

Fake Product Detection in E-Commerce Platforms Using Block-Chain Technology

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Abstract: The growing presence of counterfeit products on e-commerce platforms is a major concern, causing significant financial losses for businesses and eroding consumer trust. Fake goods not only tarnish a brand's reputation but can also put consumer safety at risk, especially in critical industries like pharmaceuticals, electronics, and luxury items. To tackle this issue, there is a pressing need for a transparent and reliable system that can verify product authenticity and build stronger trust between buyers and sellers. By using smart contracts, products are registered on a decentralized network, each assigned a unique digital identity. A QR code-based system is then used, allowing consumers to easily verify a product's authenticity before purchase. However, challenges such as scalability, interoperability between different systems, and the high costs of implementation still need to be addressed.

Keywords: Blockchain, Decentralization, Ethereum, Smart Contracts, Product Verification, QR Code Authentication, E-Commerce Security.

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I. INTRODUCTION

Blockchain technology is revolutionizing how we tackle the problem of counterfeit products. By using a decentralized and tamper-proof ledger, blockchain makes it possible to track a product's journey from its origin to the final consumer, ensuring complete transparency and authenticity. Every transaction across the supply chain is permanently recorded, making it almost impossible to alter or manipulate the data, and allowing for real-time verification to help prevent fraud.

This paper introduces a blockchain-based system designed to combat counterfeit products by giving each item a unique digital identity.

➤ Blockchain

Blockchain is a decentralized digital system that records transactions securely across a network of computers. Every transaction is stored in a "block" that is cryptographically linked to the block before it, creating an unbreakable chain. Because altering one block would require changing every block that comes after it, blockchain ensures strong data integrity and security. This makes it highly effective for

creating transparent and tamper-proof systems, especially in areas like counterfeit detection.

➤ Ethereum

Introduced by Vitalik Buterin in 2013, Ethereum expanded the possibilities of blockchain technology. Unlike Bitcoin, which mainly focuses on financial transactions, Ethereum enables the creation of decentralized applications (dApps) through the use of smart contracts.

These contracts can automatically execute tasks like verifying product authenticity, making Ethereum a powerful tool for developing anti-counterfeiting solutions.

➤ Counterfeit Products

Counterfeit products are unauthorized replicas of genuine items, made to deceive customers and capitalize on established brands. They range from fake money and forged documents to imitation luxury goods and everyday consumer products. Counterfeits not only cause significant financial damage but also pose serious safety risks to consumers.

➤ *How Block-Chain Addresses Counterfeiting*

- **User Authentication:** Every transaction starts with verifying the user's identity to ensure only authorized actions are taken.
- **Block Creation:** Once verified, a new block containing transaction details is created.
- **Network Distribution:** This new block is shared across the entire blockchain network.
- **Verification and Linking:** Other network participants verify the block's authenticity before it's permanently added to the blockchain.
- **Ongoing Synchronization:** The blockchain constantly updates across all network nodes, keeping the system synchronized and secure.

Thanks to this system, product histories become tamper-proof, making it much harder for counterfeit goods to enter the market, especially in e-commerce.

➤ *Benefits of Blockchain*

• *Improved-Accuracy:*

Blockchain significantly reduces human error by relying on automated processes and computing protocols. Every transaction is carefully verified, ensuring greater reliability and data precision.

• *Lower-Costs*

By cutting out intermediaries like banks, blockchain minimizes transaction fees. Unlike traditional payment methods that often carry hefty charges, blockchain offers a cost-effective solution through its decentralized structure.

• *Decentralization for Better Security:*

Data on a blockchain is stored across multiple nodes (computers) around the world. This setup makes it nearly impossible for hackers to corrupt the data — even if one copy is attacked, countless other copies remain safe and unchanged.

➤ *Objective*

The primary objective of this blockchain-based solution is to guarantee immutability by securely recording product data using cryptographic hashing, ensuring a tamper-proof system that prevents unauthorized modifications while maintaining data integrity and security. By providing a reliable product verification mechanism, the system enhances authenticity and trust in counterfeit detection, ultimately increasing consumer confidence in online shopping by reducing the presence of fake products. Additionally, the solution aims to enhance supply chain transparency by enabling real-time tracking of products from their origin to the end consumer. s and legal frameworks for product authentication.

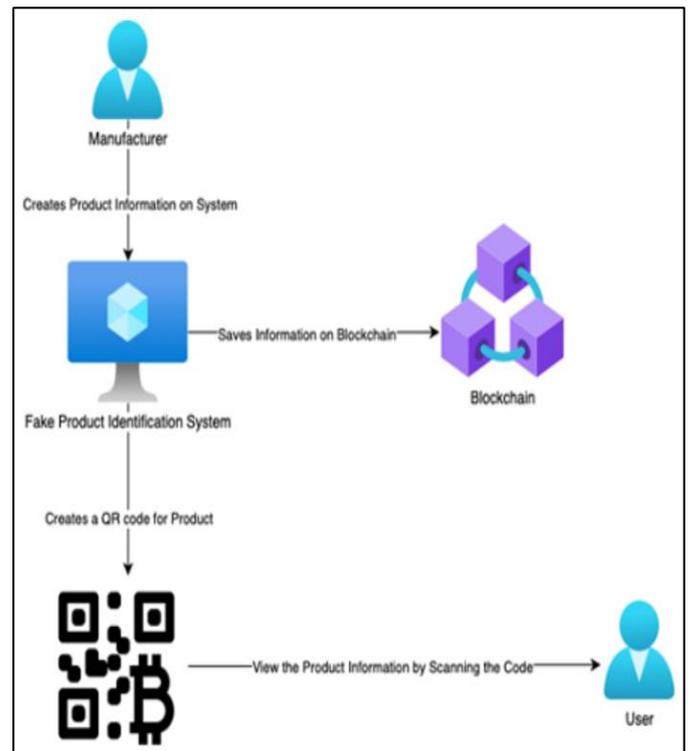


Fig 1 Workflow Diagram

II. LITERATURE REVIEW

The main goal of this blockchain-based solution is to ensure data remains secure and unaltered by recording product information using cryptographic hashing. This creates a tamper-proof system that protects data integrity and prevents unauthorized changes. By offering a trustworthy way to verify products, the system strengthens the fight against counterfeit goods, helping to build consumer trust in online shopping and reducing the risk of fake products entering the market.

In addition to protecting authenticity, the solution promotes greater supply chain transparency by allowing real-time tracking of products from their origin all the way to the final customer. Through decentralized verification, different stakeholders. This collaborative approach helps businesses and brands cut down on financial losses due to counterfeit goods.

Moreover, the system empowers consumers by making product information easily accessible and verifiable through blockchain-powered QR codes or digital certificates. On a larger scale, this blockchain solution also supports ethical and sustainable practices by encouraging responsible sourcing and eliminating fraudulent activities within the supply chain, positioning blockchain technology as a vital tool in the fight against counterfeit products.

III. EXISTING SYSTEM

Today's counterfeit detection methods mostly rely on manual inspections and automated technologies like QR codes and barcodes. However, these approaches have significant flaws they are often vulnerable to tampering and

can be inefficient. Counterfeit goods not only lead to financial losses and harm brand reputations, but they also pose serious safety risks, particularly in critical sectors such as pharmaceuticals and electronics.

Typically, consumers have to trust centralized verification systems to confirm a product’s authenticity. Unfortunately, this reliance makes the process more susceptible to fraud and misinformation.

Moreover, verifying authenticity often requires third-party involvement, such as merchants, manufacturers, or centralized databases, increasing the risk of manipulation. Without real-time detection mechanisms in place, counterfeit products can easily slip into the market unnoticed, only being discovered once a consumer or business spots an issue.

IV. METHODOLOGY

This system uses blockchain technology to provide secure and decentralized product authentication. Every

product is given a unique QR code that connects to its own blockchain record, which holds key information like manufacturing details, ownership history, and supply chain activities. By making this information easily accessible, the system improves transparency, strengthens partnerships with stakeholders, and supports ongoing updates to better detect and prevent counterfeit products.

➤ Proposed System

Our system uses blockchain technology combined with QR codes to help quickly spot and stop counterfeit products. Every product’s journey from manufacturing to shipping and ownership is securely recorded on a decentralized blockchain ledger, making the information transparent and tamper-proof. Each product gets a unique QR code that links directly to its blockchain record, so consumers and retailers can instantly verify if an item is genuine. A mobile app supports the system, allowing users to scan QR codes, get real-time updates, read product reviews, and report any concerns directly from their phones.

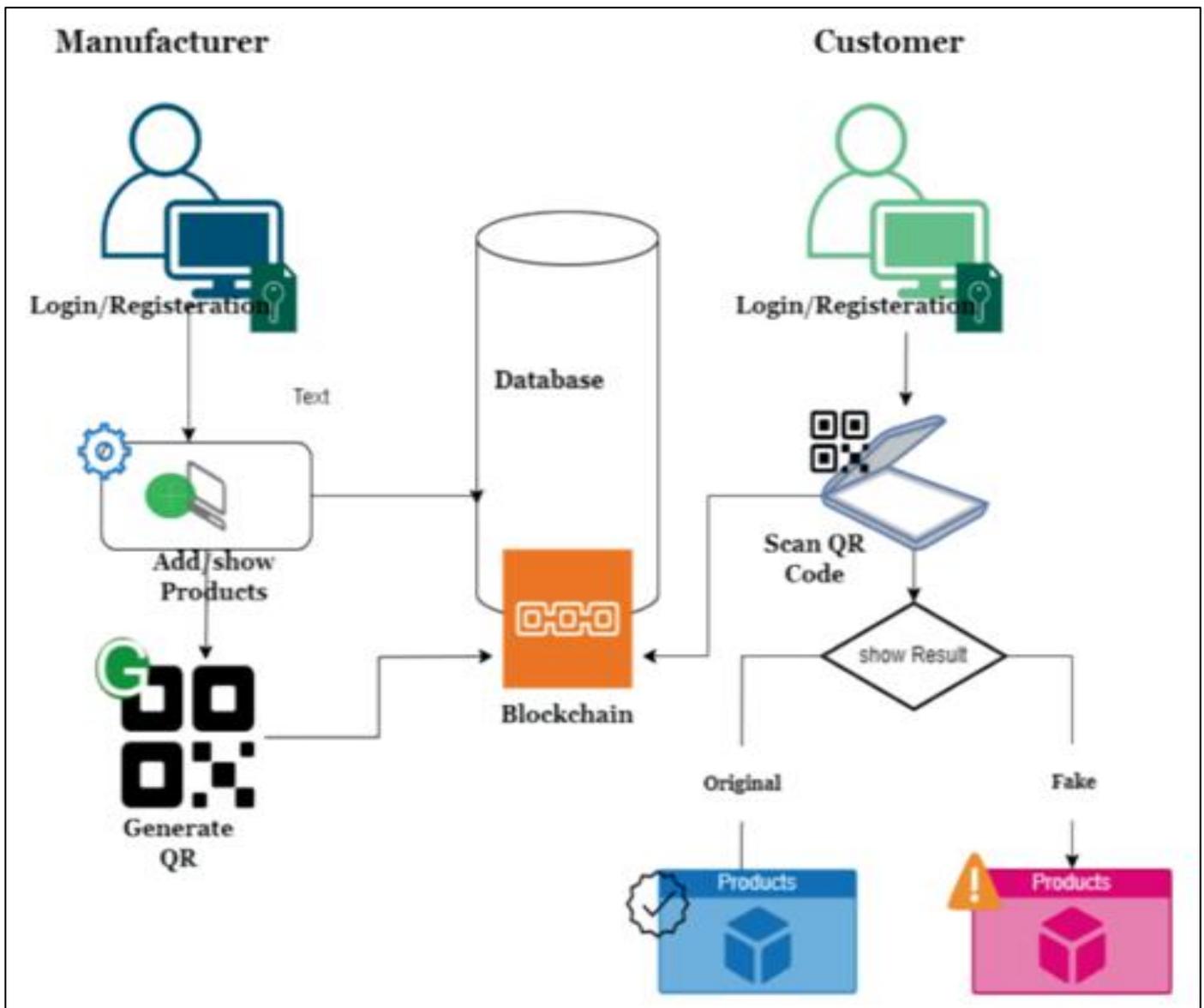


Fig 2 Architectural Diagram

➤ *Projects Requirements*• *Programming Languages*

✓ **Python:** Key for processing data, building blockchain logic, and integrating machine learning models. Its rich libraries make it perfect for data analysis, image processing, and backend development.

• *Frameworks*

✓ **Web3.js:** A JavaScript library used to interact with Ethereum blockchains, enabling smart contract operations, blockchain transactions, and data retrieval.

✓ **Flask / FastAPI:** Lightweight backend frameworks that build APIs to connect the frontend, blockchain, and databases. FastAPI excels in performance with asynchronous support, while Flask is known for its simplicity.

✓ **React.js:** A popular JavaScript library used to create dynamic and responsive front-end user interfaces.

• *Blockchain Platforms*

✓ **Ethereum:** A decentralized platform ideal for deploying smart contracts and decentralized applications (dApps), particularly for product tracking and verification.

✓ **Hyperledger Fabric:** A permissioned blockchain framework tailored for enterprise use, offering scalability, privacy, and a modular design for authenticating products.

• *Databases*

✓ **MongoDB:** A flexible NoSQL database that stores product information, blockchain transactions, and user feedback, ideal for handling large amounts of semi-structured data.

• *APIs and Libraries*

✓ **QR Code API:** Used to generate and scan QR codes that link physical products to their blockchain records for easy verification.

• *OpenCV / TensorFlow:*

✓ **OpenCV** handles computer vision tasks like QR code detection, image processing, and counterfeit analysis.

✓ **TensorFlow** helps in building machine learning models to detect anomalies in product authentication.

• *Data Processing and Analysis Tools*

✓ **Pandas:** A powerful library for cleaning, processing, and analyzing structured data.

✓ **NumPy:** Essential for performing numerical computations and working with matrices.

✓ **Scikit-learn:** A robust machine learning library used for building fraud detection models and analyzing counterfeit patterns.

• *Hardware (Optional)*

✓ **QR Code Scanner:** Physical devices used to scan QR codes, allowing users to instantly verify product authenticity.

• *Testing and Deployment Tools*

✓ **Postman:** A tool for testing APIs and ensuring seamless communication between different system components.

✓ **Mocha:** A JavaScript testing framework for validating backend logic and smart contract behavior.

✓ **Docker:** A containerization tool used for packaging applications to ensure consistent deployment across multiple environments.

• *Smart Contracts*

✓ **Solidity:** The primary language for writing smart contracts on the Ethereum blockchain, defining rules for product ownership and verification.

Together, this technology stack supports a highly secure, scalable, and efficient blockchain-based counterfeit detection system.

V. PROJECT MODULE

➤ *User Authentication & Registration*

• Multi-Factor Authentication (MFA) enhances user security.

• Role-Based Access Control (RBAC) manages permissions for buyers, sellers, and administrators.

• Users register and log in securely, ensuring protection of personal and transactional data.

➤ *Product Registration on Blockchain*

• Each product receives a unique digital identity stored securely on the blockchain.

• Smart contracts log key details like the manufacturer, production date, and batch number.

• This process creates a tamper-proof digital certificate for each product.

➤ *QR Code Generation & Verification*

• Unique QR codes are generated for every registered product.

• These codes directly link to blockchain records and are immune to tampering.

• Users can scan the QR codes through a mobile app or web interface to confirm product authenticity.

➤ *Decentralized Product Ledger*

• A distributed ledger (via Ethereum or Hyperledger Fabric) maintains a transparent record of product ownership and transactions.

- Ownership history and product information can be traced in real-time, preventing unauthorized alterations.

➤ *Smart Contract-Based Validation*

- Ethereum smart contracts automatically validate transactions, ensuring only genuine products are sold or transferred.
- Verification checks confirm that the scanned product matches the blockchain record, eliminating fraud without needing third-party involvement.

➤ *Counterfeit Detection System*

- Advanced AI (OpenCV and TensorFlow) analyzes product images to detect inconsistencies in packaging and labels.
- Products are verified both visually and through blockchain records, providing a double layer of security against counterfeiting.

➤ *E-commerce Platform Integration*

- The verification system seamlessly integrates with online marketplaces (like Amazon, eBay) via APIs.
- Buyers can instantly verify product authenticity before purchase, while sellers can register and authenticate their products directly through these platforms.

VI. FLOW OF THE PROPOSED SYSTEM

➤ *Product Registration by Manufacturer*

In the first step, the manufacturer registers the product on the blockchain to ensure its authenticity and secure its integrity. Here's how it works:

- **Secure Login:** The manufacturer logs into the system using Multi-Factor Authentication (MFA) to ensure secure access.
- **Entering Product Information:** The manufacturer then accesses the Product Registration Portal and provides essential product details, including:
 - ✓ Product specifications (e.g., model, brand, size, material, etc.)
 - ✓ Manufacturing details (factory location, batch number, production, and expiration dates)
 - ✓ A unique product identifier (such as a serial number or a hash-based ID)
- **Smart Contract Activation:** A smart contract is triggered to create a permanent, tamper-proof record of the product on the blockchain.
- **QR Code Generation:** A unique QR code is generated and linked to the blockchain, offering a way to verify the product. The QR code is:
 - ✓ Attached to the product physically (e.g., as a sticker, engraving, or embedded chip) or
 - ✓ Stored digitally for easy tracking throughout the supply chain.

- Now, the product is permanently recorded on the blockchain, ensuring its authenticity from production to the end consumer.

➤ *Supply Chain Integration - Distributors*

Once the product is registered, it moves into the supply chain, where distributors handle its transport and storage. Here's the process:

- The manufacturer ships the product to the distributor. When the product arrives, the distributor scans the QR code using a blockchain-enabled scanner or mobile app.
- The blockchain records the following details:
 - ✓ Distributor information (company name, location, unique ID)
 - ✓ Ownership transfer (timestamp, recipient details)
 - ✓ Product status (received, verified, stored in warehouse)
- Every scan updates the blockchain, creating a transparent and immutable history of the product's journey. The data cannot be altered without detection, ensuring a traceable and secure supply chain.

➤ *Supply Chain Integration - Retailers*

The product then reaches the retailer, who prepares it for sale to the customer. Here's how the process unfolds:

- The distributor ships the product to the retailer, who scans the QR code upon receipt.
- The blockchain logs the following details:
 - ✓ Retailer ownership information (store ID, name, and location)
 - ✓ Timestamp of the transfer (date and time of product arrival)
- This process ensures that the product's journey remains fully traceable, making tampering or counterfeiting impossible.

➤ *Verification by the End user*

Customers can easily verify a product's authenticity before purchasing it using a blockchain-based system. Here's how it works:

- The customer accesses a verification platform via a mobile app or a web-based platform.
- The customer scans the product's QR code or manually enters the unique product identifier.
- The system retrieves the following information from the blockchain:
 - ✓ Manufacturer details (origin, production data, and authenticity certification)
 - ✓ Full supply chain history (ownership transfers, timestamps, and verified handlers)
 - ✓ Product integrity verification (checking for tampering or duplication)

- If the blockchain data matches the product details, the customer can confidently confirm the product’s authenticity. If discrepancies are found, the system will notify the user of potential counterfeit risks.

➤ *Fake Product Detection*

The blockchain system works proactively to detect and manage counterfeit products. Here’s how it works:

- **Blockchain Cross-Verification:** Users can compare the physical product details with the blockchain record to identify inconsistencies.
- **AI-Powered Image Recognition:** Advanced AI algorithms analyze images of the product, packaging, and labels to detect signs of counterfeiting or irregularities.
- **Automated Fake Product Alerts:** If the system detects any discrepancies, it immediately flags the product as potentially counterfeit.
- **Reporting Counterfeits:** Customers and retailers can easily report suspected counterfeit products via the app or website.
- **Investigation and Legal Action:** System administrators, manufacturers, or regulatory bodies investigate reported incidents. If the product is confirmed as counterfeit, legal actions are taken against the counterfeiters.

- Alerts are sent to consumers, retailers, and distributors to halt the distribution of counterfeit products.

This comprehensive approach ensures a transparent, secure, and accountable supply chain that protects consumers from counterfeit products while maintaining the integrity and authenticity of every product at every stage.

VII. BENEFITS AND USE CASES

A. Advantages:

- **Stronger Security and Immutability** – Guarantees tamper-resistant, cryptographically secure, and decentralized records that are hard to alter.
- **Transparency and Traceability** – Offers real-time tracking, allowing for easy verification of product authenticity and origin.
- **Prevention of Fake Products** – Helps identify counterfeit items early by using unique identifiers for each product.
- **Building Consumer Confidence** – Empowers buyers to verify the authenticity of products before purchasing, enhancing trust in the brand.

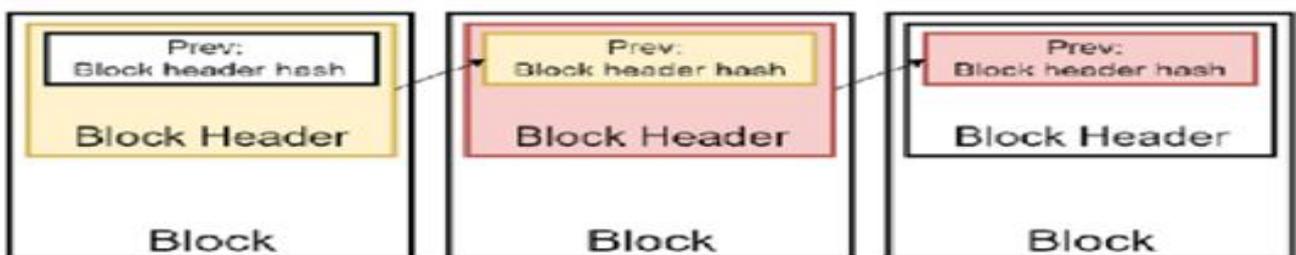


FIGURE 1. Connections between blocks in Blockchain.

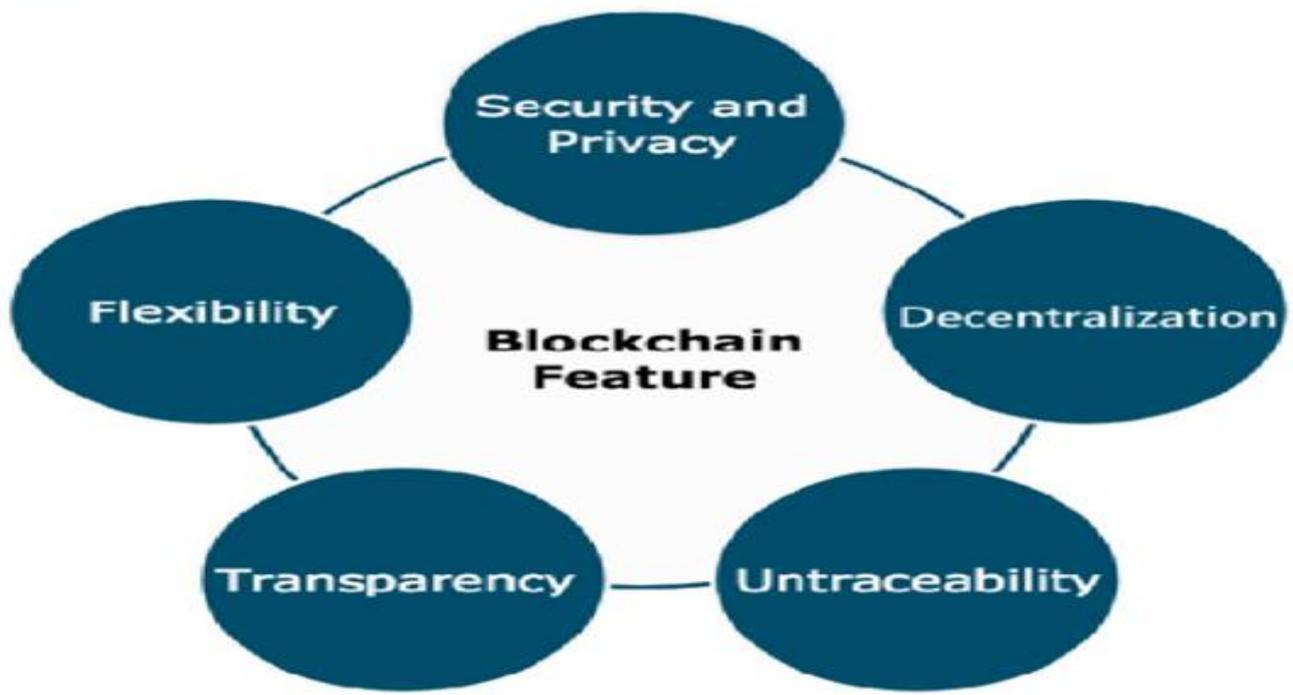


Fig 3 Block-Chain Features

B. Applications➤ *Pharmaceuticals and Healthcare*

Blockchain technology is transforming the pharmaceutical industry by ensuring the safety and authenticity of medicines and medical devices.

- **Preventing Counterfeit Drugs:** Blockchain enables the tracking of medicines from the manufacturer to the pharmacy, ensuring that fake or substandard drugs don't enter the supply chain.
- **Ensuring Patient Safety:** It helps ensure that patients receive only verified, safe medications, reducing potential health risks.

➤ *Luxury Goods and Fashion*

In the luxury goods sector, blockchain offers a way to authenticate high-end products, significantly reducing the risk of counterfeiting.

- **Verifying Authenticity:** Each luxury item can be assigned a unique QR code, NFC chip, or blockchain token, allowing consumers to easily verify its origin.
- **Protecting Brands:** Blockchain helps prevent the sale of unauthorized replicas, safeguarding the reputation of luxury brands and maintaining customer trust.
- **Authenticating Resale Items:** When it comes to second-hand luxury goods, blockchain ensures that products like watches, handbags, or sneakers are genuine before being resold.
- **Supply Chain Transparency:** It allows for the tracking of materials and manufacturing processes, promoting ethical production and sustainability within the industry.

➤ *Electronics and Consumer Goods*

Blockchain helps in preventing the distribution of counterfeit electronics and securing the overall supply chain.

- **Tracking Genuine Products:** Blockchain technology ensures that devices like smartphones, laptops, and their accessories are original and not tampered with by counterfeit parts.
- **Authenticating Warranty and Repairs:** Blockchain verifies that spare parts used for repairs are authentic, ensuring customers receive proper service for their devices.
- **Preventing Insurance and Warranty Fraud:** By verifying the authenticity of parts used in vehicles, blockchain ensures that insurance claims and repairs are accurate and legitimate.

➤ *E-Commerce and Online Marketplaces*

Blockchain plays a key role in eliminating fake listings and scams on online shopping platforms.

- **Authenticating Products:** It verifies the genuineness of items sold online by embedding blockchain-based certificates of authenticity.
- **Protecting Reviews and Ratings:** Blockchain prevents fake reviews and manipulated ratings, helping to build consumer trust.
- **Ensuring Secure Transactions:** Smart contracts allow for safe transactions and secure dispute resolution between buyers and sellers.
- **Verifying Sellers:** Blockchain enforces identity verification, preventing fraudulent sellers from listing counterfeit products on e-commerce platforms.

VIII. RESULT & DISCUSSION

Our blockchain-based application offers a life-saving solution for businesses by providing a secure, transparent, and easy-to-use platform for product trading, labelling, and purchasing. This anti-counterfeiting system is both affordable and efficient, especially for industries with limited resources, ensuring consumers can trust the authenticity of the products they buy.

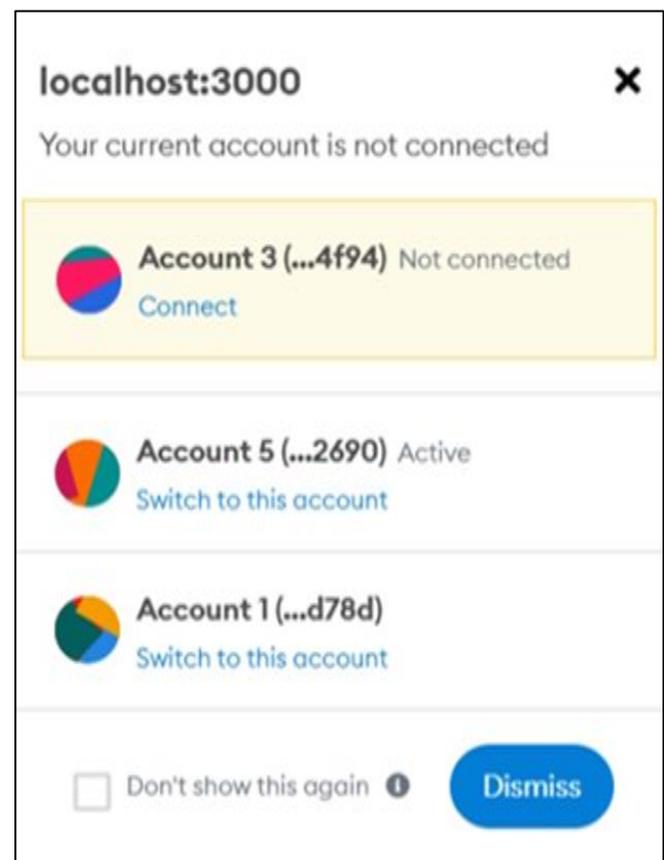


Fig 4 Creating Connections

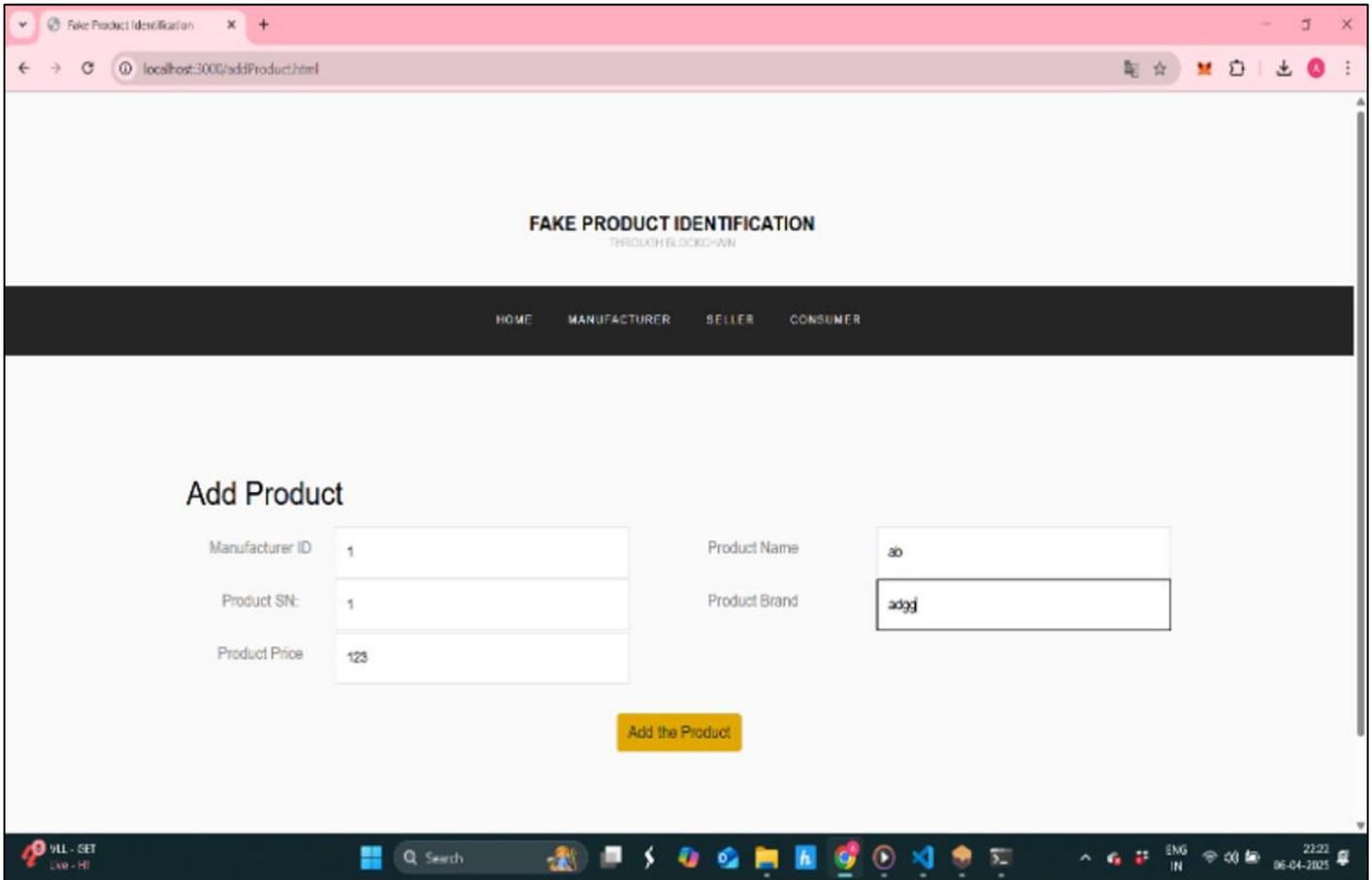


Fig 5 Adding Product Details

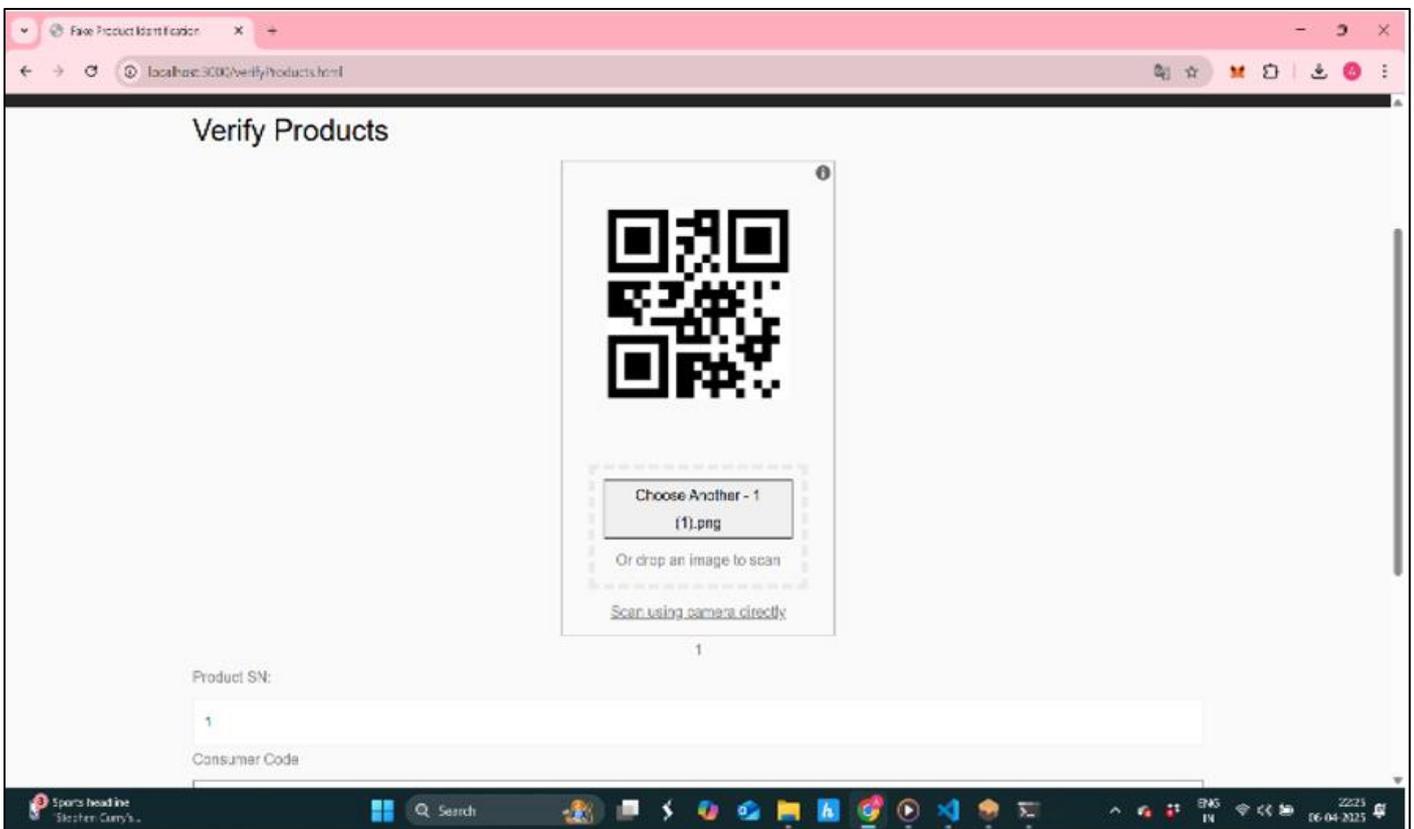


Fig 6 Product Verification

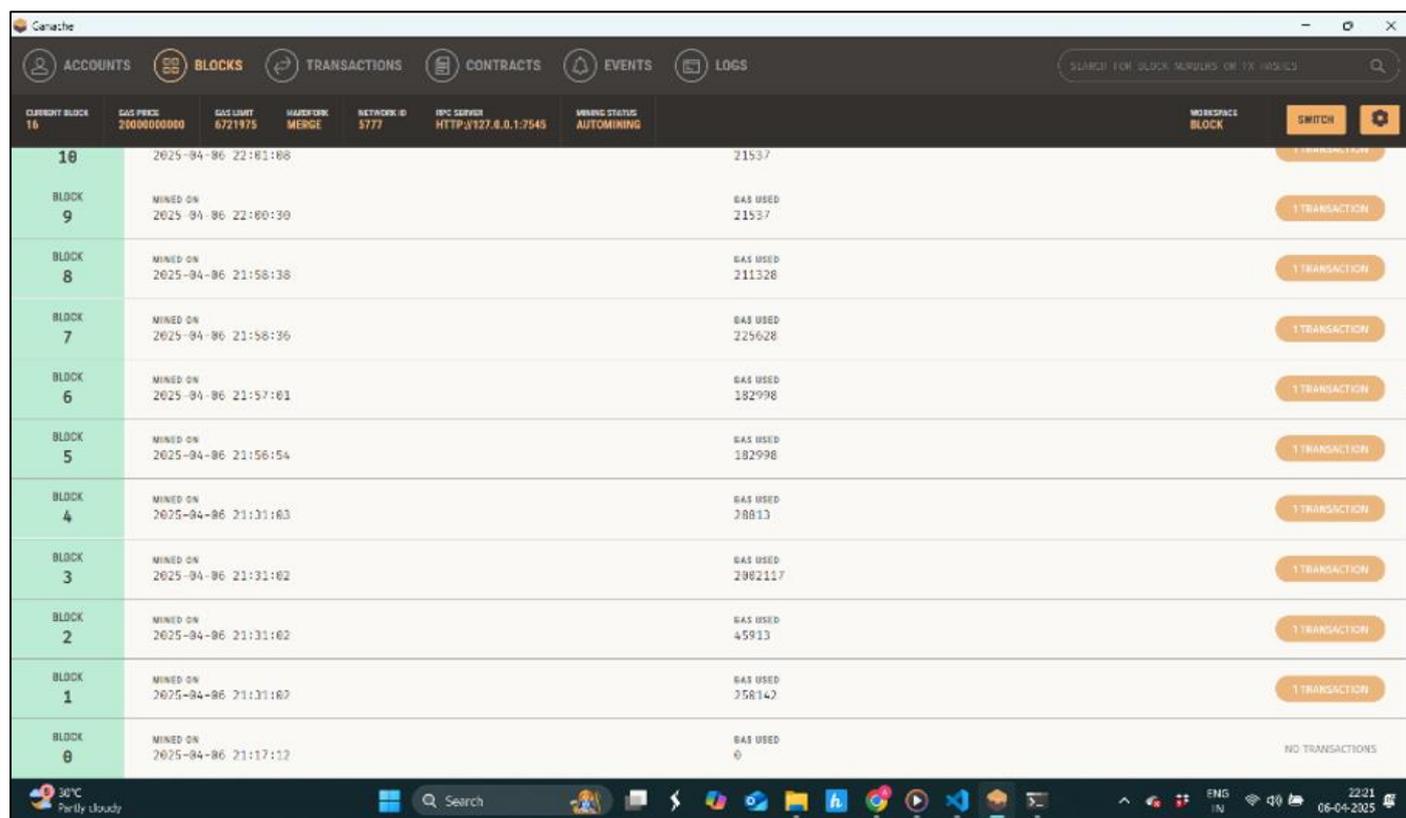


Fig 7 Transactions in Block-Chain

IX. CONCLUSION & FUTURE SCOPE

The proposed blockchain-based anti-counterfeiting solution offers a secure, transparent, and cost-effective way to ensure product authenticity and build trust within the supply chain for both businesses and consumers. By utilizing Ethereum's decentralized applications (DApps) along with the Web3.js library, the system ensures a tamper-proof platform where manufacturers and suppliers can independently record transactions without compromising each other's data. With MetaMask wallets, transaction validation is secure, while the use of QR codes makes it easy for consumers to authenticate products. This decentralized framework eliminates the need for intermediaries, reducing fraud risks and boosting operational efficiency across sectors such as e-commerce. Additionally, incorporating encrypted, secure graphic QR codes can prevent counterfeiting, even when a QR code is photocopied, ensuring data integrity. Furthermore developing a dedicated mobile app could greatly enhance user experience by allowing consumers to scan QR codes, authenticate products instantly, and receive notifications about potential counterfeit items.

REFERENCES

- [1]. Abhinav Sanghi, Aayush, Ashutosh Kata war, Anshul Arora, Aditya Kaushik, "Detecting Fake Drugs using Blockchain", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-10 Issue-1, May 2021.
- [2]. Miguel A. Prada-Delgado, Gero Ditt mann, Ilie Circular, Jens Jelte "A blockchain-based crypto-anchor platform for interoperable product

authentication", EEE International Symposium on Circuits and Systems (ISCAS),2021.

- [3]. Mrs. S. Thejaswini, Ranjitha K R, "Blockchain in Agriculture by using Decentralized Peer to Peer Networks", Proceedings of the Fourth International Conference on Inventive Systems and Control (ICISC 2020),2020.
- [4]. S. Chen, R. Shi, Z. Ren, J. Yan, Y. Shi, J. Zhang, A blockchain-based supply chain quality management framework, in 2017 IEEE 14th International Conference on e-Business Engineering (ICEBE) (IEEE, 2017), pp. 172–176
- [5]. Vinayak Singla, Indra Kumar Malav, Jaspreet Kaur and Sumit Kalra, "Develop Leave Application using Blockchain Smart Contract", 11th international conference on Communication Systems and Networks,2019.
- [6]. Jesus Maximo Montes, Cecilia E. Ramirez, Manuel Coronado Gutierrez, Victor M. Larios, "Smart Contracts for supply chain applicable to Smart Cities daily operations"5th IEEE International Smart Cities Conference (ISC2 2019), 2019.
- [7]. Sanjay K. S, Dr. Ajit Danti "Detection of fake opinions on online products using Decision Tree and Information Gain" Third International Conference on Computing Methodologies and Communication (ICCMC 2019),2019.
- [8]. Sanjay K. S, Dr. Ajit Danti "Detection of fake opinions on online products using Decision Tree and Information Gain" Third International Conference on Computing Methodologies and Communication (ICCMC 2019),2019.