon Texas oil company Weatherford International Ltd. after it was found to be shipping to sanctioned countries, such as Cuba and Syria. The fine: \$100 million, including

\$50 million in a civil penalty, a \$48 million monetary penalty, and a \$2 million criminal fine (Flores, n.d.).

To avoid that the more data the supply chain manager have in hand more transparent would be the process. Blockchain is precisely the decentralized, interoperable record that supply chain managers don't just desire, but need, to avoid massive fines and potential jail time.

7. Provenance

Automation in supply chain has been implemented by most of the companies in business. The history of supply chain has so much value that adds to the customers, distributors and retailers. Great benefits are carried along with the blockchain technology of recording every transaction on a permanent record be it financial or exchange of goods. The consumer has an urge to keep provenance alive more than ever, and with the help of blockchain, that can be made possible.

8. Reducing Human Error

Human error has been one of the biggest reasons for losing \$50000 to \$150000 each year for the shippers by making errors in invoice processing and these are the costs which can be avoidable. With the help of blockchain the reliance on manual work will reduce and automation will take charge. To save the cost of the inevitable mistakes made by humans, automation of transactions, record-keeping, data entry and inventory tracking system can be implemented using blockchain, which is faster and more affordable (2018).

9. Food Safety

Due to the errors in supply chain, the transfer of the food can get delayed and that can increase the risk of contamination of the food. There have been many cases of people dying due to consumption of contaminated food. With the help of blockchain, a single product can be tracked in literally 2.2 seconds, meaning that the time taken to trace a contamination is very less and that it could all happen with the help of members of a supply chain. Comparatively, the link-by-link process of tracing such products in non-blockchain monitored supply chains can take up to a week or longer. These additional hours and days mean lives risked that need not be risked.

10. Automation

A transparent supply chain has the power to yield more free cash flow. The inventory planning process was automated in one of the supply industries and then they ended up having \$75million in free cash flow. The clarity in the supply chain is linked to productivity, and automation will allow greater speed of data. With the help of blockchain it can be one of the most reliable, advanced and secure means of automation of the supply chain. Thus, that will reduce transaction waste and will have more free cash in hand (n.d.).

11. Automated Purchase and Planning

To reduce the process time from the beginning to the end by 60%, the company has to automate 95% of their order-to-ship process. Supply chain can be managed more precisely if the coordination between ordering and shipping could be processed faster. The supply chain record keeping, improved speed and the depth at which information is shared and transferred to gain more insights helps in making cost-saving decisions (Ignacio Felix, n.d.).

12. Reducing Counterfeit Goods

According to the Datadotdna.com there are \$11 Billion worth international goods coming to US each day. Without proper technology it is very difficult to determine the difference between the real and the counterfeit product. With the usage of QR, NFC, and RFID technologies the blockchain can maintain a proper ledger by recording the codes and then can trace the product and can determine the difference between the real products and the counterfeit ones. With this blockchain technology the products that are kept on the shelf can be verified as real and from reliable suppliers (2018).

13. Enforcing Tariffs and Trade Policies

Many international companies have been accused of evading numerous import duties and there has not been any trustworthy system in place for the same. With the help of blockchain companies that try to avoid higher import duties by just putting "Made in Vietnam" stickers can easily be traced as the original manufacturer details would have already been saved in the blockchain ledger and the transactions made would be proof of the same. This would block the companies who are trying to evade the import duties.

Dalsey, Hillblom and Lynn (DHL)

Introduction

DHL was established in 1969 and is headquartered in Germany. DHL is reputed to be the largest transportation company in the logistics industry. It is considered a giant in a sea of giants that is the logistics sector. As a result, it is inevitable that the company needs to make constant efforts of setting themselves apart by adopting new technologies.

Counterfeit Concerns

The logistics industry faces one major concern when it comes to delivering pharma products: what's their authenticity? Would they cause more harm than good to the patient? According to Interpol, counterfeit medications cause millions to lose lives every year. An estimate of up to 30 percent such pharmaceutical products are sold in emerging markets (Henderson, 2018).

Incorporating Blockchain

DHL is already working to track pharmaceutical products to combat the counterfeit market by leveraging Blockchain to improve traceability and transparency in the supply chain and logistics industry. They have joined hands with Accenture to work on the proof of concept. The aim of the project was to ensure that the medicines are coming from the legit manufacturer and can track the entire supply chain journey and keep a record of it. The manufacturer used Pharmaceutical serialization in which the process of assigning a unique identity (e.g., a serial number) to each sealable unit. This unique identity is then linked to critical information about the product's origin, batch number, and expiration date and the end users can use the barcode scanning technology and give them capabilities to scan the shipment by a mobile phone to determine the legitimacy of the medicines. This process worked by making entries into a blockchain ledger every time there was an update to the medicine. This history of a medicine is recorded right from its making from individual chemicals to the end customer (DHL Trend Research, 2018).

To achieve this, the partners have established a block- chain-based track-and-trace serialization prototype comprising a global network of nodes across six geographies. The system comprehensively documents each step that a pharmaceutical product takes on its way to the store shelf and eventually the consumer. The prototype was a lab performance simulation that demonstrated how blockchain technology could handle volumes of more than 7 billion unique pharmaceutical serial numbers and over 1,500 transactions per second.

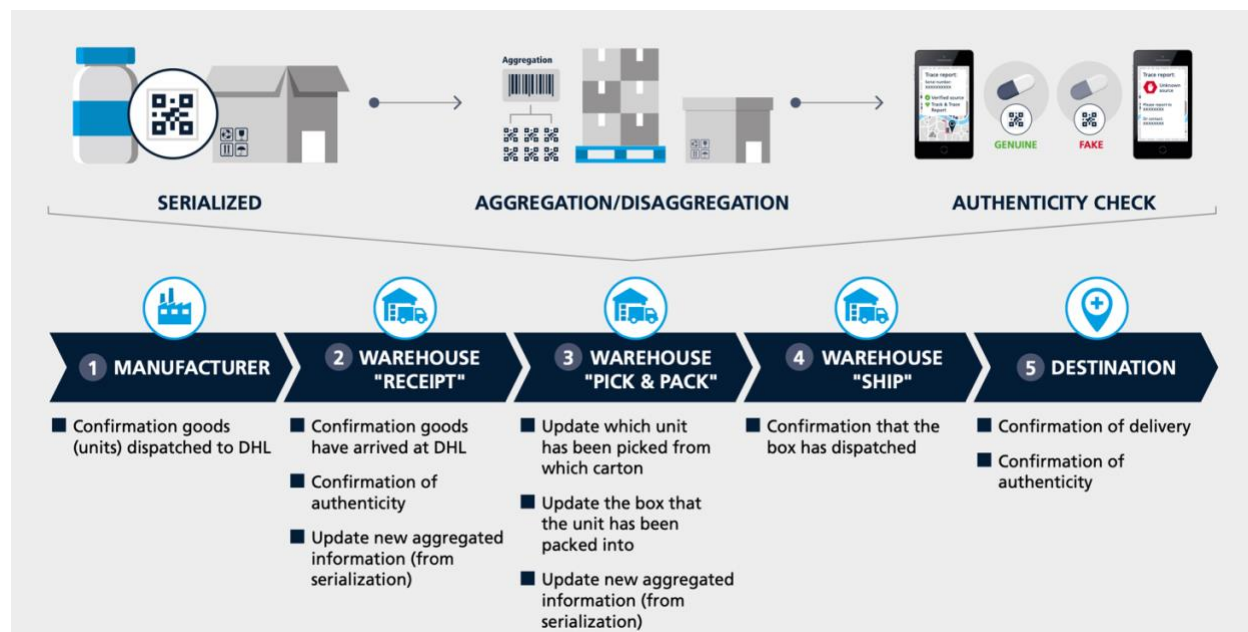


Figure 4 Proof of Concept (DHL Trend Research, 2018)

Impact on Stakeholders

Stakeholders of all the industries would be working closely along with DHL and Accenture to ensure to meet the application requirements while also keeping in mind to keep the original idea of the blockchain application intact. The major stakeholders other than DHL and Accenture who would be impacted by implementation of the blockchain idea:

- **Pharma Manufacturers** – These companies will have to make sure they source their products correctly and if they do, there is only an upside of adopting blockchain for them. The fact that customers will be able to purchase medicine from the correct source will only increase the revenue of legitimate manufacturers.
- **Logistics Partners** – As DHL has many ground-transportation partners and they have to make sure that all products are transported tamper-free and have to take utmost care while it is in transit. With the help of blockchain if there has been any tampering while the products are sent from manufacturer to the end user it will be very easy to identify the same with the help of blockchain. Once the end user determines if the product has been tampered, they can report it to DHL, and they will know where exactly in the supply chain did the problem arise, and thus they would be able to resolve it in no time.

Risks

As with any new technology there are risks associated to the technology itself, IT risks, and cultural risks which will have an impact on DHL. But one important risk that would differ is - Compliance risk. Pharmaceuticals are a highly regulated industry and any interaction with them should be highly monitored. In the event that the technology fails, and DHL is found at fault, there could be a huge backlash. This could be since DHL is the one ensuring the quality of the product not being tampered

but if it is found that the product was tampered, DHL along with the perpetrator would be reprimanded and be at fault.

Conclusion

With the implementation of Blockchain in the supply chain and logistics industry all the enhancements mentioned above can be implemented and this presents the businesses with an opportunity to improve the overall efficiency of the process, thus adding value to the products which are sold to the customers. With respect to DHL's initiative to recognize counterfeit products, if the proof of concept is completely applicable to the larger scale, it will revolutionize the way pharmaceuticals manufacture the medicines and the way they distribute it. With that, the counterfeiting of goods would come to a standstill and substantially high benefits could be experienced in every corner of the supply chain.

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