Detection of Fake Products Using Blockchain Technology

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ABSTRACT

The manufacturing and marketing of counterfeit or duplicate products and goods leads to consequential financial, health and safety threat to end users. It also impacts on the economic growth of original manufacturers and businesses through revenue loss, product defamation, downtime, replacement expenses, forcing brands to spend money fighting counterfeits, trust among business partners can also be at risk, stealing sales etc. To overcome these crucial effects of counterfeiting, a blockchain based system is used in identification of original products and detects duplicate products to ensure the identification of original goods. In this work, with massive emerging trends in wireless technology, QR (Quick Response) codes and barcodes provides a robust technique to cut down the practice of counterfeiting the products. The fake products are detected using camera scanner, where QR or barcode of the product is linked to a block chain in order to store product details and guaranteed unique code of each product as blocks in the database. If the code matches, the notification will be sent to the customer indicating the authenticity of the product and else if it does not match, a notification will be sent to customer that product is fake or counterfeited as well as to manufacturer about the place of purchase if customer accepts the request made by the application. This approach ensures that consumers won't completely rely on merchants to determine if products are original or forged.

Keywords—Blockchain, Smart contracts, QR code, anti- counterfeit.

I. INTRODUCTION

The global development of the product always comes with risk factors such as counterfeiting and duplication which in turn can affect the company name, reputation, revenue and customer satisfaction. The trading and marketing of counterfeit products is growing in humongous. It affects the sales, reputation, and profits of the companies and also do poses a fatal threat for the unsuspecting buyers. In order to ensure the identification and traceability of false goods or products throughout the supply chain and to combat this phenomenon, a fully functional blockchain system is proposed. Companies only need to pay very low transaction fees and they no longer need to worry about the possibility of delivering counterfeit products to end-users. Because of counterfeit or fake products manufacturers face the biggest problems and huge losses in sense of brand damage as well as revenue loss. To find the originality of the product blockchain technology can be used. Blockchain is an arrangement of recorded information that makes it difficult or impossible to modify or hack the framework. Blockchain technology is a distributed, decentralized, and digital ledger that stores transaction information as blocks in databases which is connected with chains. Each block in the chain contains multiple transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's record. The decentralized database managed by the number of participants is known as Distributed Ledger Technology (DLT). Blockchain is a type of DLT in which transactions are recorded with an immutable cryptographic signature called a hash. Blockchain technology helps to solve the problem of counterfeiting a product. Blockchain technology is more secure compared to other technology. Once the product is stored on the network hash code is generated for that product and it is possible to maintain all transaction records of the product and its current owner as a chain will be created for that product transactions. It will store all the transaction records as blocks in the blockchain. In the proposed system we are assigning a generated QR code or barcode to a particular product created by manufacturer along with all the details of the product and the end customer can scan that QR code to get all information about that product. After scanning the QR code or barcode the user can identify whether the product is real or fake.

II. LITERATURE SURVEY

In recent years, Counterfeit products play a vital role in product manufacturing industries. This Phenomenon affects the sales and profit of the companies. To ensure the identification of real products throughout the supply chain, functional

blockchain technology is used for preventing product counterfeiting[1]. By using blockchain technology, consumers do not need to rely on trusted third parties to know the source of the purchased product safely.

In this paper, counterfeit products are detected using a barcode reader, where a barcode of the product is linked to a Blockchain Based Management (BCBM) system. So, the proposed system may be used to store product details and the unique code of that product as blocks in the database. It collects the unique code from the customer and compares the code against entries in the blockchain database. If the code matches, it will give a notification to the customer, otherwise it gets information from the customer about where they bought the product to detect counterfeit product manufacturers.

This paper [2] presents a modern and convenient phenomenon using the Blockchain and Supply Chain technologies which itself dispenses high security and transparency in the system, but to escalate these features some extra characteristics are added in this study which is using the One Time Password (OTP) authentication for verifying the legitimate supply chain members and products, and updating the product details in the blockchain after it is sent to the next stage in the supply chain, and further the product standards are monitored by the Quality Control Officer who is deployed by the factory in-charge for the same. Taking inspiration from the related works of the researchers who have developed various creative models which have been of great use to the community in preventing the counterfeit of products in different industries. In the future, it is believed that this methodology can be made a base and many more features will be added to it including a mobile application that can be installed on the mobile phones of the supply chain members for a smoother experience for OTP verification and tracing-and-tracking the product easily making the system even more transparent and stable.

Reading product reviews before buying the product becomes a habit[3], especially for potential customers. For a company, the positive reviews from customers can generate significant financial benefits for the business, which can be taken as input for decisions related to product design and what services are provided to customers. Related to the financial benefits gained as a result of the positive reviews about the product or service from the customer, the fraudsters tried to play the existing system by writing fake reviews and providing an assessment that is not fair to promote or discredit a product or service. Automatic detection of spammers is a very important task but still lacks research. Unlike other types of spam, such as web spam or email spam, spam on a review is far more difficult to detect. The main reason is that spammers can easily disguise themselves. Thus, it is difficult for users to recognize.

After the financial benefits gained as a result of the positive reviews about the product or service from the customer, the fraudsters tried to play with the existing system by writing fake reviews and providing an assessment that is not fair to promote or discredit a product or service for a company, the positive reviews from customers can generate significant financial benefits for businesses, it can be treated as an input for decisions related to product design and what services are provided to customers.

III.   PROPOSED SYSTEM

The main goal of developing the system is to overcome negative marketing and improve business economy

1. To protect brand value and duplication threats by developing fake product detection system using blockchain technology.
2. To secure and authenticate the product details which helps in identification and traceability of the specific product throughout the supply chain.
3. All product details are secured and stored in QR code or product ID which helps in identification which is stored in tamper proof blocks of blockchain for further security.
4. Manufacturer can add product details and system generates QR code which can be used by retailers and distributors for tracing and even by consumers to ensure purchasing of original products.

Nowadays, with the rise of technology and markets the problem to differentiate with original and duplicate has also incurred a lot of damage to consumers, distributors, retailers and also manufacturers. Therefore, in order to combat this ablockchain based application fake product detector is proposed. This chapter briefs the design of the system including a full description of the function and user interface of the system. The goal is used to use the blockchain features to provide a convenient, accurate and low-cost product anti-counterfeiting solution. The system is a blockchain based android application used to detect counterfeit products on daily basis.

The system consists of manufacturer and consumer part application.

● MANUFACTURE END:

The company after verification of mail Id for registration and authentication purpose. They can login to the system and add new product/item, upload the product details with system generated QR code which stores all the details of the products.

Serializing the QR code is also advised for more security and to keep track of the product.

The product details will be stored in database and QR code is made tamper proof using secure graphic technique which makes the QR code copy sensitive that is when copied it loses information and printed irreversibly.

- CUSTOMER END:

Customer has to register/login with email ID and password.

After the completion of user authentication, the product initiates with scan button to scan QR code of the product.

Here user is customer who wants to confirm whether the product is legit or not. The unique scanned code from the customer will be compared with the code produced by the manufacturer in blocks. Then the user will be notified with authenticity of the product.

There is an option for customers to check product details like name, manufacturing year, price, total quality, quality of the product and also the details of manufacturer.

For developing the application , we used Language: Dart, Solidity, Database: Firebase with Android studio, VS code, Ethereum remix, Metamask wallet.

Firebase is a platform developed by Google for creating mobile and web applications.

Firebase is a mobile app platform with integrated, unified client libraries in various mobile

programming languages. Firebase's different backend-as-a-service (BaaS) features help you develop high-quality apps, grow your user base, and earn more money. Each feature works independently, and they work even better together.

FEATURES:
- Unlimited reporting and Crash reporting
- Remote configuration
- Easy storage
- Firebase allows us to deliver and receive messages in a more reliable way across platforms.
- Firebase has little friction with acclaimed authentication.
- Test in the lab instead on your users.

Another important component in the project is MetaMaskwhich is a software cryptocurrency wallet used to interact with the Ethereum blockchain. It allows users to access their Ethereum wallet through a browser extension or mobile app, which can then be used to interact with decentralized applications.

MetaMask allows users to store and manage account keys, broadcast transactions, send and receive Ethereum-based cryptocurrencies and tokens, and securely connect to decentralized applications through a compatible web browser or the mobile app's built-in browser. Developers achieve a connection between Metamask and their decentralized applications by using a JavaScript plugin such as Web3js or Ethers to define interactions between Metamask and Smart Contracts.

ETHEREUM REMIX

Remix IDE is an open-source web and desktop application. It fosters a fast development cycle and has a rich set of plugins with intuitive GUIs. Remix IDE helps to write Solidity contracts straight from the browser. It is written in JavaScript and supports both usage in the browser, but run locally and in a desktop version. Remix IDE has modules for testing, debugging and deploying of smart contracts

FEATURES:
- Custom solidity versions & Remix functionality.
- Auto Compile.
- Enable optimization.
- Compilation Details and Publishing.
- Compilation Errors and Warning.

WORKING METHODOLOGY

- The system will detect counterfeit products using QR (Quick response) code, where QR code is chained to a specific product and linked to smart contracts to scan the code using smart phones or any scanner devices. This will notify whether the products are original or fake.
- A company after verification of mail Id and registration process will be given access to upload the product details with system generated QR code.
- The product details include brand and product name with manufacturing year, price, total quantity, quality of the product and also the details of manufacturer. This will be stored in database(firebase) and QR code will be stored in decentralized block using Blockchain technology.
- Each transaction of block will contain a unique QR code which cannot be reused by the manufacturer for different product.
- Manufacturer can make the tracing and identification process more secure and reliable by making use of

serialized QR code with can show product information, engage customers and increase sales.

- Customer has to register/login to the system before scanning the QR or barcode of the product.
- After the completion of user authentication, the unique scanned code from the customer will be compared with the code produced by the manufacturer stored in blocks of smart contracts.
- If code matches, then user will be notified that product is original with all its details and authentic certificate from database.
- If code does not match, the user will be notified that product is fake which can prevent purchasing of falsified product and that may result in significant health or financial losses.
- Even manufacturer can be benefitted if product is fake then the location of the user will be accessed with permission and alert will be sent to manufacturer who can take further legal actions on distributor, retailer and black-market manufacturer.
- This ensures customers trust on merchants and increases the user's satisfaction and also can save manufacturer time and money in fighting the defamation and sales because of forged manufacturers.
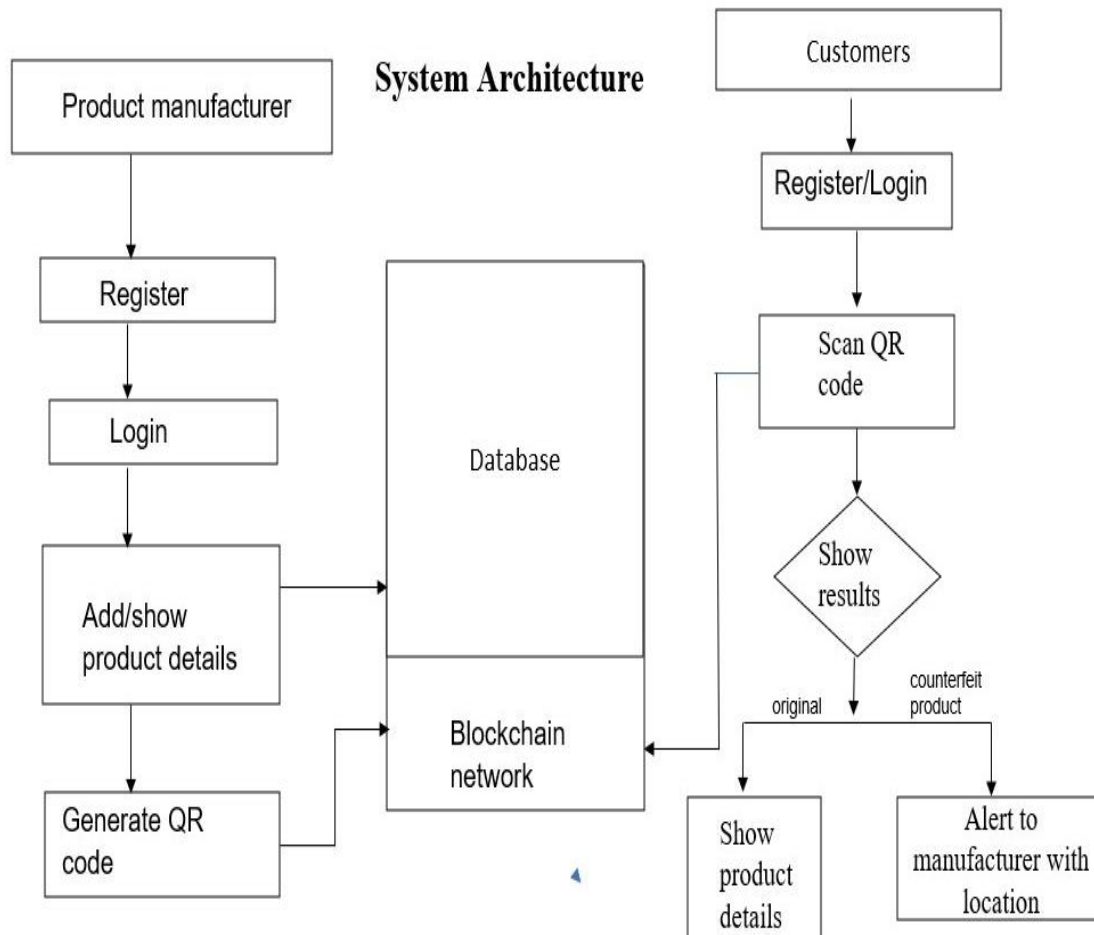

Fig 1: System Architecture

IV. RESULTS AND SNAPSHOTS:

The proposed system uses Ethereum as the back end Blockchain operating system and uses Ethereum's proprietary programming language Solidity as the high-level programming language for writing smart contracts. Solidity supports inheritance, libraries importing, etc. Solidity is designed for Ethereum Virtual Machine (EVM). Unlike Bitcoin's scripts, Solidity provides loops and it is Turing complete. On the system, the public smart contract is based on Ethereum's Blockchain. The user interface seen by the user is a mobile based application. The server side is made using the http-server suite, which is provided by node.js and web3.js is used as the link between the smart contract and the user interface. The Private Chain and Address information can be connected after setting the server.
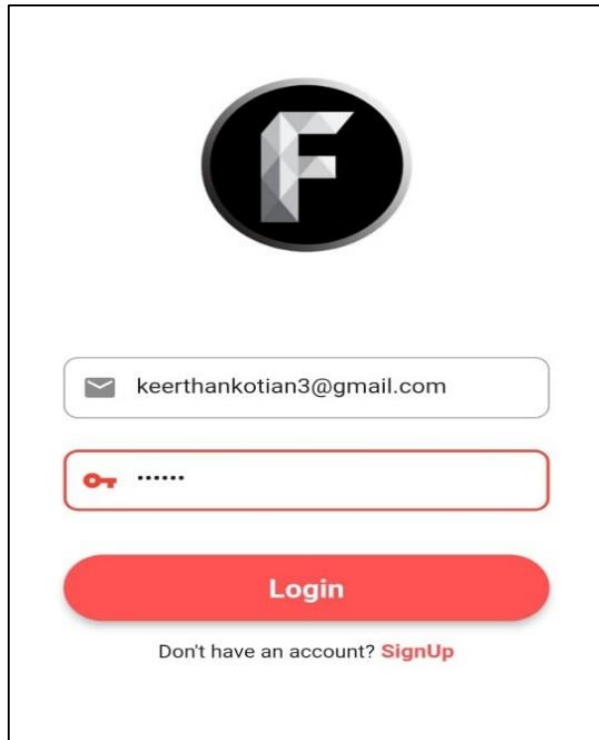
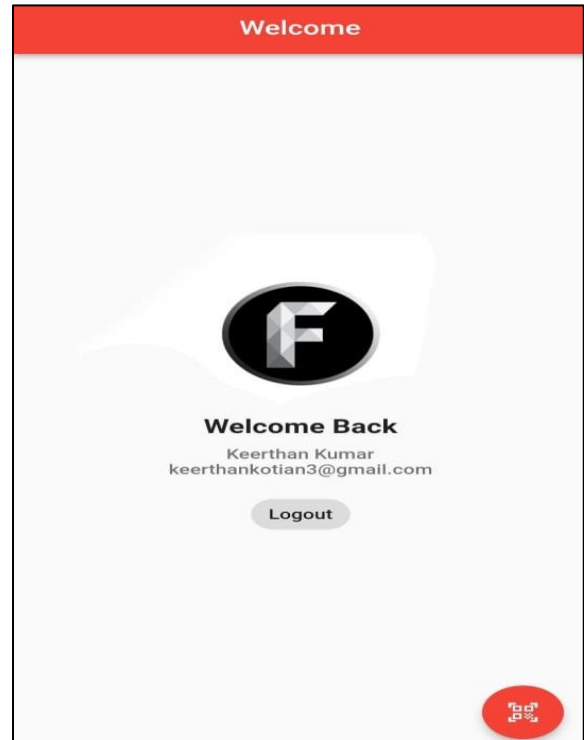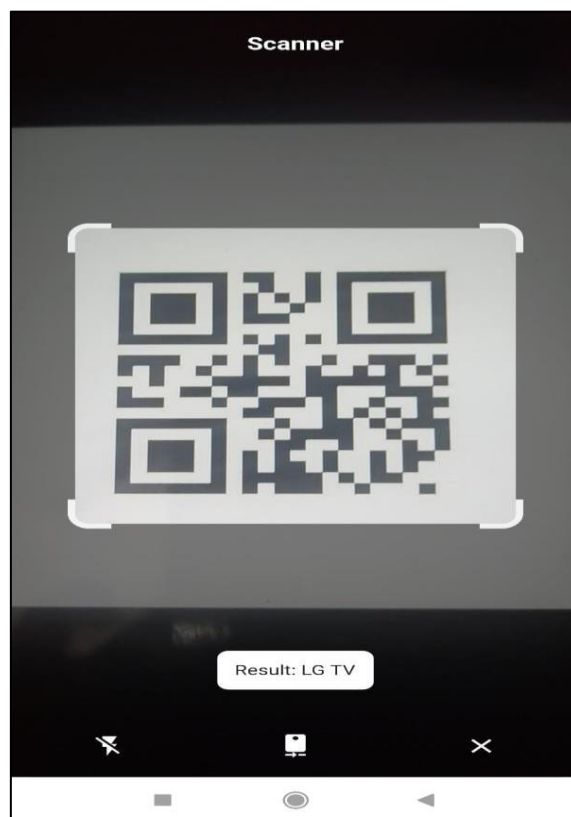CUSTOMER END:

Fig 2: Login Page

Fig 3: Home Page
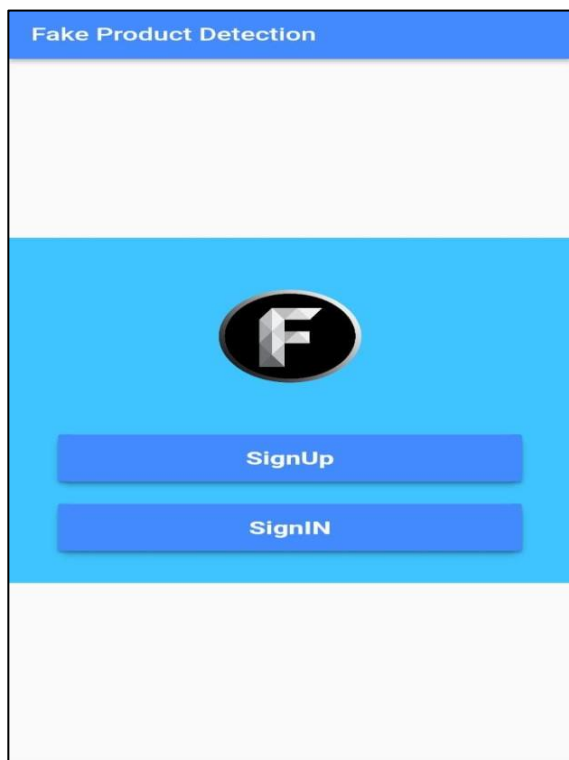

Fig 4: Final Result

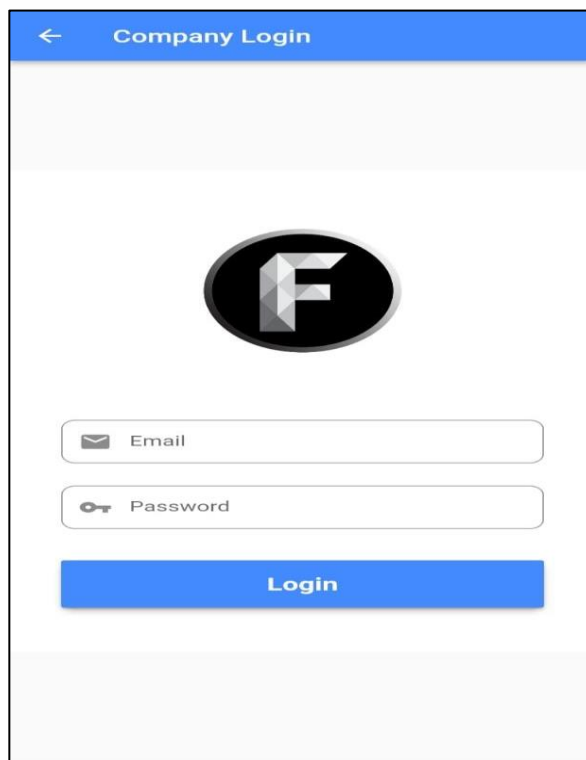MANUFACTURER END:

Fig 5: Company Sign Up

Fig 6: Company Login

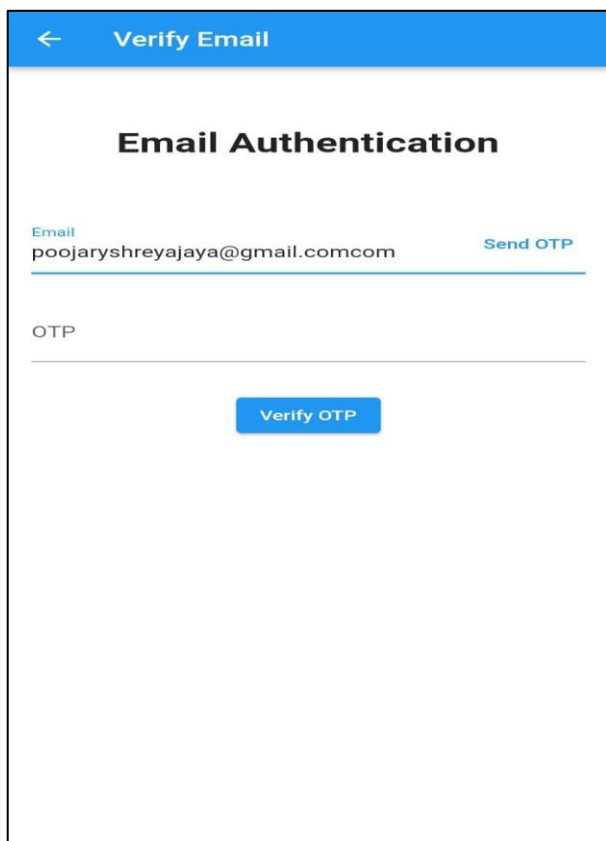**Fig 7: Email Authentication from company**
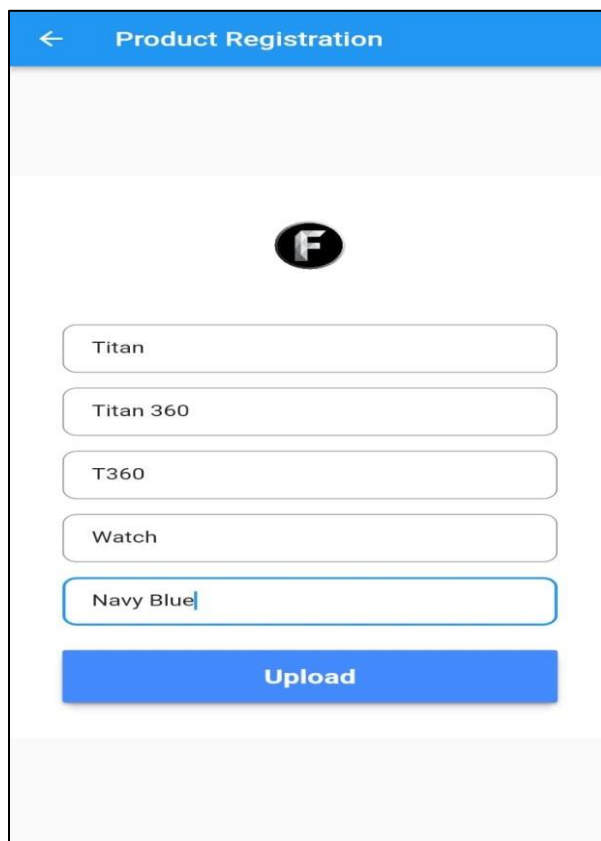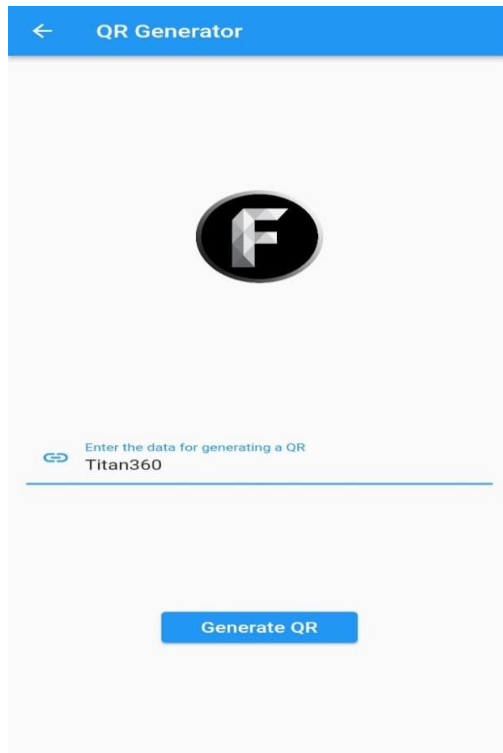

Fig 8: Product Registration

Fig 9: QR code generator	Fig 10: Generated QR code

V.   CONCLUSION

The research paper is the only smart contract based blockchain system that proposes a fully functional anti-counterfeiting application. Companies will start to adopt it at a very fast pace due to its useful features. Blockchain has been found as a great tool for the purpose of fake product identification   and elimination in supply chain management. The proposed system willallow user to easily identify and gather information about the product that they want to check or verify by paying a very low transaction fee, users of this application will no longer need to be worried about the possibility of purchasing an unsusceptible counterfeited product. Manufacturers can use the application to store relevant information on product details inblockchain which can be accessible to anyone in the application network. The total amount of sales that is sold by the distributor, retailers and manufacturers and the number of products currently left in the warehouse are transparent to manufacturing head because of serialized QR code. The consumers can make use of all provided features by the application to immediately perform manufacturer-side verification. The system provides identity verification by using digitalized QR code. This will help users to make better choice in the market and also allow them to trust the seller and the manufacturer. They don't have to rely on a third party to verify the authenticity of the product which will help in smooth and risk-free experience for them. There are no other means to decrypt the private key of the key owner unless the key owner accidentally leaks the key.

The fully functional application can effectively reduce the threshold of the anti-counterfeiting of branded goods and provide the industries with limited financial resources and also easier approach to provide consumers with the trust and surety that they will not be purchasing unsusceptible counterfeited goods. Overall, this blockchain technology-based application can emerge as a life saver for the companies and provide a new system for trading, marking and purchasing which is more secure and user friendly.

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