

Block chain Based Information Architecture for Medical Product Supply Chain

ABSTRACT

The medical product supply chain is the most complex and fragmented of all supply chains. The production is found all over the world both on land and in water. A lot of the producers and intermediaries are difficult to identify and track. For all the participants in the production chain this creates uncertainty and risk. Mitigating this uncertainty comes at a cost, and the outcome may still be insufficient. Examples of problems that have been difficult or impossible to solve with current technologies include establishing reliable provenance and preventing fraud and counterfeiting. These issues can have knock-on effects on public health and the environment, and reduce financial costs of unnecessary recalls of Medical products. To overcome the above challenges, a Blockchain based Medical Product traceability system (BIMPTS) is proposed in this study, to achieve the following: To integrate blockchain technology for effective and efficient traceability, and To support shelf life adjustment and quality decay evaluation for improving quality assurance. For the sake of better computational load, the blockchain is modified as a lightweight blockchain to be associated with cloud computing to support monitoring, and can be vaporized after the entire life cycle of traceability to release computational resources of the system. By using such a reliable data source, the decision support in product quality can be made by using fuzzy logic to determine adjustment of shelf life, rate, and order of quality decay, according to different situations for each batch of perishable products at processing sites. Therefore, the proposed traceability model is extended to the modern Medical Product supply chain environment, resulting in reliable and intelligent monitoring, product tracking, and quality assurance.

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I. INTRODUCTION

Blockchain has huge potential to impact global Medical Product supply chain (MPSC) by increasing productivity in terms of supply chain performance. Real-time monitoring of the medical product quality and visibility of that quality index would prevent outbreak of food-borne illnesses, economically motivated adulteration, contamination, food wastage due to misconception of the labeled expiry dates, and losses due to spoilage, which have broad impacts on the medical product security.

In order to improve safety and prevent wastage, modern Blockchain based technologies are required to monitor the Medical product quality and increase the visibility level of the monitored data. There are a number of Block Chain based tracking and tracing infrastructures such as Electronic Article Surveillance (EAS), Radio Frequency Identification (RFID), and QR codes which are primarily targeted for automatic package level tracking. However, the role of these technologies is limited in identifying the medical product package and does not provide any information pertaining to the state of the Medical product quality. This limitation prevents quick removal of a defective product from reaching higher levels of the MPSC. For example, when a quality control lapse is identified along the MPSC, the company is forced to recall all the Medical products within a certain time frame leading to a huge economic loss, which can be mitigated with the availability of individual Medical Product package quality information resulting in targeted recalls. In literature, a number of sensing techniques compatible with existing tracking and tracing infrastructure are proposed for monitoring Medical products.

EXISTING SYSTEM

In supply chain management, MPSC is considered complex and complicated due to its environmentally sensitive nature and the presence of shelf life. Supply chain interested parties and end customers pay close attention to information regarding products, shipment information, and environmental monitoring, to minimize the processing and transportation of unsafe and poor-quality products. This can reduce impact from adverse publicity, liability, and recalls. Therefore, traceability systems play a crucial role with significant values in the MPSC. To establish a Medical product traceability system, TRUs should be well defined for building a complex traceability tree. There are three major components for system implementation: identification of TRUs, attributes of TRUs, and documentation of transformations. The identification of TRUs and transformations in

traceability systems require further improvements. Therefore, reliability, information accuracy, and traceability efficiency can be further secured and enhanced, and decision support in MPSC can be obtained beyond monitoring and data management. To improve Medical product traceability systems, Block chain technology is deemed promising for interconnecting products, shipment journeys, order information, and environmental control.

DISADVANTAGE

- The block chain is not designed to handle and store such a large amount of data
- The direct adoption of block chain may cause poor performance in block mining and smart contract mechanisms.
- Some non-quantifiable clauses can damage the entire system.

PROPOSED SYSTEM

The data collecting and processing node, that scans a secret code is termed as a 'terminal'. The common network shared by all the terminals is termed as 'shared network'. The scan of a secret ID by a terminal and enlisting the data is termed as a 'transaction'. Once a transaction is validated based on the consensus of participating terminals, the transaction is converted into a 'block' and included in the Blockchain. Apart from terminals, there exists another type of node, a 'manager', that is responsible for policy making and processing requests based on consensus with other nodes. Finally, there exists a third type of node, called 'agent', that requests information about a secret ID from the blockchain by providing a proper cyber address. 'Address collision' is referred to the existence of a minimum of two identical cyber or physical addresses. A typical Medical product based supply chain is each packaged food product with an embedded secret ID travel through multiple stages of transactions at different terminals starting from packaging through transportation, storage and finally to a consumer for purchase. A data block is created containing the information about the package at each valid transaction. Once the transaction is verified, the transaction of the secret ID is converted into a block of information and appended to its pre-existing data blocks thus forming a chain of information blocks and thus a Blockchain.

ADVANTAGES

- Real time tracking and sensing of food products throughout the MPSC, and allowing identification of key bottlenecks.
- Discouraging adulteration of Medical products, and identifying weak links on occurrence.
- Determining the shelf life of Medical products leading to reduced waste.
- Providing end to end information accurately. Allowing specific and targeted recalls.

II. CONCLUSION

An Blockchain based MPSC monitoring architecture has been proposed in this work. Sensing modality was integrated with identification with a small footprint for tracking and quality monitoring of the Medical product packages. When the Medical Product packages are scanned at different retailers, logistics or storage stage within the supply chain, the real time sensor data is updated in a blockchain providing a tamper-proof digital history. Any consumer or retailer can check the public ledger to obtain information regarding the specific medical product packages. The information helps in updating the shelf life, identifying key bottlenecks in the MPSC, implementing targeted recalls and moreover increasing visibility. A single secret ID integration was demonstrated in this work. The proposed architecture takes consensus from participating terminals in the network before updating the blockchain data. The broader participation of all the nodes helps to keep the network decentralized. The security analysis showed that the validation of a fake block drops with a higher number of node participation in the network and multiple consensus stages.

FUTURE ENHANCEMENT

In future this system provide the more security. Then this system provide the more security purposes like the damaged or modified details are complaint to the higher officials. so the products have a more and more security.

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