Blockchain Based Supply Chain Management: An Overview

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Abstract

Blockchain is recently a much talked technology. In this paper, a new way for supply chain management, by providing a new path, which is blockchain based supply chain is proposed. Many industries and people thought that the use of blockchain or using blockchain will disrupt the supply chain. Blockchain is disrupting supply chain. Though blockchain eliminates corruption, intermediate or middle man, extra charges and increases security and ease of tracking of products but also will help to grow supply chain. All the processes of industries and people are explained properly in this article. This technique or method is future revolution, so companies or industries should be aware of this. This idea will emphasize readers about the significances of blockchain based supply chain. Now days, the company like IBM already started working on blockchain, they are coming with the IBM blockchain for supply chain. So, Blockchain is not only used for bit coin or cryptocurrency, it has many other applications on which much amount of work has not been done and supply chain is one of them. Hence, all the companies and industries are aware that blockchain is upcoming and future ruling technology.

Keywords: *Blockchain, supply chain management (SCM), Immutability, security, Transparency, hacking, E-commerce.*

1. INTRODUCTION

Have you ever wondered that the clothes that you wear, phone you use in day-to –day life, products you use in daily life from where these come from? From confirming the order to delivering the order, there are many processes that need to be done such as collecting the raw material, information, proper resources, manufacturing, shipping and then finally delivering the order that require organization with a number of people required to do delivery [1]. So the whole process is called supply chain as all processes are connected to each other and the management of the all this supply chain is called supply chain management (SCM). The supply chain gets started with the delivery of the raw material from supplier to manufacture and end with the consumer by consuming that particular product. In simple language flow of the finished good from the origin to the point of destination is supply chain management [2]. The components in the supply required chain are:

1. **Natural resources:** The resources that we get from nature such as water, wood, timber is that sufficient for your making or not. We need to check this thing in natural resources.

2. **Material:** For the production of material you need your product such as steel or alloy or carbon or wool etc.

3. **Ingredients and goods:** As now you have the natural resources as well as material required. Now all you need is an ingredient for your product such as glass or battery for your mobile phone.

4. **Finished Good:** Now you are ready to make your product as you have all the necessary things required for your making of the product.

5. **Retail and E-commerce:** Now your product is ready, so you have to sell your product to the retailer and list on the websites for E-commerce.

6. **Costumer or consumer:** Now the consumer finally get that particular product in their hand either from retailer or from E-commerce.

7. **Return or refund:** Now, as we know that there are some products that may be defective or faulty. So supply chain will not go obviously unidirectional it can be in back way also. So if the consumer

is not happy with the product, then we have to provide choice to consumer either of the return or refund [3].
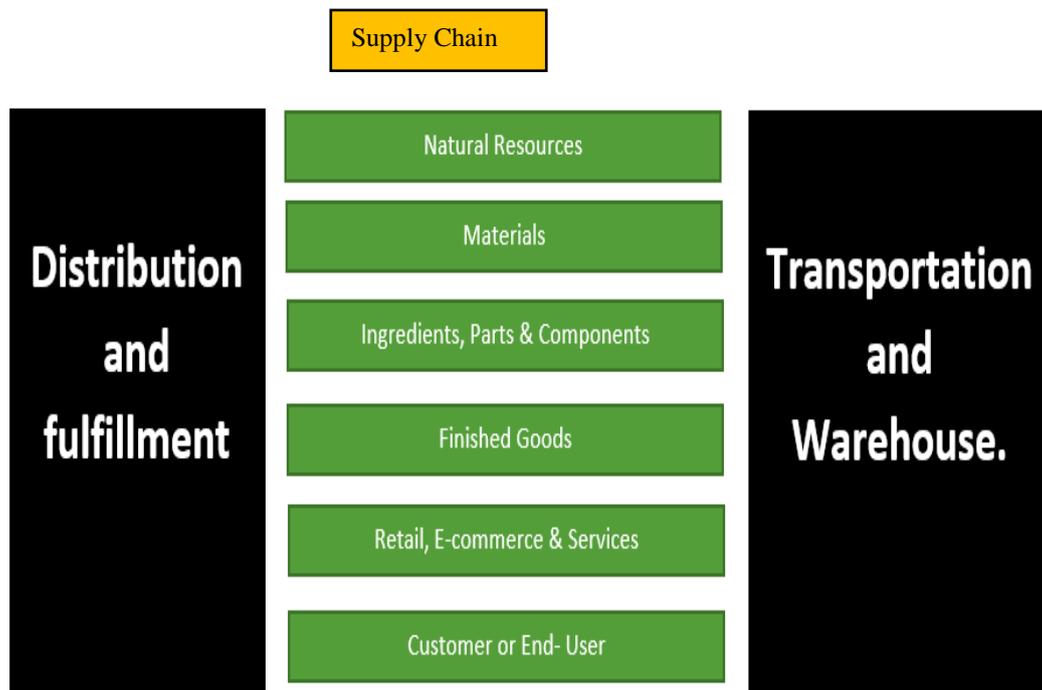

Fig. 1: Components in Supply Chain

So this is all we need to know about the supply chain. Main motive of this paper is not to tell you about the supply chain but to tell how supply chain can use the blockchain that make supply chain more productive and efficient [4]. Yes, it is right that we can use the blockchain based supply chain management.

Blockchain can carry many improvements in the supply chain. Let's discuss one by one how blockchain improves supply chain.

1. **Provenance Tracking:** As the organization and companies have many elements that part of the supply chain management. So it become very difficult for them to track each and every element. This will lead to consumer issues about the product or quality that will ultimately defame the name of the company or brand. However, using the blockchain we can keep the track on every product with the help of embedded sensors. All the history we can get through blockchain from the time of manufacture till now.

2. **Detect frauds:** Blockchain also help to detect the fraud in any part of the supply chain. As we all know that there is corruption everywhere so for the greed of some money any person of supply chain may sell that product and we can detect that easily with the help of blockchain.

3. **Cost reduction:** By using blockchain the cost factor also gets reduced as the blockchain eliminates the middle man and intermediates which causes frauds or product duplicity. Also the payment mode will be cryptocurrency that too will be in between the supplier and consumer instead of any middleman. Let us take an example to understand this clearly as we have seen in INDIA that there was the sale of Redmi phones and some people were not able to book the phone in particular time period. So what people started doing is they started selling the Redmi products at higher cost as the availability is less and demand is more that increases the cost of the product. The cost increased by the middleman not by seller. The original rate was same but buying from middleman cost you expensive. So blockchain eliminates this problem.

4. **Immutability:** Immutability means non-tampering. Any data you put inside the blockchain will not be deleted or tampered lifetime. Also you cannot add on any extra payment in it once you entered the record. So this will make your data secure and immutable. The blockchain provides the

data security by using hash function that will take the string as input and convert it into fixed length output. Plus, all the blocks are inter linked with previous blocks. So it is not easy to tamper the data in blockchain.

5. **Transparency:** This is the most interesting concept as many people are not able to understand concept of transparency. Some people believe in that data should remain private while other thinks data is transparent in blockchain. However, in case of blockchain the identity of the person is hidden using cryptography hashing function and the only visible thing is your public address. So the person real identity is not visible instead it is clandestine [5].
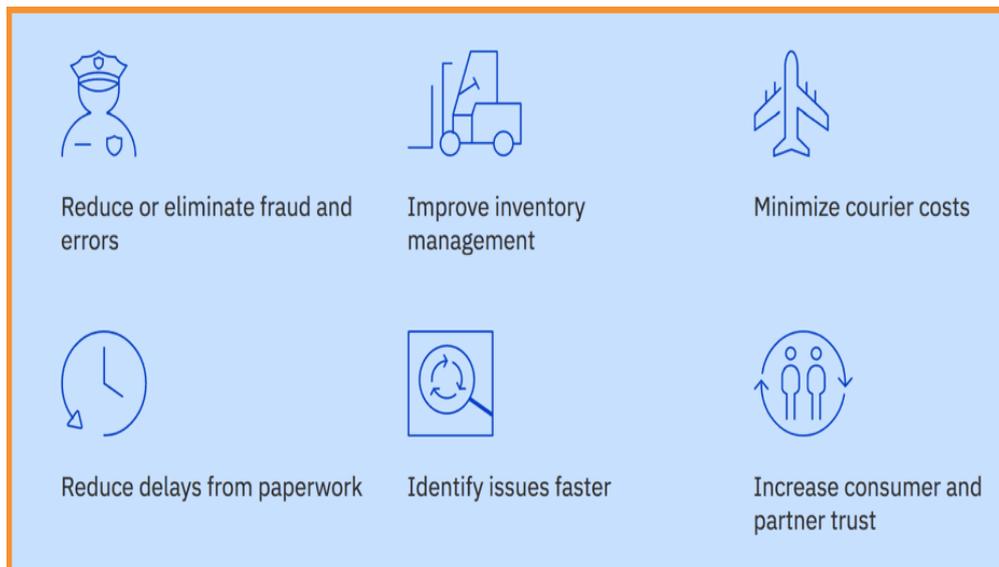

Fig. 2: How Blockchain improves supply chain

In this paper, we have reviewed how blockchain based improves supply chain and its architectural aspects. Section 2 gives an overview of architecture of blockchain. Section 3 discusses advantages of using blockchain based supply chain.

2. BLOCKCHAIN ARCHITECTURE

Blockchain is a continuous sequence of the blocks in a chain that contain data (information) of the user, but this data is stored is secured way. Blockchain provide the P2P i.e. Peer-to-peer network means data is grouped together in P2P network. In simple words we can say that blockchain is a combination of computers that are in peer-to-peer network instead of the central server means whole blockchain network is decentralized [8]. The blockchain technique provides users digital information to be distributed, rather than copied. The technique of providing distributed ledger increases the users trust, data transparency and data security [9].

The architecture of the blockchain is widely used in financial industries. Hence, this technology is increasing day-by-day in every industry or fields and is not employed only for the bitcoin or cryptocurrency. However, nowadays it is used for digital notary, keeping of records of various transaction and smart contracts. Fig. 3 describes continuous sequence of the blockchain. As shown all the blocks are linked with each other and each block contains the block header, parent block. The very first block of the blockchain is known as genesis block [10] [16] [17].
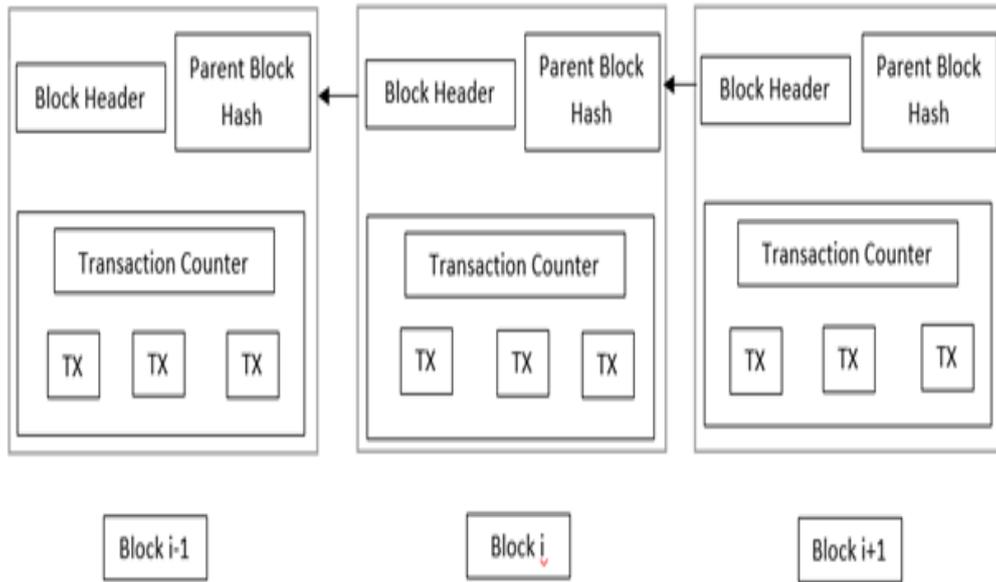
Fig. 3: Consecutive sequence of blocks consists in Blockchain

Structure of the block include block header, hash of previous block header, merkle root and block body as shown in above fig. 4. A block is a data structure used for storing a set of transactions that is distributed in a network [11] [18] [19].

➢ **Block header**: it is the header of the block that is used to point to the next block.

➢ **Merkle root**: It is used to store the hash value of all the transactions in the given block.

➢ **Hash of the previous block header**: It is defined by its name; this block contains the hash value that point to previous block.
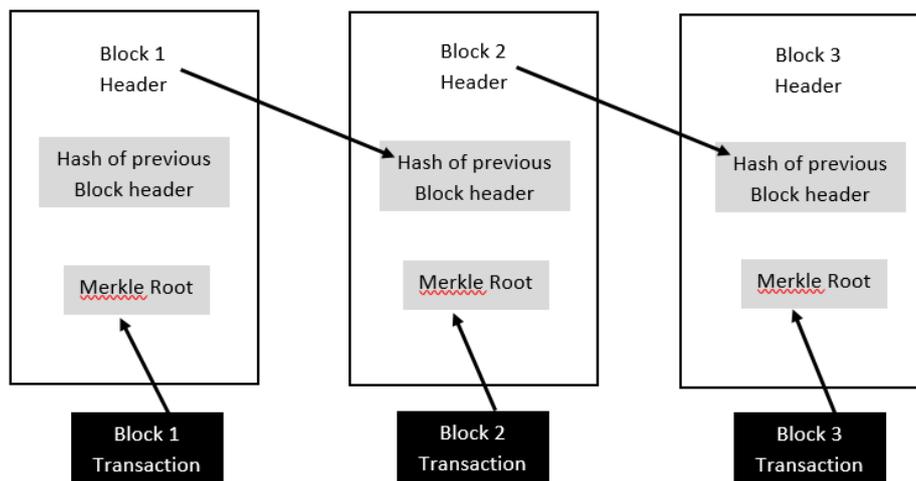

Fig. 4: Structure of the Block

Logically, the first block of the blockchain does not contain any pointer as this is the first block [12]. Similarly, the last block also does not contain any value in his pointer field [13].Architecture of the blockchain serve following motive for organizations:

• **Cost reduction**: An excessive amount of money is lost on centralizing the data (e.g. banks, government institute etc.) to secure it from hackers, cybercrimes and any bad intentions.

• **Data history**: The data history is stored as snapshot in a centralized location whereas in case of the blockchain architecture, user can check the history of the transaction anytime and anywhere [14] [20] [21].

• **Data security**: The blockchain is the most secured technique till date. Once any data or information is entered in the database it is very difficult to tamper that information whereas in centralized database anyone can easily hack the data and fetch the information of any user. This means that the blockchain guarantees high data security [22] [23] [24].

3. ADVANTAGES OF USING BLOCKCHAIN BASED SUPPLY CHAIN

1. Immutable records storage in the blockchain

2. Removal of middle man or intermediates.

3. Easy to track the product from the day of manufacture till now.

4. Provide transparency to the consumer.

5. Helps in providing all information about the manufacture process, assembly

    and   delivery of the finished good.

6. Utilization of blockchain also open up scope for future.

7. Reduces fraud or corruption.

8. Cost reduction of the product and delivery charges.

9. Increases trust between seller and consumer.

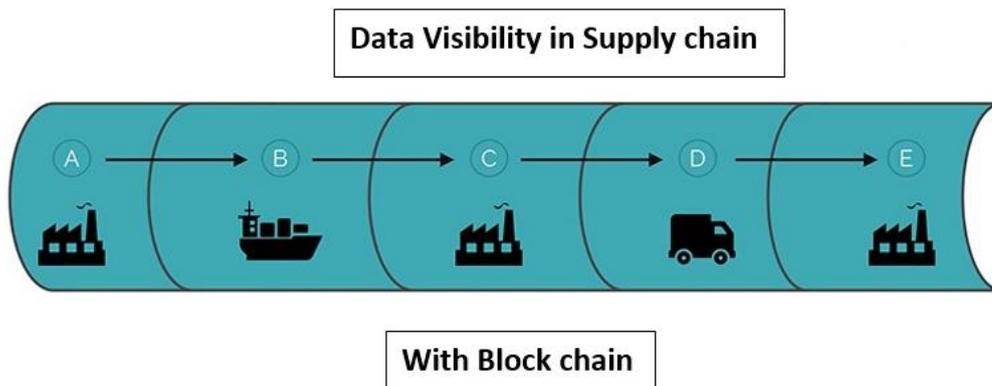10. Transparency between seller and customer [15].

Fig. 5: Supply Chain

4. CONCLUSION

So finally we can say that blockchain can used in many industries such as clothing, food, mobile, medicines etc. So it is seen that blockchain and supply chain are made for each other means if we use blockchain based supply chain management that will increase the efficiency and eliminates many problems in the supply chain management. Hope that blockchain based supply chain can be norm in the future. Supply chain transformation with the IBM blockchain is already underway. So we are not far from the day when blockchain based supply chain management will come.

ACKNOWLEDGMENTS

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