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Identification of Counterfeit Product Using Blockchain

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Abstract: With the increasing globalisation and the quickening pace of technological advancement, the quantity of production and the ease of finding counterfeit products have increased to vast range levels. To deter counterfeiting of food, drugs, or luxury products, all sorts of industrial manufacturing and distribution companies are now seeking greater transparency in supply chain activities.. In order to detect fake goods in the supply chain system, this article offers a decentralized Blockchain-based application system (DApp). Due to the rapid advancement of Blockchain systems, it is now widely accepted that the records kept there is safe and unalterable. Therefore, the project that is being proposed here uses this concept to deal with the transfer of ownership of products. A customer can verify the distribution and ownership details of the products by scanning a Quick Response (QR) code generated by the DApp for each product linked to the Blockchain

Index Terms: Counterfeit, Supplychain, Blockchain, Ethereum, QR Code.

I. INTRODUCTION

All supply chain stakeholders have had difficulties in the years in identifying the counterfeit items in the marketplace. According to the most recent assessment by the Organization for Economic Cooperation and Development (OECD) and the EU Intellectual Property Office (EUIPO), the amount of counterfeit and pirated goods sold globally and dramatically climbed to 460 billion euros, or nearly 3.3% of all trade. This occurrence has impacted the sales and earnings of businesses all across the world. Sales declines of nearly 26.3 billion euros and 10.2 billion euros, respectively were reported in the apparel and pharmaceutical industries. Also, the market for fake goods has flourished on social media platform with the advent of current technology and E-commerce. For counterfeiters, social media and e-anonymity, commerce's reach, and segmentation tools have made life easier. Hence, counterfeiting—the act of creating twins or imitations of genuine goods—poses a serious danger to innovation and economic development. Over the past 10 years, blockchain has attracted a lot of attention and new application are being created. Blockchain is a distributed, shared, unchangeable ledger system. It makes it easier to record, trade and track assets via a corporate network, which lowers risk and lowers cost of everyone. As a result, every application that uses Blockchain as its foundational technologies guarantees that the data are impenetrable. Risk considerations, such as counterfeiting and duplication, which can have an impact on a company's reputation, revenue, and customer satisfaction, are always present when a technology or product is developed globally. The supply chain contains a huge number of products. The issue of product counterfeiting is helped by blockchain technology. It is safer to use blockchain technology. A chain will be constructed for that product's transactions once it is stored on the network, making it feasible to keep track of all the product's transactions and those of its present owner. In the blockchain, each transaction record will be recorded as a block.This article introduces a decentralized application system (DApp) with an Ethereum blockchain-based architecture. The DApp makes sure that product ownership is transmitted and documented in the blockchain network while simulating a real-world supply chain. Also, the system suggested here can be applied to retail and e-commerce websites, significantly increasing openness for all users of the virtual marketplaces. Despite the fact that Radio Frequency Identification (RFID) has been employed in the field of research in the past, it has presented security and privacy problems that can be effectively addressed using blockchain.

II. LITERATURE REVIEW

[1]. The supply chain, which is made up of numerous system components including individuals, physical resources, expertise, protocols, and contracts and transactions, facilitates the movement of a Product from a supplier to a client. It is very difficult to get a comprehensive view of all transactions occurring within a big supply chain system. Typically, this data is stored across a variety of locations and only particular system entities are allowed entry. Customers usually have access to some of the complete data contained in such systems, whether they are the large organization within the chain or the end customers. The decentralised distributed system that is proposed in this article gathers, maintains, and stores essential product data for each specific product throughout its life cycle. Such a decentralized block of data can be utilized

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to generate a secure, shared transaction record for each individual product, together with unique product metadata. The suggested method proposed by Monfared et al. (2016) uses a decentralised distributed system that employs blockchains to gather, store, and manage each product's critical product information across the course of its life cycle. As a result, each product receives a secure, shared record of exchange that includes detailed product information. While a product moves through its life cycle, several actors, including suppliers, manufacturers, wholesalers, retailers, and eventually the end user, are in possession of it. Each of these players fills a crucial role in this system by entering crucial data about the product and its current state onto the blockchain network. Each product would have a unique digital profile that would be filled out during the course of its many stages of existence and contain all relevant data.

[2]. The current supply chains for combating counterfeit goods rely on a centralised authority. Issues with this architecture include single point processing, failure, and storage. Blockchain technology has emerged as a potential remedy for these problems. In this study, we suggest the block-supply chain, a new decentralised supply chain that utilises blockchain and Near Field Communication (NFC) technology to identify counterfeiting attempts. A new proposed consensus protocol called block-supply chain replaces the centralised supply chain design and strikes a balance between efficiency and security. It is totally decentralised, unlike current protocols. Our simulations demonstrate that the suggested protocol, when compared to the cutting-edge consensus protocol Tendermint, offers exceptional performance with a sufficient level of security. (Alzahrani N. & Bulusu N. 2018)

[3]. The Consumers can contribute to and assist this process because there are more counterfeit goods on the European market than there used to be, making the intervention of inspection bodies and authorities insufficient. In this work proposed by Gaedke et al.(2020) we investigate whether machine learning-based technologies can limit the production of counterfeit goods. Machine learning-based image and text identification and classification techniques have the potential to be an important tool in the fight against counterfeiting. End users may quickly and accurately identify counterfeit goods by comparing them to trained models thanks to automatic image and text recognition and classification of product information.

[4]. In this study proposed by De Li et al.(2017) a brand-new anti-counterfeiting method and a highly reliable digital watermarking technique were proposed. We used a QR code as the carrier image, which is created using the pertinent data of the copyright owner, and added the owner's information as a watermark on the QR code. After that, we used watermark detection and two-dimensional bar code scanning techniques to extract the watermark data from the QR code. We could evaluate watermark information and scanning data to confirm its validity in order to meet the goal of anti-counterfeiting. The experiment demonstrated the method's resistance to attacks such as compressive, rotational, and noise attack.

[5]. The pharmaceutical supply chain can easily track the history of drugs thanks to blockchain technology. The fact that the blocks in a blockchain are timestamped and immutable, making data tampering impossible, are two key features that make data on a blockchain secure and safe. A blockchain can be either public or private for an organisation. On these blockchains, the parties engaged in the production and distribution of the drug will share a distributed ledger. Additionally, these blockchains only offer restricted access, which is dependent on the parties' data-sharing agreement. We can fully trace the movement of pharmaceuticals via blockchain, from manufacturers to final users in the system proposed by Kumari K & Saini K. (2019) The block supply chain stores the information each time the medicine moves from one entity to another. This makes medicine tracing simple and aids in the fight against industry-wide counterfeiting

[6] This study proposed by Shreekumar et al. (2022) uses blockchain and supply chain technologies to demonstrate a contemporary and practical phenomenon. These technologies already provide high levels of security and transparency for the system, but this study adds some additional characteristics by using one-time password (OTP) authentication to confirm the legitimacy of supply chain participants and products and to update product information in the block. It becomes ingrained in people to read product reviews before making a purchase[3], especially prospective buyers. Positive customer feedback can result in substantial financial gains for a firm, which can be used as information when making decisions on how to create products and what services to offer clients. The fraudsters attempted to take advantage of the current system by writing false reviews and offering an assessment that is unfair to either promote or discredit a product or service. This was done in relation to the financial gains made as a result of the positive reviews about the product or service from the customer. The goal of automatically detecting spammers is crucial, but research is still needed.

[7] In this In this study, a brand-new product ownership management system (POMS) for products with RFID tags for counterfeit prevention that can be applied in the post supply chain is proposed by Toyoda et al.(2017). He use the blockchain concept of Bitcoin for this, where anyone can verify the balance evidence of ownership. If the seller does not have ownership of the counterfeit goods, the consumer can refuse to buy them even if the RFID tag information is

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authentic, according to the proposed POMS. With the help of the Ethereum decentralized application platform, he created a proof-of-concept experimental system and assessed its cost performance.

[8] Because the agri-food value chain is crucial to providing customers with sufficient, affordable, safe, and sustainable food, feed, fibre, and fuel, it is crucial to keep these value chains operating efficiently and profitably by utilising cutting-edge internet technology. Blockchain technology is a new digital technological approach supported by Industry 4.0 that offers fault-tolerance, immutability, trust, transparency, and full traceability of the stored transaction records to all agri-food value chain partners. This ensures data integrity and prevents tampering and single point failure. The state-of-the-art blockchain technology, including its most recent advancements, key applications in the agri-food value chain, and obstacles, were reviewed in this paper using comprehensive literature network analysis. The results imply that the adoption of blockchain technology, along with cutting-edge ICT and the IoT, has improved the management of the agri-food value chain in four key areas: traceability, information security, manufacturing, and sustainable water management. Six issues have been found, including the following: lack of expertise, privacy leaks, high cost and regulation issues, throughput and latency problems. This study proposed by Zhao G et al. (2019) discusses the applications and difficulties of blockchain technology in the management of the agri-food value chain and identifies research gaps and future research initiatives. By identifying the potential of blockchain technology and its implications for agri-food value chain performance improvements including food safety, food quality, and food traceability, this study adds to the body of knowledge already available in the field of agri-food value chain management.

III. PROPOSED METHODOLOGY

3.1 System Architecture

The solution that is being presented here uses the Ethereum blockchain's Rinkeby Test Network and the MetaMask cryptocurrency wallet for all transactions. The Manufacturer, the Seller, and the Customer are the DApp's three main stakeholders.

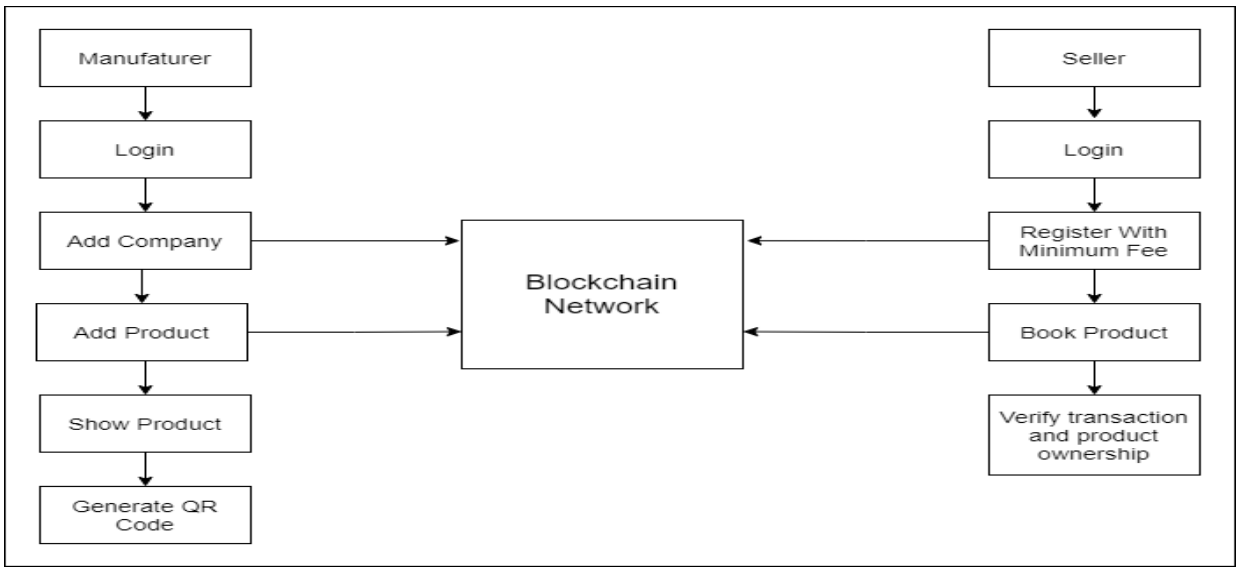

Fig 3.1 System Architecture

3.1.1 Manufacturer

The manufacturer's duties are connecting the business to the blockchain, supplying the organisation name, and determining the minimal registration cost for third parties who wish to sell or buy from the business. Only the manufacturer retains the authority to add products to the network. When the seller has purchased the item stock, the producer may transfer ownership and control the status of product distribution. The manufacturer's two main tasks in this system are adding and distributing products. A product is added using Algorithm 1.

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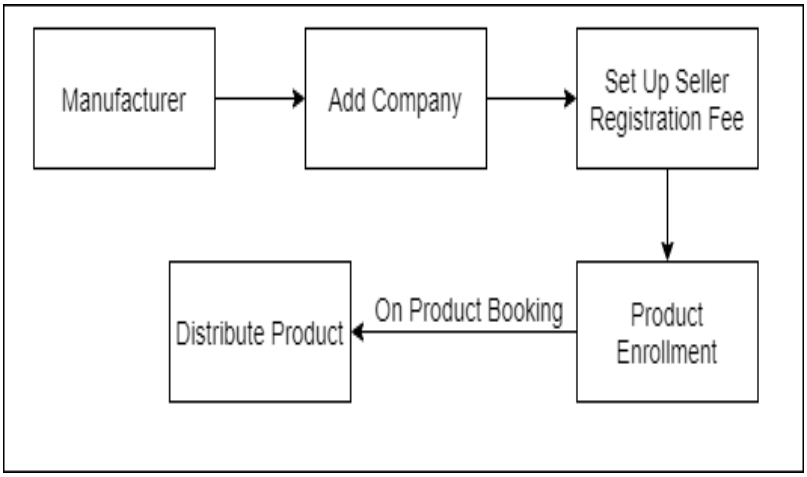

Fig 3.2 Manufacturer's Working Process

Algorithm 1 : Build a Product
Input: Product name, Product Cost, Inventory
Output: Adding Product
if message's sender is not manufacturer then
throw;
end
else
add product to the product array
endif

For distribution of product Algorithm 2 is used. The productand order status in the blockchain is changed through this.

Algorithm 2 : Distribute Product
Input: Product ID
Output: Changed Product Status
if msg.sender is not manufacturer then
throw;
end
else
Change product status to "Shipped" and set order status as complete
endif

3.1.2 Seller

A vendor can register for the business by paying the minimal fee imposed by the manufacturer. The vendor can purchase any goods and follow the distribution of it after registering just once. When a product is delivered to the seller by the manufacturer, its status is changed from "Ready To Go" to "Shipped."

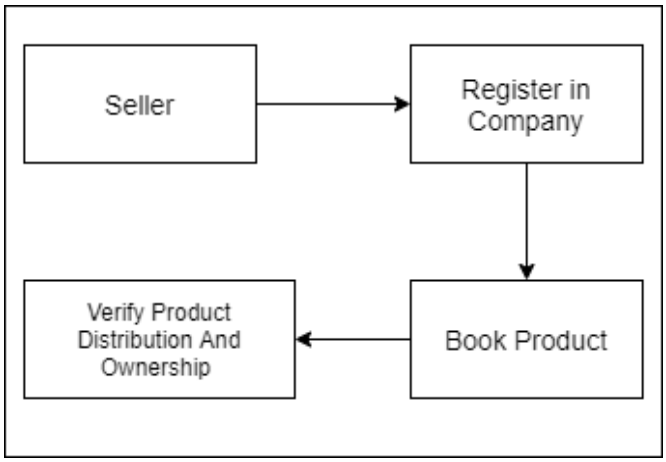

Fig 3.3 Seller's Working Process

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Algorithm 3 here is used to make sure a seller pays the minimum registration fee set by the manufacturer.

Algorithm 3: Seller Registration
Input: Minimum amount of registration fee set by manufacturer
Output: Registered Seller
if msg.sender is registered seller or fee is less than requirement then
throw;
end
else
Map msg.sender is true
endif

Algorithm 4 is used by the seller to buy or book products from the manufacturer. It records the sellers data in lockchain.

Algorithm 4: Seller Registration
Input: Product ID, Seller Name, Amount to buy
Output: Set the current owner of product as msg.Sender
if msg.sender is not registered seller then
throw;
else if msg.value is less than required amount then
throw
end
else
Set product owner name as seller name and store account address of seller
Endif

3.1.3 Consumer

Consumers can confirm the transfer of ownership from maker to seller by scanning the QR code included with each product. Also, the consumer has the option of checking the product's distribution status and the name of the product's current owner.

3.2 Blockchain

The supply chain management paradigm offers promising potential thanks to blockchain technology. On nodes, where each node has a full copy of the blockchain database, blockchain data is kept. With a blockchain network, orders, payments, accounts, product prices, and other data may be monitored, shared, and safeguarded. The following are some crucial characteristics of blockchain technology for supply chain management:

- Security and Privacy: Public key encryption is a form of cryptography that is used by blockchain to secure data. Users have a set of public and private keys that are used to validate transactions, which are unchangeable and irreversible.
- Decentralization: Because blockchain uses a distributed ledger, it is not dependent on a centralized authority or third party.

3.3 Etherium DApp Architecture

The fundamental architecture of the system is shown in Fig. 3.3. ReactJS was used to create the user interface (UI) in this instance. In order for the user to engage with the smart contract, the DApp will make use of Web3.js, which connects to MetaMask via its provider. The user's private key is used by MetaMask to create and sign a transaction. The Ethereum network then receives this transaction. The transaction is processed, verified, and included in a network block. The user can safely interact with the network because the private keys of the user are never recorded during the operation.

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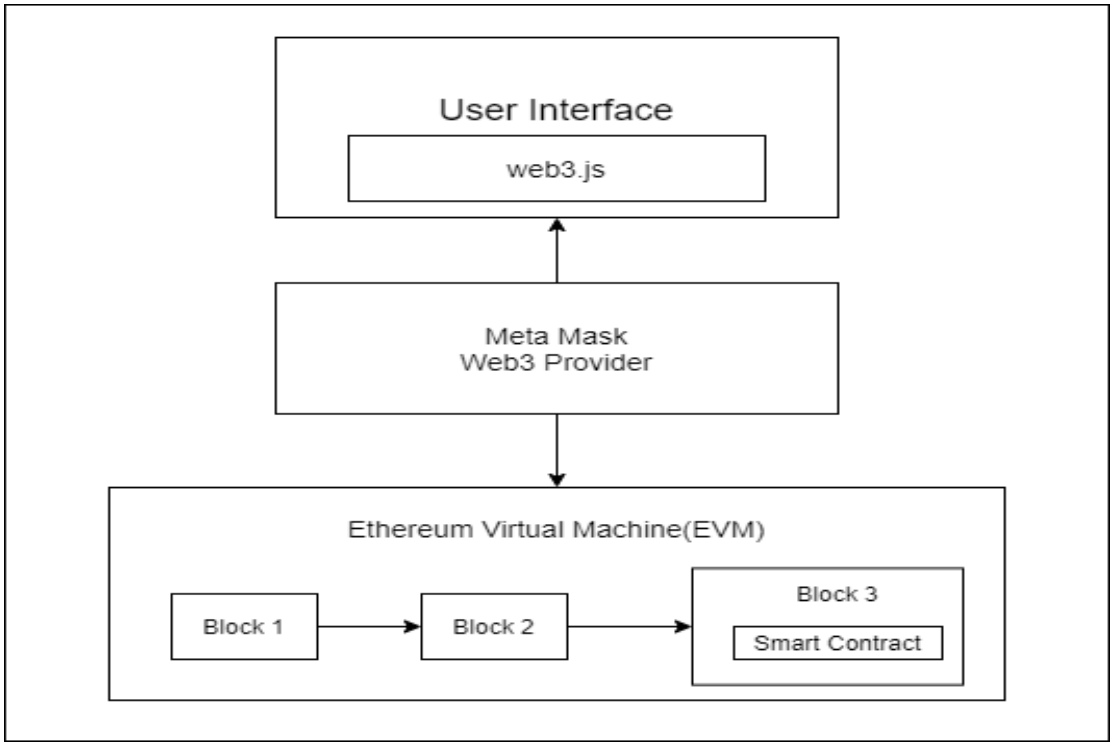

Fig 3.4 Etherium DApp Architecture

IV. RESULT AND DISCUSSIONS

The cost of sending data to the Blockchain is known as the transaction cost. Miners frequently give higher-cost transactions priority. Gas, the native currency of Ethereum, is used to assess transaction costs, and gas fees are paid in ether (ETH). The transaction costs and gas expenses necessary for the suggested system are shown in the table.

Sl No.	Function Description	Transaction Cost (gas)	Gas Fee (ETH)
1	Deploy Contract of our system	133405	0.001333
2	Adding New Company	1068597	0.001069
3	Seller Registration	45755	0.000046
4	Product Enrollment	208571	0.000209
5	Buying Product	41581	0.000042
6	Product Distribution	55578	0.000056
Total=0.002755 ETH/ $8.56			
Deploy= $4.14			

V. CONCLUSION

Blockchain-based distributed ledgers are reshaping the ownership tracking system. The present supply chain trends are being impacted by the quick developments in the e-commerce and commercial sectors. The DApp created here guarantees increased supply chain management transparency and can be trusted to be used in e-commerce. As a result, this technique cuts out administrative fees and challenging procedures. Additionally, enrolling each product in the suggested model only costs 0.000209 ether, or 0.65 US dollars, which can significantly lower expenses for major chain stores. The model also includes a QR code end-user verification system so that transactions may be checked on Etherscan. The provided features can be further enhanced as part of the proposed model's ongoing development to bring reliability to supply chain management.

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REFERENCES

[1] Abeyratne, S. A., & Monfared, R. P. (2016). Blockchain ready manufacturing supply chain using distributed ledger. International journal of research in engineering and technology, 5(9), 1-10.
[2] Alzahrani, N., & Bulusu, N. (2018, June). Block-supply chain: A new anti-counterfeiting supply chain using NFC and blockchain. In Proceedings of the 1st Workshop on Cryptocurrencies and Blockchains for Distributed Systems (pp. 30-35).
[3] Daoud, E., Vu, D., Nguyen, H., & Gaedke, M. (2020). Improving fake product detection using ai-based technology. In Proceedings of the 18th International Conference on E-Society (ES 2020).
[4] De Li, X. G., Sun, Y., & Cui, L. (2017). Research on anti-counterfeiting technology based on QR code image watermarking algorithm. Int J Multimed Ubiquitous Eng, 12(5), 57-66.
[5] Kumari, K., & Saini, K. (2019). Cfdd (counterfeit drug detection) using blockchain in the pharmaceutical industry. Int J Eng Res Technol (IJERT), 8, 1-4.
[6] Shreekumar, T., Mittal, P., Sharma, S., Kamath, R. N., Rajesh, S., & Ganapathy, B. N. (2022). Fake Product Detection Using Blockchain Technology. JOURNAL OF ALGEBRAIC STATISTICS, 13(3), 2815-2821.
[7] Toyoda, K., Mathiopoulos, P. T., Sasase, I., & Ohtsuki, T. (2017). A novel blockchain-based product ownership management system (POMS) for anti-counterfeits in the post supply chain. IEEE access, 5, 17465-17477.
[8] Zhao, G., Liu, S., Lopez, C., Lu, H., Elgueta, S., Chen, H., & Boshkoska, B. M. (2019). Blockchain technology in agri-food value chain management: A synthesis of applications, challenges and future research directions. Computers in industry, 109, 83-99.

