

A Review of ‘Blockchain for Effective Supply Chain Management’ Current Progress and Future Ahead

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Abstract

Blockchain is a revolutionary innovative technology that is transforming the way many processes are done. Blockchain provides stronger security, it is cost effective and provides many benefits over traditional systems. The biggest application of Blockchain currently is the cryptocurrency. However, blockchain is no more limited to the cryptocurrencies only. Innovators all over the world are experimenting and are expanding the usage of blockchain to areas like transparent electoral voting, effective taxi management, music industry, supply chain and many other areas. The current research paper presents the possible usage of blockchain in supply chain management, reviews the existing progress in the field and discusses the probability in near future. Researchers found out that organisations like Samsung, IBM and Maersk are already experimenting and working on it. Blockchain will certainly provide organisations, an enhanced efficiency, will help in reducing the cost, reduce the excessive documentation and will provide better traceability.

JEL: R41, R42, O31, O33

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Introduction

It is said in the digital community that after internet, blockchain is the biggest thing which is going to change a lot of things in our world. Typically, blockchain is understood as a digitized, decentralized public ledger of the cryptocurrency transactions. Here, every node in the network updates the ledger independently and with consensus over the network, it becomes the official record. This concept of consensus verification is the reason why blockchain is considered to be very much secure.

Blockchain which became well-known technology because of its first generation application – cryptocurrencies, is now no more limited to it. Yes, Bitcoin - the very first cryptocurrency was built on a blockchain system. But the blockchains applications are not essentially limited to cryptocurrencies. This way, bitcoin and blockchain are two distinct investment ideas (Duggan, 2018). Blockchain technology is now being applied to a variety of other businesses, like decentralized supercomputers, blockchain-based gaming (Ex. FirstBlood), secure data storage, the Internet of Things and supply chain economics.

The opposing views

There are opposing and diverse views too about the concept of blockchain, challenging its widespread and existing understanding. For example, as mentioned on the website Investopedia (Investopedia, 2018), “A blockchain is a distributed, decentralized, public ledger technology.”. Again, many blockchains are not public, and many other blockchains are not necessarily decentralized (Jeffries, 2018). Warren Buffett has been holding negative views about Bitcoin and had predicted “almost with certainty” that the cryptocurrency craze “will end badly” for investors.

According to an editorial article on www.theguardian.com, “The only value of cryptocurrencies today lies in the expectation that someone else will buy them. But the supply of bigger fools must run out one day”. The first application of blockchain - Cryptocurrency has been referred to as the bubble which is due to pop at any moment.

There are supporters and there are people with opposing views too. However, this does not demean the opportunity of advancement that blockchain offers in other areas than cryptocurrencies (Editorial, 2017).

Literature review

Blockchain

The name blockchain is a combination of two words— the “block” which contains batched transactions and a “chain” that represents cryptographically linked blocks. Once the transactions are confirmed by the nodes in the network, the block is formed, time-stamped, and then added to the previous block (MASLOVA, 2018). So the blockchain is a basically distributed ledger and immutable database for transferring data very securely. The key elements in the blockchain are explained below:

Distributed ledgers: A copy of all the transactions is with everyone participating in a blockchain network. It enables a truthful and immutable record since it’s virtually impossible to interfere with historical records that are stored on various nodes.

Consensus algorithm: A majority of parties agree to network-verified transactions. This is the mechanism to confirm transactions without any intermediary.

Cryptography: After the transactions are made, cryptography is used to approve authenticated and verifiable transactions. The blocks in the chain are also linked and secured using cryptography so that the data can be read only by the designated users.

Permission: This ensures that the members in a network can only see items in ledgers which are relevant to them.

The coding of blockchain is complex for sure. However, the users don’t necessarily need to know all the coding since its usage is made easier. As per a technical review by George Pirlea (Pirlea, 2014), a blockchain is a digital chain of *blocks*. These blocks are cryptographically chained using hashes. Hash function take an input of any length (a message, for example), and returns a fixed-length string of numbers and letters. That is called as hash value (also referred to as a message digest, digital fingerprint, or digest) (UNICORN, 2018). Each block contains the hash of the previous block, which in turn contains the hash of the previous, and so on back to the first block. Modifying any part of a past block would invalidate all the subsequent hashes. This is critical for preserving the integrity of the ledger.

Using Blockchain for supply chain

Almost all the leading organizations use computerized enterprise resource planning (ERP) solution and supply chain management software (Brody, 2017). Systems are so advanced that the products are tracked on computerized systems from their earliest origins, often all the way to the dust bins. However, even with this advanced digital infrastructure, most organizations have only limited

visibility and insights into where all their products are at any given moment. Many a times, it is because of the analog gaps that exist between systems inside enterprises and across enterprise boundaries. In the words of Paul Brody of EY Global Innovation Blockchain Leader, “At its most basic level, the core logic of blockchains means that no piece of inventory can exist in the same place twice.”

Trust without intermediaries

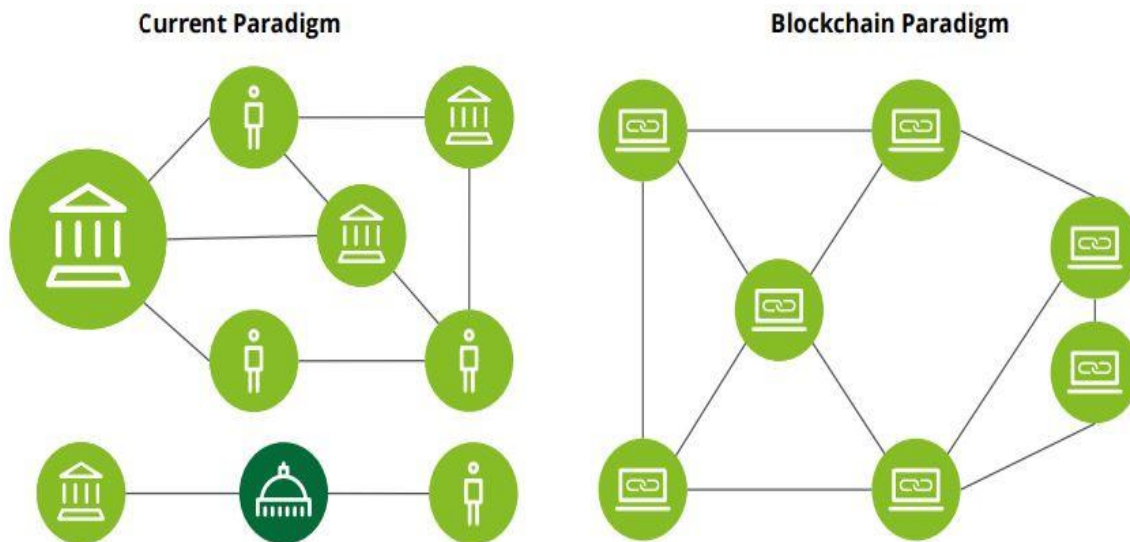
With Blockchains, business partners can share and agree upon key pieces of information. But it can be done without appointing any intermediary. Instead of appointing a central intermediary, blockchains can synchronize all data and transactions across the network. Each participant verifies the work and calculations of others. This huge amount of redundancy and crosschecking is the reason why financial solutions like bitcoin are secure and reliable.

Applying the core logic of blockchain to supply chain

If we apply the above mentioned security and redundancy to inventory and replace supply chain partners for banking nodes, we can have the basis for a radically new approach to supply chain management. When we say the core logic of blockchain, it means that no unit of inventory can exist in the same place twice. In this system, when we move a product from finished goods to in-transit, that transaction status will be updated for everyone and everywhere, within minutes. This will also provide full traceability to the point of origin.

Traditional database vs. Blockchain base distributed ledger

Under the existing database system, there are various intermediaries due to which the process becomes time consuming, costly and less reliable. In blockchain paradigm, the immutability of a Blockchain makes it impossible for changes to be made in the records once established. This increases confidence in data integrity and also reduces possibility for fraud.



(Source: Blockchain technology in India, Opportunities and challenges (Deloitte, 2017))

Current scenario – Using blockchain for supply chain

Case of Samsung: According to Bloomberg.com, Samsung, the world's largest smartphones and semiconductors maker, is considering using blockchain to manage its global supply network (Kim, 2018). They send shipments worth tens of billions of dollars a year. It is expected that the system will help to reduce the shipping costs by 20 percent, according to Samsung SDS Co.

Case of IBM and Maersk: IBM and Danish shipping (HACKETT, 2018) giant Maersk will be forming a new company whose aim is to commercialize blockchain technology. This company will help shippers, ports, banks, customs offices and other stakeholders in global supply chains track freight. It will also replace the related paperwork with secure tamper-resistant digital records. They did a first blockchain trial in summer 2016 wherein they traced a container of flowers which sailed from Mombasa, Kenya to Rotterdam in the Netherlands. Several developments convinced Maersk of the system's potential.

According to a study published by the World Economic Forum, if the friction around information-sharing and border administration is reduced in any international trade, it has a potential to increase GDP by nearly 5% and trade by 15%—a boost that amounts to trillions of dollars (Bank, 2013).

Conclusion

The current supply chain has certain gaps which can be certainly improved upon by applying blockchain technology. In the present system, many shipping supply chains have to deal with a huge pile of paperwork shuffled between a number of middlemen. If the documents are lost or delayed causes perishable goods lying in wait to spoil. This turns out to be very costly and give a lot of headache. Using blockchain is extremely beneficial to organizations as it enhances efficiency, reduces the cost, reduces the excessive documentation, provides better traceability and many other benefits which we can expect when we start adopting the blockchain for supply chain.

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