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Blockchain Based Anticounterfeit Detection System in the Post Supply Chain: A Survey

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Abstract: ***For more than a decade now, RFID (Radio Frequency Identification) technology has been quite effective in providing anti-counterfeit measures in the supply chain. However, the genuineness of RFID tags cannot be guaranteed in the post supply chain since these tags can be rather easily cloned in the public space.***
The concept of Product Ownership Management System (POMS) of products for anti-counterfeits that can be used in the post supply chain by using QR code. With this scheme, a customer can reject the purchase of counterfeits by scanning QR code if the seller does not possess their ownership.
We are implementing a proof-of-concept experimental system employing a blockchain-based decentralized application platform which will help to overcome the problems associated with currently working supply chain management system and provides the mechanism to prove the ownership of the products. This paper gives a detailed survey of various methods for POMS and Blockchain implementation.
Keywords: Product Ownership Management System (POMS), Blockchain Technology, QR Code, Supply Chain, Consensus.

I. INTRODUCTION

Traditional SCM systems do not prove the product ownership. They still use a traditional method to maintain the supply chain process. Counterfeiting products, such as branded goods, is one of the most important and difficult issues to deal with in national/international markets.
In a decentralized supply chain, lack of proper capacity risk sharing increases the cost of capacity risk. To deliver on time, the contract manufacturer secures capacity in advance of an original equipment manufacturer order.
For such a supply chain, if consumer demand turns out to be high, both the contract manufacturer and the original equipment manufacturer face upside capacity risk.
However, if consumer demand turns out to be low, only the contract manufacturer faces downside capacity risk. Also, due to the rapid development of e-and i-commerce, clearly there exists an urgent demand to develop anti-counterfeits systems. To improve supply chain quality management with the blockchain technology, it is required to develop a framework and system architecture for blockchain-based supply chain quality for product ownership management.
Blockchain technology is supported by a distributed network consisting of a large number of interconnected nodes. Each of these nodes has their own copy of the distributed ledger [17] that contains the full history of all transactions the network has processed. There is no single authority that controls the network. If the majority of the nodes agree, they accept a transaction.

A. Advantages of Blockchain Technology

1) Blockchain technology allows faster and cheaper financial services, which can increase the efficiency of transactions and payments in the stock market.
2) It also helps for optimizing the transaction time.
3) This technology can also be used to sign up for voting and validating personal identification.
4) Blockchain decentralization [17] helps to become less likely to be attacked which provides to use for online security.
5) Blockchain provides us with a tremendous opportunity to overcome challenges that exist in the industry today,including interoperability, security, integrity, traceability and universal access.
6) Helps to Avoids record tampering.

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II. LITERATURE REVIEW

The author of [1] paper discusses how to improve the supply chain quality management by adopting the blockchain technology and propose a framework for blockchain-based supply chain quality management. This framework will provide a theoretical basis to the intelligent quality management of supply chain based on the blockchain technology. Also, it provides a foundation to develop theories about information resource management in distributed, virtual organizations, especially distributed, cross-organizational and decentralized management theory.

The [2] paper proposes a blockchain based solution to address the problems of the supply chain such as Double Marginalization and Information Asymmetry etc. The SCM systems provide information sharing and analysis to companies and support their planning activities. The sharing of data between manufacturers, suppliers, and customers become very important to ensure reactivity towards markets variability in Supply Chain Management (SCM).

The double marginalization is a widespread and serious problem in supply chain management. In the cases of both deterministic and random demands the decentralized systems under wholesale price contracts are investigated, with double marginalization effects shown to lead to supply insufficiencies.

The Freya Sheer Hardwicket al explores the possibility of the blockchain technology and its effectiveness in the e-voting scheme in [5]. The paper proposes an e-voting scheme, which is then implemented. The implementation and related performance measurements are given in the paper along with the challenges presented by the blockchain platform to develop a complex application like e-voting.

The paper highlights some shortcomings and presents two potential paths forward to improve the underlying platform (blockchain technology) to support e-voting and other similar applications. Blockchain technology has a lot of promise; however, in its current state, it might not reach its full potential.

Based on CMCR, a protocol and Authentication with Block-chain algorithm to protect the user privacy information in the social community detection. Considering user with higher closeness, they have use authentication mechanism based on the block-chain, and encrypt the relationship with Hash function for better security.

Then, they have use the text encryption protocol in the text recommendation process to ensure the security of information. Experiments have proven that improvements have obtained better results. [7] This paper focuses on the various opportunities of blockchain for usage in the healthcare sector, for eg. In public health management, user-oriented medical research based on personal patient data as well as drug counterfeiting.

This paper proposed an Ethereum blockchain technology for decentralized healthcare database. Through this shared network infrastructure, different healthcare specialists can access the same information. [8] The current paper describes how the blockchain is important for storing healthcare data on the cloud.

It also proposed a data security and privacy while data storing. When new healthcare data for a particular patient is created (e.g. from a consultation, and medical operation such as a surgery), a new block is instantiated and distributed to all peers in the patient network.

After a majority of the peers have approved the new block, the system will insert it in the chain. With the rapid growth of the internet of things, many researchers consider the application of relevant technologies for traceability systems in food supply chains. Folinas et al.(2006)[9] pointed out that the efficiency of a traceability system depends on the ability to track and trace each individual product and logistics units, in a way that enables continuous monitoring from primary production until final disposal by the consumer.

Shanahan et al. (2009) [10] suggested an RFID based framework for beef traceability from farm to slaughter. Busing RFID for the identification of individual cattle, this system proposed as a solution to the inaccessibility of traceability records and the fraudulent activities.

In order to build an automated system which integrates online traceability data and chill chain condition monitoring information, Abad et al. (2010)[11] tried to validate an RFID smart tag developed for real-time traceability and cold-chain monitoring of food under the case study of an intercontinental fresh fish logistics chain. Mattoli et al. (2010)[12] developed a Flexible Tag Data-logger(FTD) which is attached to the bottles for collecting environmental data, (like light, humidity, and temperature) in order to trace the wine bottles to a supermarket.

The history data stored in the FTD can be read by a smartphones or Personal Digital Assistant (PDA) with the integrated infrared port to evaluate the safety status of wine bottles.

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III. PROPOSED SYSTEM

Nowadays, majority of the people buy the counterfeits product, because they are not aware or cannot track the product ownership, the manufacturer of the product. So our main motivation is to implement this system to maintain the product ownership in SCM and provide the anti-counterfeits products to end users/consumers.

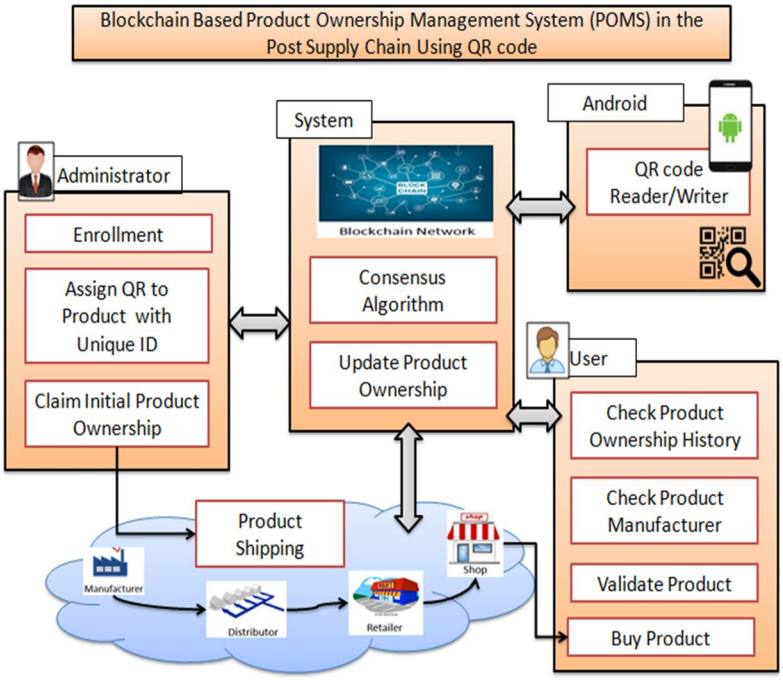

Figure: 1 System Architecture

The proposed system provides reliable and secure product transaction history using blockchain. Figure 1 shows the architecture of the blockchain based POMS in SCM using consensus algorithm.

In proposed system the manufacturer will enroll him with valid information on the blockchain with company name and other details and assigns a unique ID to each product with QR code.

The manufacturer ships products to the Distributor where a distributor can check the manufacturer details and ownership of the products, etc. Distributor verifies the genuineness of the EPC using assigned QR code and issues a transaction.

Ownership of the product will be transfer from the manufacturer to the distributor. Similarly, when any party receives products, a recipient follows the Same procedure as above. Every time the product ownership transfer details is updated against the product unique id through the QR code.

Every product has its own QR code, so through the QR code we get the product history. The product history from manufacturing to shipping details is stored in the DB with the unique ID by using blockchain technology. So, after scanning product QR code we get the unique identification number and through it we get the overall product history.

Customer should be able to buy products at the shop by validating the product information like manufacturer of the product, Current owner of the product, etc using their assigned QR code.

After that, the customer can buy and make a new transaction on the blockchain network if the product is valid or deny it if fake product information found in the product history.

IV. CONCLUSION

Blockchain is based on open source software, Open API's, and commodity hardware. These components facilitate easier and faster interoperability between systems. It can efficiently scale to handle larger volumes of data and more blockchain users.

This paper gives the survey of different techniques used by the researcher for implementing blockchain in various sectors. By surveying all the above POMS in blockchain we come to know that the present system in POMS is only able to maintain the product ownership details but it does not provide the security. The proposed system can help to solve problems of security in supply chain management.

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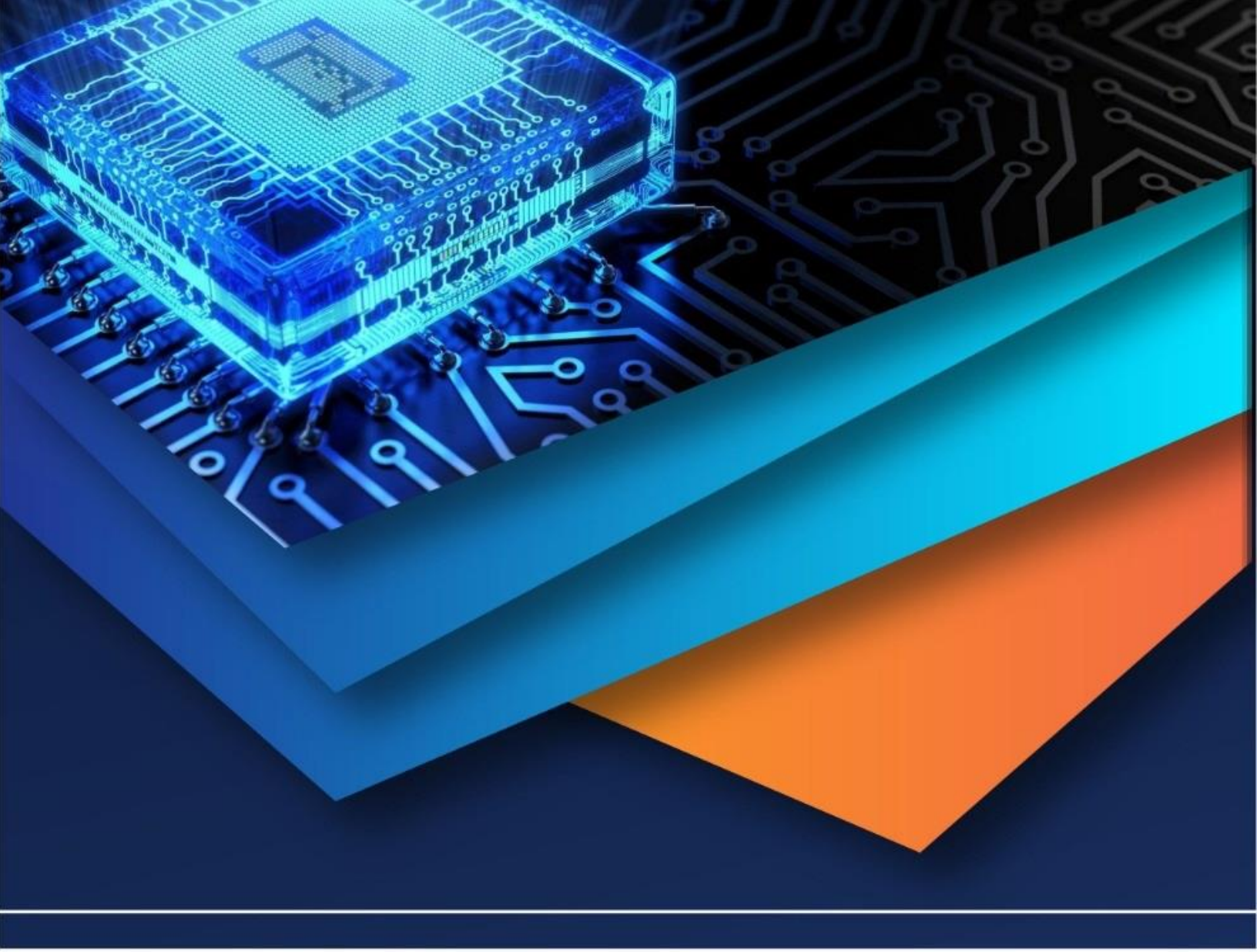

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