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FAKE PRODUCT DETECTION USING BLOCKCHAIN TECHNOLOGY

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ABSTRACT

End consumers face threats to their finances, health, and safety when counterfeit or duplicate goods are manufactured and marketed. Through revenue loss, product defamation, downtime, replacement costs, causing brands to spend money battling counterfeits, compromising partner trust, stealing sales, etc., it also has an adverse effect on the economic growth of original manufacturers and businesses. A block chain-based system that uses barcodes and QR codes to authenticate objects is suggested as a solution to this problem, enhancing security with the SHA-256 algorithm. This technology makes use of a camera scanner to confirm the product's unique code that is kept on an impenetrable block chain, guaranteeing the legitimacy of every item thanks to the cryptographic strength of SHA-256. The consumer is notified if a product's code matches the block chain record after it is scanned; if there are any differences, the manufacturer and the customer are notified about the product's counterfeit status. By giving consumers direct verification capabilities and protecting producers' interests with an opaque, safe, and secure verification system against counterfeit goods, this strategy drastically lowers reliance on merchant promises.

Keywords: Block chain, smart contracts, QR (Quick Response) code, anti- counterfeit.

1.INTRODUCTION

In a time where online marketplaces and digital transactions are commonplace, it is crucial to make sure that products are authentic. The proliferation of counterfeit goods presents noteworthy obstacles for customers and businesses alike, resulting in monetary losses, dilution of brands, and even certain health hazards. In the face of advanced counterfeiting strategies, conventional methods of product authentication frequently prove inadequate. The development of block chain technology, however, presents a viable remedy. A decentralised system for confirming the legitimacy of goods at every step of the supply chain can be established by utilising the transparent and unchangeable characteristics of block chain ledgers. This introduction delves into the idea of detecting
fraudulent products with block chain technology, emphasising how revolutionary this technology can be in terms of product authentication and boosting consumer confidence in the marketplace.

1.1 BLOCK CHAIN

Block chain technology, which started out as the foundation of cryptocurrencies like Bitcoin, has quickly developed into a transformative force that is changing a wide range of businesses outside of finance. Block chain is fundamentally a decentralised, immutable ledger system that records transactions securely over a network of computers. Its primary innovation is its ability to provide data exchanges with openness, security, and trust without the need for middlemen. Block chain is gaining traction and has applications in everything from voting systems to supply chain management. It has the potential to completely change the way people connect, transact, and build trust in the digital age.

1.2 SMART CONTRACTS

Smart contracts are a revolutionary development in the field of block chain technology, providing a new model for the automated and trust less execution and enforcement of agreements. In contrast to conventional contracts, which depend on middlemen and human enforcement, smart contracts are self-executing computer programmes kept on a block chain. When certain criteria are met, they automatically carry out and enforce the terms of an agreement without the need for middlemen or outside scrutiny. This introduction explores the idea of smart

contracts and how it may be used to improve trust, save costs, and streamline processes in a variety of industries, including supply chain management, finance, and real estate.

1.3 QR (QUICK RESPONSE)

In today's digital world, QR (Quick Response) codes are commonplace and function as effective entry points for information and smooth transactions. QR codes were first created in Japan in the middle of the 1990s for the purpose of tracking car parts. Since then, they have developed into incredibly useful tools with a wide range of industrial applications. These two-dimensional barcodes can include a variety of data, including payment instructions, authentication codes, website connections, and contact information, all in a compact format for data storage. These codes are now essential in marketing, retail, ticketing, and other industries because to the increasing use of smartphones that come with built-in QR code readers. This introduction delves into the many facets of QR codes, looking at their development, uses, and influence on contemporary trade and communication.

1.4 ANTI- COUNTERFEIT

The spread of fake goods is a serious danger to global economic stability, brand integrity, and consumer safety. Innovative anti-counterfeit techniques have arisen in response to this growing challenge, with the goal of safeguarding both legitimate firms and consumers. These precautions cover a wide range of methods and tools, such as sophisticated labelling, regulatory enforcement, and advanced authentication mechanisms. Anti-counterfeit initiatives use cutting-edge technologies like biometrics, RFID (Radio Frequency Identification), and block chain to provide customers the power to trace products back to their source and confirm their authenticity. This introduction examines how anti-counterfeit methods are changing and emphasises how crucial they are to protecting consumers and maintaining the integrity of international trade.

2.LITERATURE REVIEW

According to Research [1] and Markets' research published on May 15, 2018, counterfeit goods accounted for up to 1.2 trillion USD in sales in 2017. Eduard Daoud, Dang Vu, and colleagues have put out their proposal in this system. According to the research, this harm will cost the world 1.82 trillion dollars by 2020 (RESEARCH AND MARKETS, 2018). This study looks on technological measures to avoid counterfeiting, rather than copyrights, digital piracy, counterfeiting, or fake documents. Since the number of counterfeit goods on the European market is rising, government and inspection agency participation is insufficient; instead, people must participate in and support this process. In this work, we investigate the potential of machine learning-based technology to minimise counterfeit goods. Machine learning-based text and image identification and classification systems have the potential to be important tools in the fight against counterfeiting. By comparing them to trained models, end users may quickly and accurately identify counterfeit products thanks to automatic image and text recognition as well as the classification of product information. The purpose of this article is to develop user-friendly programmes that assist in the identification of counterfeit goods and aid in the battle against product piracy. When it comes to toys for kids or medical supplies, for example, it can be difficult or even harmful for consumers to identify counterfeit goods. According to Research and Markets' analysis published on May 15, 2018, counterfeit goods accounted for up to 1.2 trillion USD in sales in 2017. According to the research, this harm will cost the world 1.82 trillion dollars by 2020 (RESEARCH AND MARKETS, 2018). In particular Since the number of counterfeit goods on the European market is rising (OECD/EUIPO, 2016), authorities' and inspection organisations' actions alone are insufficient. The EU's Rapid Alert System has been giving member states a network and communication tools to promote counterfeit goods since its introduction in 2003. The system stabilises on a regular basis; each week, roughly fifty notifications are posted on the website of the European Commission, and annually, slightly over 2,000 alerts are provided. (European Commission, Directorate-General for Justice and Consumers, 2018). In comparison to the quantity of counterfeit goods shipped into the EU, the reported number of counterfeit products is incredibly low.

This system has been proposed by JINHUA MA [2] et al. Block chain technology has gained a lot of attention lately, and several new uses for it have been discovered. One well-known example of a block chain application is the cryptocurrency Bitcoin, which not only solves the double-spending issue but also has the ability to validate transactional data independently of a centralised system. As a result, any application that uses Block chain technology as its foundational design guarantees the integrity of its data. This article ensures that customers do not solely depend on merchants to verify the authenticity of products by utilising the decentralised Block chain technology method. In order to enable producers to offer authentic products without having to oversee directly owned storefronts, we present a decentralised Block chain system with product anti-counterfeiting features. This can drastically lower the cost of product quality assurance. The sales and earnings of businesses impacted by this situation are being negatively

impacted by the expanding trade in counterfeit goods. For the first time, a fully functional block chain solution to stop product counterfeiting is proposed in this study, ensuring the identification and traceability of genuine products along the supply chain. Businesses just pay extremely small transaction costs and are relieved of the concern that they might acquire fake goods. Although not yet fully developed, the associated anti-counterfeiting technology has previously been proposed. For example, "Maker chain: A block chain with chemical signature for self-organizing process in social manufacturing" proposes a new decentralised supply chain (block-supply) using blockchain and NFC technologies, and "Block-Supply Chain: A New Anti-Counterfeiting Supply Chain Using NFC and Block chain" describes an anti-counterfeiting method composed of chemical signature to represent unique features of personalised products. However, none of these strategies can stop sellers from selling customers fake goods. Small and medium-sized businesses (SMEs) nowadays frequently face financial difficulties that are incomparable to those of huge corporations with ample financial resources. SMEs in the brand management space will almost certainly have to cut expenses because they will not be able to employ conventional measures to stop counterfeit goods. This study presents the first functional anti-product forgery mechanism proposed on a blockchain. Users of our system can purchase products without worrying about the potential of receiving a counterfeit one by paying a very small transaction fee.

In this system, Naif Alzahrani [3] et al. have proposed For many years, the global society has been hampered by the proliferation of counterfeit goods. The fight against counterfeiting is still quite difficult these days. The majority of anti-counterfeiting solutions in use today are centralised. We suggest (Block-Supply), a decentralised anti-counterfeiting supply chain that takes advantage of NFC and block chain technologies, inspired by the development of block chain technology. Additionally, this study suggests a novel genuinely decentralised consensus mechanism that uses a random selection of validators every time a new block is suggested, in contrast to most existing protocols that need proof of work (PoW). Our approach assesses the risk likelihood of the nodes proposing the block using a game theoretical model. The number of validators that participate in the consensus process is decided using this risk likelihood. In addition, by rewarding honest individuals and punishing dishonest ones, the game model encourages the behaviour of the honest consensus nodes. A unique, decentralised, dynamic mapping between the nodes involved in the consensus process is employed by our protocol. This mapping makes sure that all communication between these nodes is done in a blind and anonymous manner. This method of mapping resists a variety of attacks, including DDoS, bribery, and eclipse attacks, which call for prior knowledge of the identities of the participating nodes. Large, globalised, digital supply chains have expanded as a result of the explosive global growth in pharmaceuticals and other items. The majority of the structure of contemporary supply chains is centralised, with a central authority maintaining and storing the authentication records of the products. Every node in this typical arrangement verifies a product when it arrives. A supply chain node and one authentication server execute authentication protocols in order to do this authentication. Similar procedures apply to supply chains that use track-and-trace, in which a centralised tracking server keeps track of the actual whereabouts of products and updates their records. Beyond cryptocurrencies, block chain technology has recently shown itself to be a suitable option for a wide range of businesses. Better decentralisation, global peer-to-peer communication, security, and transparency are ordered by block chains. A block chain is essentially a distributed public ledger made up of chained blocks. Every block has multiple transactions in it. To ensure security, a small number of carefully chosen network nodes worldwide and transparently validate the blocks.

This system has been proposed by Neo C. K [4] et al. In the supply chain business, assessing and ascertaining the origins of tangible objects that validate the legitimacy of high-end products like wine bottles presents an intriguing research challenge. It is worth noting that a considerable number of supply chain networks and systems have been constructed and executed using centralised system architecture, which is dependent on centralised authorities or intermediaries. This has resulted in problems like single-point processing, storage, and failure, which can be vulnerable to malicious modifications of product records or other potential attacks on system components by unscrupulous participant nodes moving along the supply chain. Block chain technology is now a programmable interactive environment for developing decentralised and dependable apps that solve many use-cases and global issues, rather than only being a decentralised, distributed, and unchangeable ledger of bitcoin transactions. The Decentralised NFC-Enabled Anti-Counterfeiting System (dNAS) is proposed and developed in this study using the proof-by-demonstration research method. It uses Blockchain technology to decentralise an anti-counterfeiting system of the supply chain industry and to facilitate trustworthy data provenance retrieval, verification, and management. It also strengthens the product's anti-counterfeiting and traceability qualities in the wine industry, with the potential to further extend this to the supply chain

industry as a whole. In order to create a secure and unchangeable platform for tracking and managing scientific data provenance, the proposed dNAS makes use of programmable smart contracts, a distributed file storage system, and a decentralised block chain network with a consensus protocol that is compatible with the idea of an enterprise block chain. Provenance records, which offer convincing characteristics of the data integrity of luxury goods, are automatically recorded, verified, and validated on this platform. This section outlines the reason behind the research as well as a set of research questions along with the methodology. The expanding challenges of enhancing the trade of counterfeit products are discussed. To address the need for more creative and decentralised solutions, like dNAS, which is proposed in this research along with a set of research objectives, the current solutions that have already been implemented in the supply chain industry against the challenges, along with the ineffectiveness and inefficiency of current solutions against counterfeit product trading, are discussed.

This system has been proposed by Neo C. K [5] et al. In fact, centralised system architecture is used in the development and implementation of current product anti-counterfeiting and traceability solutions throughout today's global supply chain networks, which rely on centralised authority or intermediaries. Weaknesses in centralised product anti-counterfeiting systems may result in system failure, make product records vulnerable to malicious adjustments, or open the door to other potential attacks on system components by dishonest participant nodes moving through the supply chain. Block chain technology has evolved from only serving as an immutable ledger for bitcoin transactions to a programmable interactive environment that allows developers to create dependable, decentralised applications that meet a variety of use cases all around the world. Through a series of security analyses conducted against solutions currently implemented in the supply chain industry with centralised architecture, key areas of decentralisation, fundamental system requirements, and feasible mechanisms of developing decentralised product anti-counterfeiting and traceability ecosystems utilising block chain technology are identified in this research. The decentralised solution will be a safe, unchangeable scientific data provenance tracking and management platform where provenance records are automatically captured and validated across the supply chain, offering convincing properties on the data integrity of luxury items. One of the biggest issues the supply chain sector has been dealing with in a global economy driven by innovation is the issue of counterfeit product trading, which includes high-end items and pharmaceuticals. The global proliferation of fake and pirated goods has led to a concerning situation that has affected multinational supply chain networks of businesses. According to an analytical study [1] on the global trade activities of counterfeit and pirated goods released in 2019 by the European Union Intellectual Property Office (EUIPO) and the Organisation for Economic Cooperation and Development (OECD), the volume of international trade in these goods increased from $250 billion in 2007 to $461 billion in 2013, or roughly 2.5% of global imports. Approximately $116 billion worth of products that were counterfeit or pirated were imported into the European Union, making up 5% of total imports. According to the most recent figures, which were released in 2016, the situation is concerning because the volume has already reached $509 billion, or 3.3% of global commerce and 6.8% of imports from non-EU nations. This research contributes to the understanding of whether anti-counterfeiting and traceability solutions currently used in the supply chain industry could benefit from a certain degree of decentralisation through a series of security analyses: functional analyses conducted against NAS. The research is based on the growing concern in the supply chain industry regarding product counterfeiting.

3. RELATED WORK

Today, counterfeiting exists across a wide range of businesses and takes many different forms, which has detrimental effects on supply chain operations. Products that are being counterfeited include luxury products, technology, food and drink, accessories, prescription drugs, and apparel. The persistent breaches in the supply chain have necessitated the mobilisation of all relevant parties to address the issues around counterfeiting. To counteract this tendency and ensure sustainable and safe supply chain operations, effective traceability appears to be the only viable solution. In order to tackle the phenomena of product supply chain counterfeiting, this research presents an organised literature assessment on traceability strategies that resulted in the creation of a systematic classification framework. The conducted study can serve as a guide for actual supply chain counterfeiting projects by highlighting trends and best practices. The findings demonstrate the ineffectiveness of old traceability techniques since modern technological improvements make it simple to falsify them. But these same developments also provide useful technologies like block chain and the internet of things to guarantee secure and long-lasting supply chain operations.

4.METHODOLOGY

The suggested approach uses a block chain-based authentication technique to try and solve the ubiquitous problem of counterfeit goods. By utilising the openness of block chain technology and the strength of the SHA-256 algorithm, the system provides a comprehensive defence against counterfeit goods at several points in the supply chain. It is made up of discrete modules designed for various user roles, such as administrators, manufacturers, and clients. With the use of block chain authentication, the system grants administrators privileged access to supervise user management and system operations. With distinct QR codes for easy authentication, manufacturers can safely upload goods to the block chain ledger using this technology. Consumers gain immediate access to product information and block chain-stored authentication records, enabling them to instantaneously scan QR codes to confirm the legitimacy of products. The suggested approach seeks to reduce income loss for original manufacturers, foster consumer trust, and impede the spread of counterfeit items on the market with these features.

5. PROBLEM DEFINITION

ADMIN LOGIN: Grants entry to administrative functions, including user account management and system operations supervision. A distributed ledger, or block chain, is used to support authentication in order to improve security and auditability.

USER LOGIN: This feature, which uses block chain technology for safe authentication and user privacy protection, enables access to the system for registered users.

USER REGISTRATION: Makes it possible for new users to safely register for accounts on the system. Block chain technology is used to store and validate user registration data, guaranteeing data integrity and guarding against unwanted access.

MANUFACTURER: Distributed Ledger (Block chain): Provides manufacturers with a safe platform to handle authentication logs and product details. The block chain ledger guarantees data storage that is impervious to tampering, upholding the validity and integrity of product facts.

Add Products: This feature enables manufacturers to include new products in the system, each with a unique QR code to help with end-user verification. Adding QR codes is essential to making seamless product verification possible.

Customers can access product details and authentication records that are securely maintained on the block chain through the Distributed Ledger (Block chain) system. This guarantees openness and confidence in the product details that buyers are given.

View Product Details: Provides clients with access to detailed product details, such as specs and the status of authenticity certification. Based on the verified product details, customers are able to make knowledgeable judgements.

1. Scan QR Code: Allows users to use their mobile devices to instantly confirm the legitimacy of products by scanning QR codes. To verify the authenticity of the product, the scanned QR code is compared to the block chain data.

2. View QR Code: This feature lets users see the QR code linked to a particular product, giving them a visual reference for authentication and increasing their trust in the product's verification.

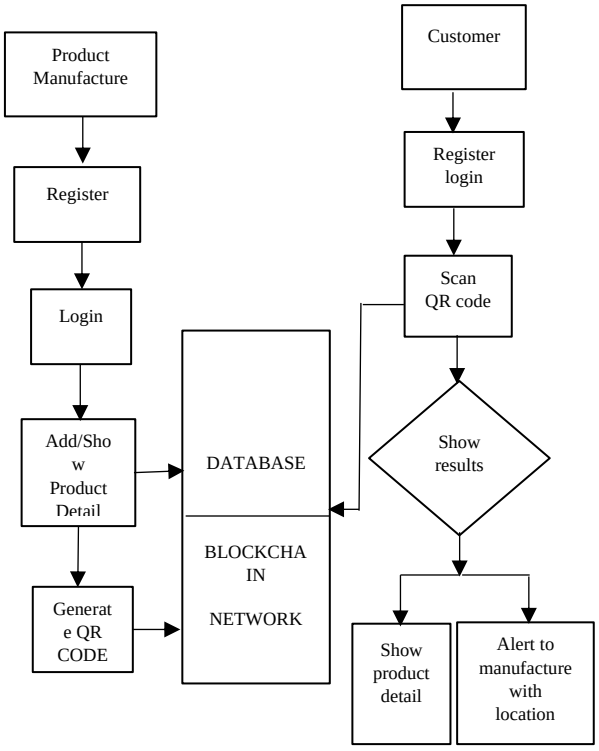

Figure 1 SYSTEM ARCHITECTURE

6. RESULTS AND DISCUSSION

Currently, the present system addresses the issue of counterfeit items with an accuracy of 75%. At 81% accuracy, the suggested approach, on the other hand, provides a notable improvement. The suggested algorithm makes use of a block chain-based authentication method, capitalising on the SHA-256 algorithm's stability and block chain technology's openness. It functions by means of distinct modules designed for various user roles, such as manufacturers, clients, and administrators. Administrators are able to monitor user behaviour and system functions with special access, protecting the system's integrity. Manufacturers can designate unique QR codes for simple authentication and safely upload product data to the block chain ledger. Customers can quickly confirm the legality of products by scanning QR codes because they have instant access to product details and block chain-stored authentication records. Overall, by improving the accuracy and dependability of authentication processes, the suggested algorithm aims to reduce revenue loss for original manufacturers, promote customer trust, and stop the spread of counterfeit items in the market.

algorithm	accuracy
EXISTING	75
PROPOSED	81

Table 1. Comparison table

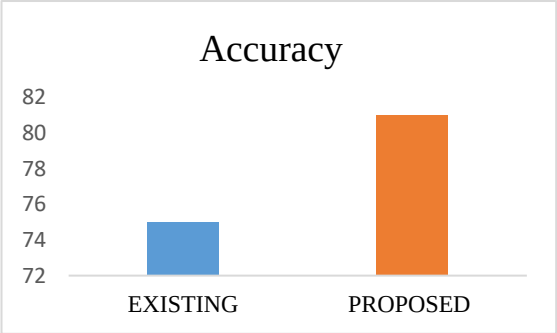

Figure 2. Comparison graph

7.CONCLUSION

To sum up, the suggested block chain-based authentication method provides a strong and practical response to the pervasive problem of counterfeit goods. The solution guarantees transparent verification of product authenticity and secure authentication by utilising block chain technology and the SHA-256 algorithm. The system offers a smooth user experience with modules tailored to administrators, manufacturers, and customers. It also gives users the ability to verify information directly. Through the enhancement of trust, mitigation of income loss, and protection of brand reputation, the system has the potential to substantially decrease the market share of counterfeit items, thereby yielding benefits for both manufacturers and consumers.

8. FUTURE WORK

Future research could look at expanding and improving the suggested block chain-based authentication system in order to increase its effect and capabilities. Adding cutting-edge machine learning algorithms to the system could be one way to improve its counterfeit detection skills and make it possible to identify fake products more precisely and proactively.

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