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Survey on Drug Supply Chain Using Blockchain Technology

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Abstract: ***It is quite challenging to have an effective supply chain management in every industry. However, it is more challenging and at the same time risky to develop a supply chain in Healthcare as a compromised supply chain can put the patient's life on risk. The Healthcare industry faces problems such as lack of transparency, difficulty in tracking the products, shipments of expired products, lack of trust, lack of safety and security and many more such problems. With the help of Blockchain Technology many of these problems are solved. The rising awareness of Drug safety has created the need to improve the traceability and transparency in the supply chain. Drug counterfeit can also be prevented by using an effective, traceable and transparent supply chain with the support of Blockchain Technology.***

Keywords: Blockchain, Smart Contract, Drug Traceability, Drug Counterfeit, Supply Chain

I. INTRODUCTION

Drug safety is one of the most important need now-a-days as it directly affects the public's health. Many researchers have claimed, to guarantee the drug safety the best solution is to build a reliable drug traceability system ranging from drug production, logistics to sales. This transparent and traceable drug supply chain can be achieved with the help of Blockchain Technology.

A. Blockchain

It is a decentralized, immutable, distributed ledger that stores and shares all the transactions that occurs within the blockchain network. It is a peer-to-peer network architecture. Key elements of Blockchain are Distributed ledger technology, Immutable records, Smart contracts.

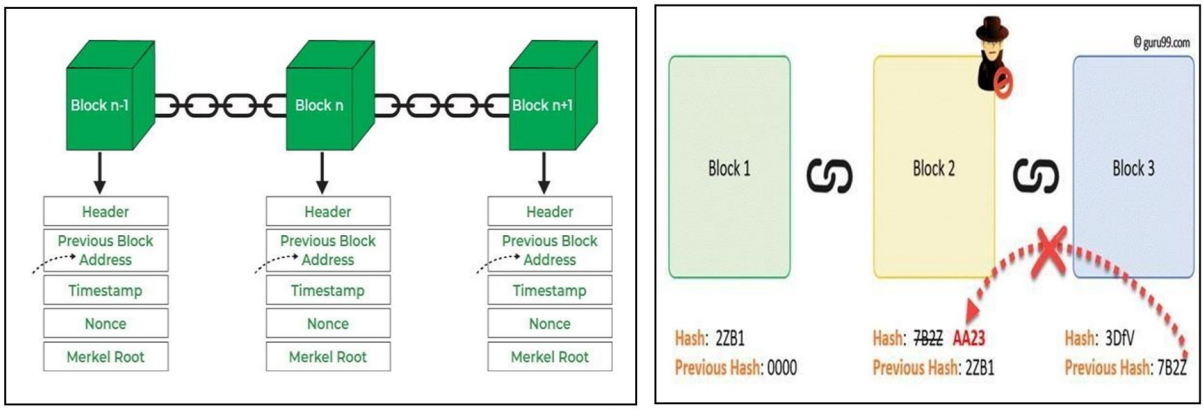

Figure 1: Blockchain Structure [9][10]

II. SYSTEM ARCHITECTURE

The diagram in figure 2 gives a quick overview of the working of Drug Supply Chain using Blockchain Technology.

The System works as follow:

1) *Suppliers:* Suppliers supply the raw materials that are required for the manufacturing of medicines to the manufacturer/ Producer.
2) *Producer:* Producer is responsible to manufacture new medicines and supply them to Distributors.
3) *Distributor:* Distributors take the medicines from Producer in bulk and delivers it to the next participant of the Supply Chain.

4) *3PL:* 3PL are the Third-Party Logistics. They are responsible for shipping packages/consignment form one stage to other.
5) *Retailer:* Retailers stock inventory and sell in smaller quantities to customers in the generalpublic.
6) *Customer:* Customers are individuals or organizations that purchase and use a productmanufactured by the Producer.

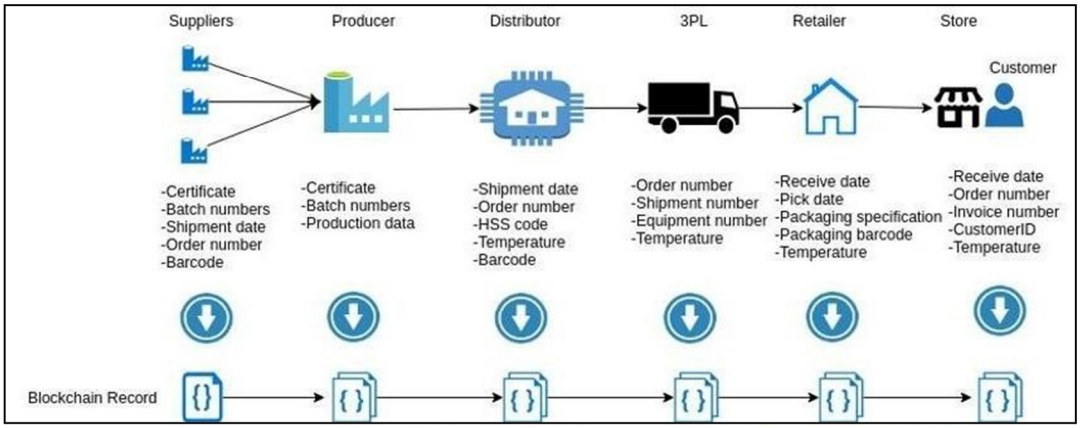

Figure 2: System Architecture for Drug Supply Chain [11]

III. LITERATURE SURVEY

Author /Year ofPublication	Title	Strength	Weakness
Xinlai Liu, Ali Vatankhah Barenji, Zhi Li, Benoit Montreuil, George Q. Huang, Computers & Industrial Engineering2021 [1]	Blockchain-based smart tracking and tracing platform for drug supply chain	Provides more traceable and transparent drugtrails.	This paper only considers limited stakeholders to test theefficiency of the proposed platform.
Indra Eluubek kyzy, Huaming Song, Ahmadreza Vajdi, Yongli Wang, JunlongZhou ,Expert Systems with Applications 2021 [2]	Blockchain for consortium: A practical paradigm in agricultural supply chain system	The problems of trust ability, scalability, and share amount assignment have been solved.	It is important for the farmers to learn how to use the systemor else the proposed system will be of no use.
Mikulas Cerny, Marian Gogola, Stanislav Kubalak, Jan Ondrus, ScienceDirect, 2021 [3]	Blockchain technologyas a new driver in supply chain	This paper gives an introduction to the issues of blockchain technology and its application in the supply chain.	Some important risks and challenges are not addressed like high investment costs, the time needed to implement blockchain into the supply chain, the impact of blockchainon supply chain management, etc.
Tripti Paul, Sandeep Mondal, Nazrul Islam, Sandip Rakshit, Technological Forecasting and SocialChange, 2021 [4]	The impact of blockchain technologyon the tea supply chainand its sustainable performance	Paper discussed the conceptual framework integrating blockchain technology into supply chain	This study has used a cross-sectional method, so it dependson self-reported data collected at one point in time. This increases the probability of biased findings.

Tarun Kumar Agrawal, Vijay Kumar, Rudrajeet Pal, LichuanWang, Yan Chen, Computers & Industrial Engineering, 2021 [5]	Blockchain-based framework for supply chain traceability: A case example of textileand clothing industry	It creates a foundation for futureresearch in multiple directions.	The demonstration work carriedin the paper provides evidence- based proof of how the critical aspects of blockchain-SCM integration must be operationalized which remains currently elusive in research.
Gokcay Balci , Ebru Surucu-Balci, Transportation Research Part E, 2021 [6]	Blockchain adoption in the maritime supply chain: Examining barriers and salient stakeholders in containerized international trade	This study reveals the most salient stakeholders for adoption and also uncovers the structural relationships between BT adoption barriersin CIT.	This study has the limitation ofnot including certain technological barriers like Scalability and System Speed.

IV. SUMMARY

Blockchain technology has a great positive effect on the Supply chain Management. Problems with traditional supply chain can be tackled with blockchain. End-to-end traceability of health products, reduced losses related to counterfeiting, transparency to enhance accountability, efficient recall management are some of the advantages that can be achieved with traceable and transparent supply chain system. We studied six papers and listed their strength and weakness and accordingly planned todevelop a Blockchain based web application for Drug Supply Chain.

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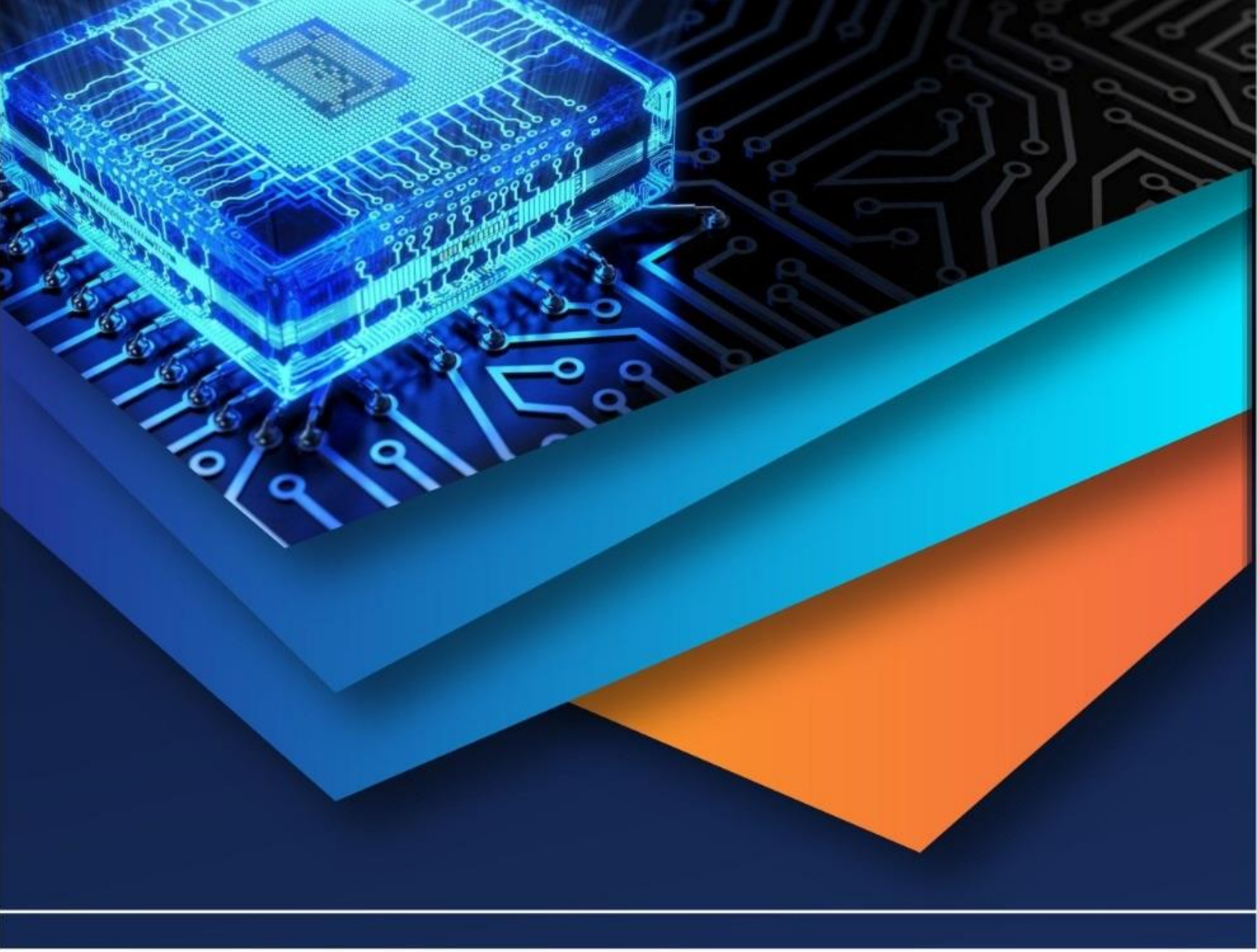

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