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Identifying Fake Products through a Barcode based Blockchain System

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Abstract: ***Counterfeit products pose a significant threat to consumers, businesses, and economies worldwide. Traditional methods of authentication often fall short in effectively combating this issue. In response, this paper proposes a novel approach utilizing a barcode based blockchain system to authenticate products and detect counterfeit items. By integrating blockchain technology with barcode scanning, consumers and retailers can verify the authenticity of products throughout the supply chain. The system employs smart contracts to record product information and transactions securely, providing a transparent and immutable record of each item's journey. Through this approach, stakeholders can mitigate the risks associated with counterfeit goods, safeguard brand reputation, and enhance consumer trust. This paper outlines the architecture of the proposed system, discusses its potential benefits, and addresses implementation challenges. Furthermore, it explores the implications of integrating blockchain technology with barcode scanning for combating counterfeit products and enhancing supply chain transparency.***

Index Terms: Blockchain; Security; Counterfeit Detection; Product Verification; Fraud Prevention.

I. INTRODUCTION

Counterfeiting is a pervasive issue that plagues numerous industries, including pharmaceuticals, electronics, fashion, and luxury goods. The proliferation of counterfeit products not only poses significant risks to consumers, businesses, and economies but also undermines trust in brands and erodes consumer confidence. Traditional methods of authentication, such as holographic stickers and serial numbers, are often inadequate in effectively combating this problem, as counterfeiters have become increasingly sophisticated in replicating such features. Consequently, there is a pressing need for innovative solutions that can reliably verify the authenticity of products and detect counterfeit items. Blockchain technology has emerged as a promising tool for addressing various challenges in supply chain management, including counterfeit detection. Blockchain is a decentralized, distributed ledger that records transactions across a network of computers in a secure and transparent manner. Each transaction, or block, is cryptographically linked to the previous one, forming a chain of blocks that cannot be altered retroactively. This immutable nature of blockchain ensures the integrity and transparency of data, making it an ideal technology for combating counterfeit products. In recent years, several initiatives have explored the potential of blockchain in authenticating products and enhancing supply chain transparency. However, many of these initiatives have focused primarily on high-value goods or relied on proprietary technologies that limit interoperability and scalability. In contrast, this paper proposes a barcode-based blockchain system that offers a cost-effective and scalable solution for authenticating a wide range of products across various industries. The proposed system leverages the ubiquity of barcodes, which are already widely used for product identification and tracking. By integrating blockchain technology with barcode scanning, consumers and retailers can easily verify the authenticity of products using their smartphones or dedicated scanning devices. Each product is assigned a unique digital identity, which is stored on the blockchain along with relevant information such as manufacturing details, distribution history, and authentication records. This immutable record ensures that the provenance of each product can be traced back to its origin, enabling stakeholders to detect and prevent counterfeit items from entering the supply chain. One of the key components of the proposed system is the use of smart contracts, which are self-executing contracts with the terms of the agreement directly written into code. Smart contracts facilitate automated and transparent transactions, allowing for seamless interactions between various parties in the supply chain. For instance, when a product is scanned at different checkpoints along the supply chain, a smart contract can automatically update its status on the blockchain, recording details such as location, timestamp, and responsible party. This real-time visibility into the movement of goods enables stakeholders to identify anomalies or suspicious activities that may indicate the presence of counterfeit products. In addition to enhancing counterfeit detection, the barcode-based blockchain system offers several other benefits for supply chain management. It improves traceability by providing a comprehensive and immutable record of each product's journey from manufacturing to consumption.

This enhanced traceability not only helps in quality control and regulatory compliance but also enables faster and more efficient recalls in the event of product recalls or safety issues. Furthermore, by fostering transparency and trust among stakeholders, the system can help in building stronger relationships between manufacturers, distributors, retailers, and consumers. Overall, the integration of blockchain technology with barcode scanning has the potential to revolutionize the way products are authenticated and tracked throughout the supply chain. By combining the security and transparency of blockchain with the ubiquity of barcodes, the proposed system offers a robust and scalable solution for combating counterfeit products and enhancing supply chain transparency across various industries. In the following sections, we will delve deeper into the architecture of the system, discuss its potential benefits and challenges, and explore its implications for combating counterfeit products and improving supply chain management.

II. PROBLEM STATEMENT

With the rise of globalization and the ever-increasing rate of technological advancement, the volume of production as well as the ease of obtaining counterfeit goods has reached new levels. It impacts a company's sales, reputation, and revenues, as well as poses alethal hazard to unsuspecting customers. Our Fake Product Identification Through Barcode Using Blockchain Technology System – a Dotnet project proposes a form of identification of fake products using blockchain technology. In the proposed system, we are assigning a barcode to a particular product created by the manufacturer along with all the details of the product and the end customer can scan that barcode to get all information about that product. After scanning the barcode, the user can identify whether the product is real or fake.

III. LITERATURE REVIEW

1) Title: Drug-laden 3D biodegradable label using QR code for anti-counterfeiting of drugs. Publisher/Year: Jie Fei , Ran Liu / Year- 2016 Problem Statement: Drug-laden 3D biodegradable label using QR code for anticounterfeiting of drugs. Result/Accuracy: Possible to retrieve most of the information by directly connecting to the websites via links within the QR code. Limitations: Found that within an appropriate range under certain conditions, the lesser the aspect ratio, the more the difference in roughness (reflectivity) was present, which meant the identification needed an upper limitation of aspect ratio.

2) Title: Counterfeited Product Identification in a Supply Chain using Blockchain Technology. Publish year: Shivam Singh, Gaurav Choudhary, Shishir Kumar, Vikas Sihag/ August 2021 Problem Statement: Combine Blockchain technology with the Supply Chain in order for the betterment of the future technology of the Supply Chain and its applications. Result / accuracy: The supply chain members will be receiving an OTP on their mobile number sent by the supply chain member of the previous stage under the supervision of the “Quality Control Officer” who will be the main person behind the accurate transfer of goods and the product verification by the supply chain members Limitations: The solutions proposed by the researchers are complex and not much userfriendly and also there are no dynamic authentication methods used on the products in the supply chain which could have helped the supply chain in becoming healthier and userfriendly.

3) Title: A Blockchain Based Solution for MedicationAnti-Counterfeiting and Traceability Publish year :PENG ZHU 1, (Member, IEEE), JIAN HU 1, YUE ZHANG2, AND XIAOTONG LI3/ October 20, 2020. Problem statement: A blockchain based method for medication information storage, inquiry, and anti-counterfeiting along a medication supply chain. Result/Accuracy: Reduced the energy consumption, thereby making the blockchain technology more suitable for medicine traceability and anti-counterfeiting. Limitations: Firstly, while it is highly desirable that medication information stored on blockchain will be reliable and non-modifiable, the trustworthiness of medication information before uploading on blockchain fully depends on the trustworthiness of each node in the supply chain; the authenticity of such information still needs verification. Secondly, all information is stored on blockchain as proposed, which will demand and consume largen amount of storage resources (memory utilization).

4) Title: Fake Product Detection Using BlockchainTechnology Publish year: Tejaswini Tambe , Sonali Chitalkar , Manali Khurud , Madhavi Varpe , S. Y. Raut/ 2021 Problem statement: To detect fake Product using Blockchain Technology. Result/Accuracy: This real-time system can be implemented to check the received product is a counterfeit product or original product. The manufacturer uses the SHA-256 algorithm to generate a QR code in blockchain technology. The generated QR code is scanned by the user to check given product is fake or real.

5) Title: Blockchain-Based Supply Chain Quality Management Framework Publish Year: Si Chen,Rui Shi, Zhuangyu Ren, Jiaqi Yan, Yani Shi, Jinyu Zhang/ 2017 Problem statement: A blockchain-based SCQI framework. Based on blockchain technology, a new supply chain system can be built in which information sharing and quality control are assured. Result/ Accuracy: Proposed a framework for blockchain based SCQI.

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IV. METHODOLOGY

A. *Existing System*

1) Nevon Projects proposes a system that assigns a barcode to a product created by the manufacturer, along with all the details of the product. The end customer can scan that barcode to get all information about that product. The system comprises two modules, including Admin and User. The admin can add, update, view, and delete the products, including product serial ID, date of manufacture, origin of the product, expiry date, etc., along with the information of the seller. Theuser would need to register first to log in.

2) Cointelegraph explains that blockchain technology can aid in the discovery of fake products by offering a tamper-proof and transparent record of the entire supply chain, making it simpler to trace and verify the authenticity of products and enabling the prompt identification of any fraudulent activity. Digital identities can play a crucial role in detecting and preventing fake products from entering the market. Manufacturers can establish a verifiable.

3) IEEE Xplore proposes a system that detects counterfeit products using a barcode reader, where a barcode of the product linked to a blockchain-based management system. The system can detect counterfeit products and prevent them from entering the supply chain.

4) A GitHub project proposes a blockchain-based system for identifying original products and detecting fake products. The system uses a barcode scanner to scan the barcode of the product and then checks the blockchain ledger to verify the authenticity of the product.

B. *Proposed System*

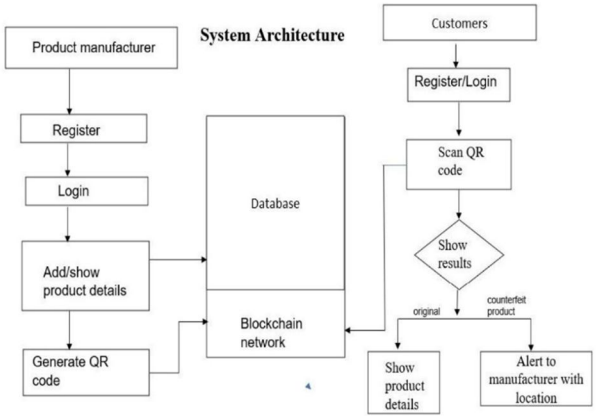

Fig. 1. System Architecture

Type of Logins

1) Three Type of login: Manufacturer, User and Admin.

2) Registration: User have to register to become a part of project.

3) Login: User have to login themself to access in project.

4) Add Product: After Manufacturer Login Manufacturer can add product using java script and smart Contract in Block chain Database.

5) Generate Qr Code: All Product data display in admin side and admin verify that product and generate qr code of that related product using python and add in block chain database.

6) Scan Qr Code: User Scan that QR code using Android Application And then Display All information of product in our mobile screen.

C. *System Overview*

1) *Product Manufacturer:* Responsible for registering and logging into the system. Can add and showcase product details. Generates QR codes for products to be linked to the blockchain.

2) *Database - Blockchain Network:* Centralized database storing product information using blockchain technology. Records each product's unique identifier, manufacturer details, and authenticity status.

3) *Customer:* Registers and logs into the system. Scans QR codes of products using a mobile app. Receives results indicating the product's authenticity. If the product is genuine, shows detailed product information. If the product is fake, alerts the manufacturer with the product's location.
4) *Authentication and Authorization:* Implementation of secure authentication mechanisms for both manufacturers and customers. Authorization controls to ensure only authorized users can perform specific actions, such as adding products or viewing details.
5) *QR Code Generation and Scanning:* Integration of QR code generation functionality for products by manufacturers. QR code scanning capability for customers to access product information quickly.

D. *System Requirements*

1) *Software Requirements*

- Operating System : Windows 10, 7, 8.
- Python
- Anaconda
- Spyder, Jupyter notebook, Flask.
- MYSQL
- Android studio, JAVA
- Ganache

2) *Hardware Requirements*

- I3 Processes
- 250 GB Hard Disk
- 4 GB RAM

V. RESULT ANALYSIS

A. *Implementation*

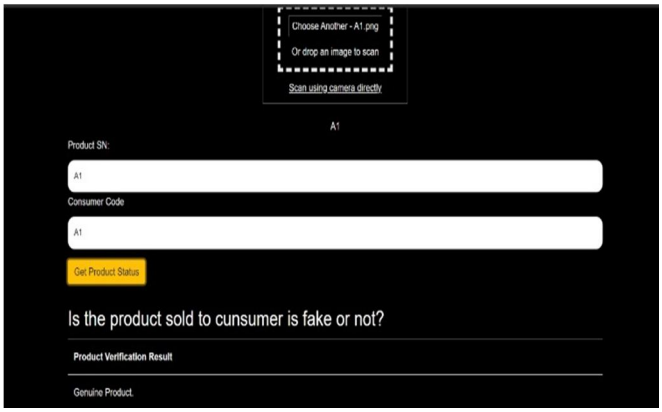

Fig. 2. Final Output

VI. APPLICATIONS

1) Supply Chain Management
2) Counterfeit Prevention
3) Brand Protection
4) Consumer Confidence
5) Regulatory Compliance
6) Product Recall Management
7) Pharmaceuticals and Healthcare
8) Food and Beverage Industry

VII. CONCLUSION

A barcode-based blockchain system can be used to detect fake products by offering a tamper-proof and transparent record of the entire supply chain. This makes it simpler to trace and verify the authenticity of products and enables the prompt identification of any fraudulent activity. Digital identities can also play a crucial role in detecting and preventing fake products from entering the market by providing a secure and reliable means to validate the origin and ownership of a product. Several studies have been conducted on fake product detection using blockchain technology. For example, one study proposed a system that uses a camera scanner to link the QR or barcode of a product to a blockchain in order to store product details and detect fake products. Another study suggested storing the supply chain of products at every stage of the transaction of a product to a new party with the help of a QR code. The use of blockchain technology in fake product detection can help companies comply with rules and regulations in various industries that demand supply chain openness. It can also help protect consumers from the risks associated with fake products and prevent companies from suffering losses due to counterfeit products affecting their sales and profits. Overall, a barcode-based blockchain system can be an effective tool for identifying fake products and ensuring the authenticity of products in the supply chain.

VIII. FUTURE WORK

1) *Increased Transparency:* Blockchain technology can provide a transparent and tamper-proof record of the entire supply chain, making it easier to trace and verify the authenticity of products. This increased transparency can help to prevent the entry of fake products into the market.
2) *Improved Consumer Confidence:* The use of blockchain technology and barcode scanning can help to improve consumer confidence in the products they purchase. Consumers can scan the barcode of a product and check if it is genuine or not, which can help to prevent them from purchasing fake products.
3) *Reduced Counterfeit Products:* The use of blockchain technology and barcode scanning can help to reduce the production and sale of counterfeit products. The transparency provided by blockchain technology can make it difficult for counterfeiters to replicate products, and barcode scanning can help to identify fake products before they enter the market.
4) *Integration with Other Technologies:* The use of blockchain technology and barcode scanning can be integrated with other technologies such as RFID, barcode scanners, and holographic packaging to provide a more comprehensive solution for identifying fake products.

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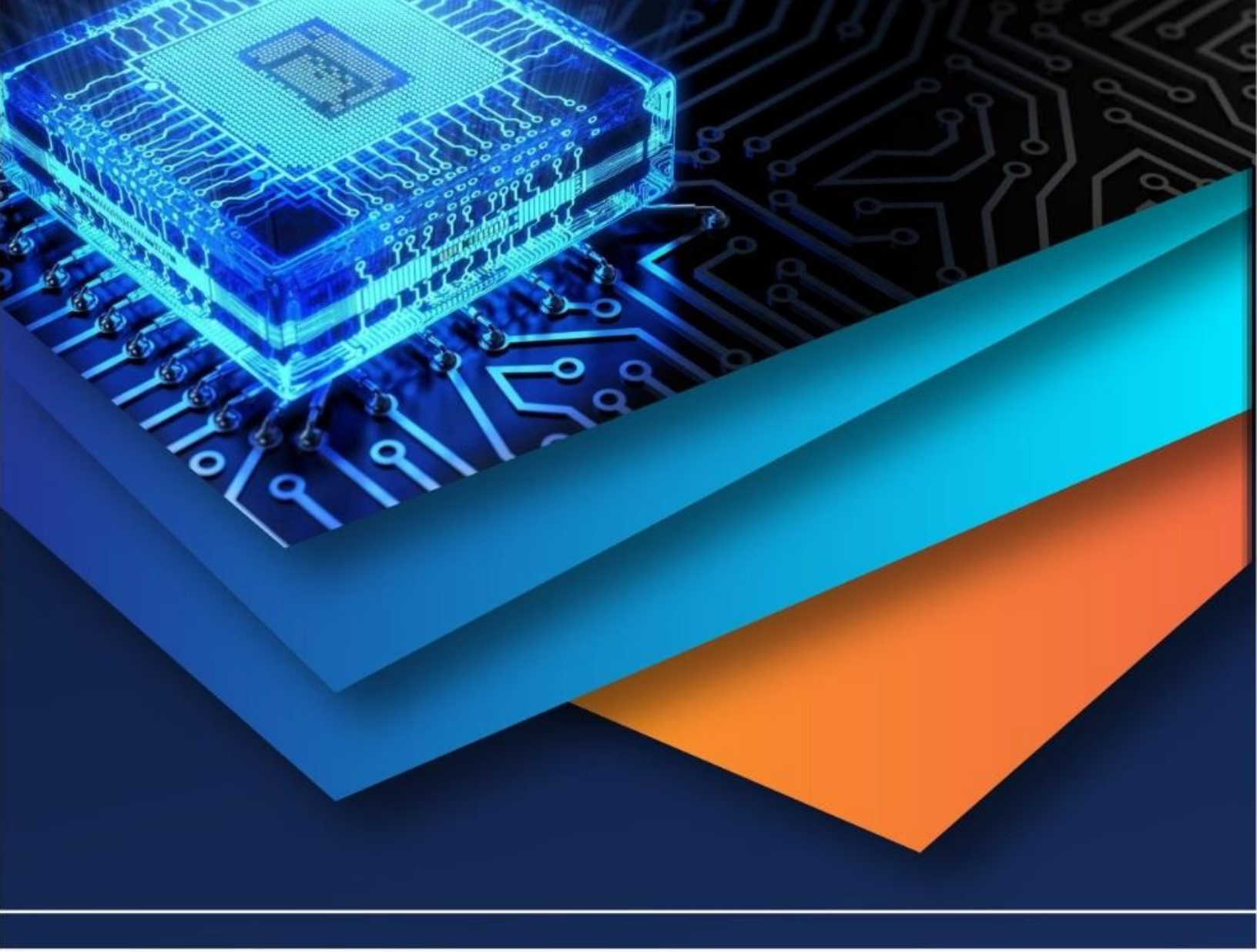

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