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RESEARCH ARTICLE

COUNTERFEIT PRODUCT DETECTION SYSTEM USING GRAPHICAL QR CODE IN BLOCKCHAIN

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Abstract

Nowadays people buy products through online and even from shops, but could not distinguish which is a counterfeit product and which is a genuine product. There are many famous companies whose product is duplicated and made some changes and are sold in the market, where even the manufacturer get confused with the duplicate product. The customer buys the product and comes to a bad opinion about the company which is completely a negative part on the side of the manufacturer and the seller who sells the product. So in order to overcome this, manufacturers need to generate a graphical Quick response code that will be linked with the blockchain. When there is a usage of a normal Quick response code (QR code) which has a combination of black and white colors it will be easy for the hackers to duplicate the data. So manufacturers need to include a graphical-based QR code where hackers could not duplicate the product which may lead to ink smearing. When they link the Graphical QR code to the blockchain all the data will be stored in the form of blocks and could not change any of the data which is stored in blocks, on the customer side where they could scan the graphical QR code and find whether the Product is genuine or not. For each transaction in the blockchain, a specific hash value will be generated and this hash when the customer scan needs to match the hash value what the manufacturer who added the block for the product. In this way, the counterfeit product could be eradicated from the market.

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Introduction:-

Even from the customer's point of view or manufacturer's point of view, counterfeit products are not preferable in the supply chain process since it creates a lot of drawbacks. The people who buy, the counterfeit product will face the problems they used to leave feedback to the manufacturer, then the manufacturer needs to look into the problem, instead in the initial stage itself the manufacturer can generate a graphical-based QR code with the basic details and can link to the blockchain. Where the customer could find whether it is genuine or not by scanning the QR code.

The blockchain is nothing but a series of blocks where all the data will be stored and converted into hash value. Each block will have a separate hash value. When we link the data, it creates a block and forms a hash value to it. We could not change any data if we try to change any data the hash value will change. The verification will be done by comparing the previous hash and the next hash value in the block. So we can keep all the data in a secure manner.

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When the customer scans the graphical QR code then the hash value will be generated and that hash will be compared with the hash value which the manufacturer who have generated by linking to the blockchain. If both hash value matches it shows as a genuine product or otherwise counterfeit product.

Literature Survey:-

Various Research has been done related to this field. The approach to cut down counterfeit ensures that consumers won't completely rely on merchants to determine if products are original or forged through blockchain[1]. A consumer can verify the product distribution and ownership information by scanning a Quick Response (QR) code generated by the DApp for each product linked to the Blockchain[2]. A paper displayed a system where blockchain was used with RFID to remove the limitation in the post-supply chain[3]. The concept might be used to store the data like product details and generated unique code for that product as blocks to the database of Blockchain. When the user uploads the unique code and the code is compared to the Blockchain database. The hashvalue of the QR code should matched otherwise it will notify the customer that the QR code is not matched and the product is fake[4]. They collect the unique code from the user and compare the code against entries in the Blockchain database. If the code matches, it will give a notification to the customer that the product is genuine, otherwise, it will give a notification to the customer that the product is fake[5]. The blockchain technology, a consumer may verify a product's authenticity without depending on a third party, which is advantageous to both them and the product's owner. Blockchain technology is a decentralized, distributed ledger that keeps all transactional data in the form of immutable, highly secure blocks that are linked by chains[6].

System architecture:

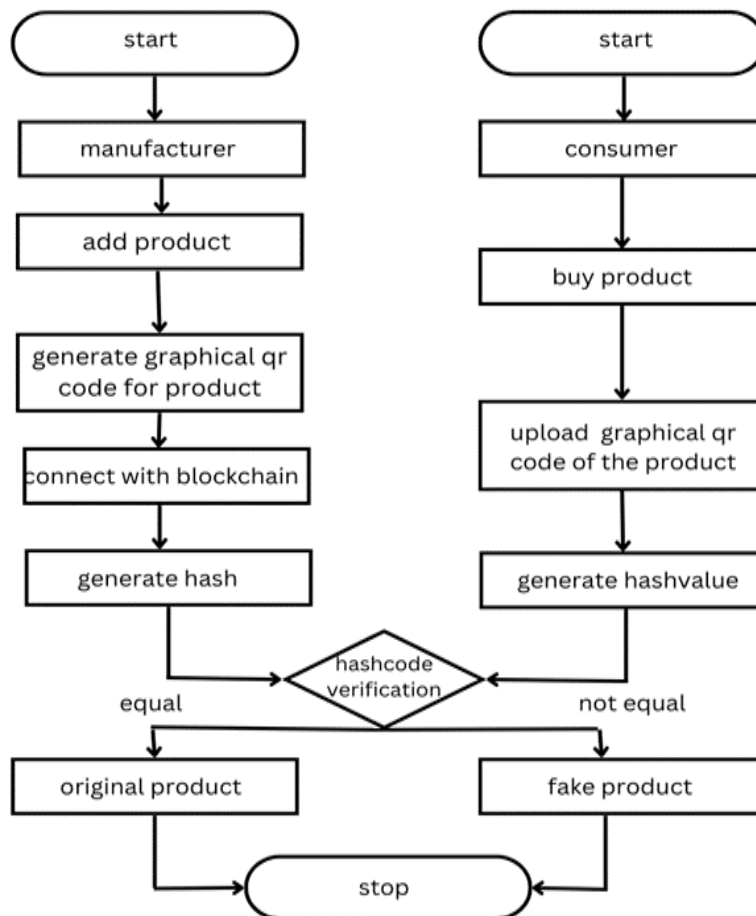


Fig 3.1:- Architecture Diagram.

The System architecture consists of manufacture and consumer part application.

In Manufacturer side they need to enter the product details and seller details. The product details include product id, product name, product brand, product price, product serial number and product pictograph, using this we generate the

graphical qr code based on the data entered by manufacturer. The seller details include seller name, seller manager, seller id, seller brand, seller phone number, seller address. All the data for verification was stored in block chain database.

In consumer side , first the consumer needs to enter the consumer code and get the product. After that they need to verify the product by using graphical qr code and product serial number and consumer code and finally the consumer will get product status as counterfeit product or original product.

Algorithm:

SHA-256 Algorithm is used for the QR code generation. SHA-256 stands for Secured Hash Algorithm 256-bit and it is used for cryptographic security.

Some of the features of SHA-256 Algorithm:

1. Message Length : The length of the cleartext should be less than 264 bits. The size needs to be in the comparison area to keep the digest as random as possible.
2. Digest Length : The length of the hash digest should be 256 bits in SHA 256 algorithm.
3. Irreversible : All hash functions such as the SHA 256 are irreversible. You should neither get a plaintext when you have the digest beforehand nor should the digest provide its original value when you pass it through the hash function again.

Blockchain Features:

Blockchain can add data to its database which does not depend on any centralized authority as a arbitrator, instead it works on its own consensus algorithms. Blockchain in openly available database and is highly reliable. The features of blockchain technology are described below.

1. Security and Privacy
2. Decentralized
3. Untrace ability
4. Transparency
5. Flexibility

Ethereum Architecture:

The user interface here has been developed using ReactJS. If the user wants to interact with the smart contract, the DApp will use Web3.js which communicates with MetaMask through its provider. MetaMask creates a transaction and signs it with the user's private key where the private key for the user is taken from ganache. When developing DApp, it is highly beneficial to setup a local Ethereum blockchain where your DApp can be tested in a safe environment. This transaction is then sent to Ethereum network. The transaction is processed, verified and added to a block in the network. The private keys of the user are never recorded in the process so user can safely interact with the network.

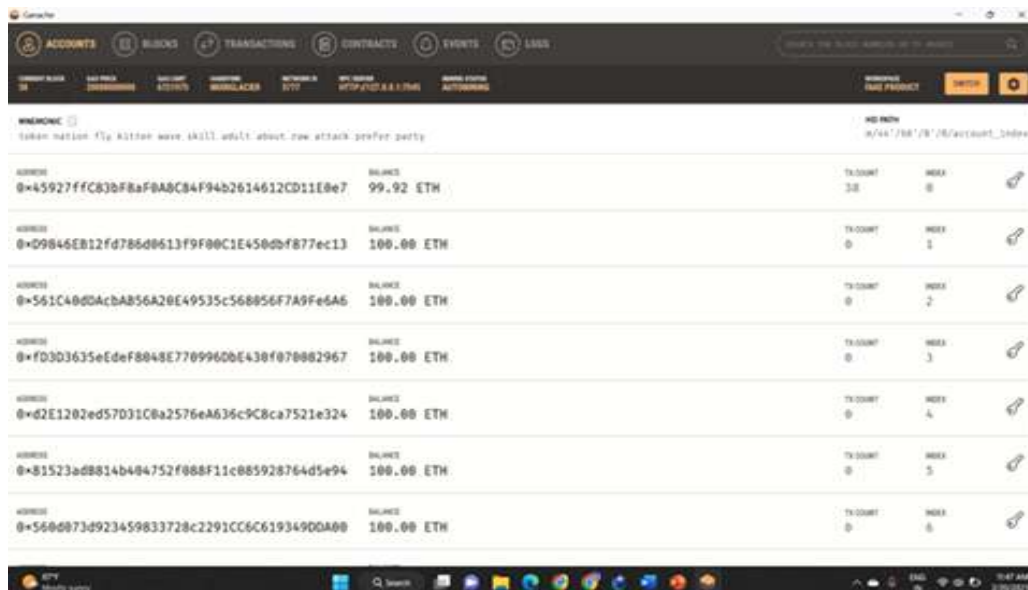


Fig6 6.1:-Ganache.

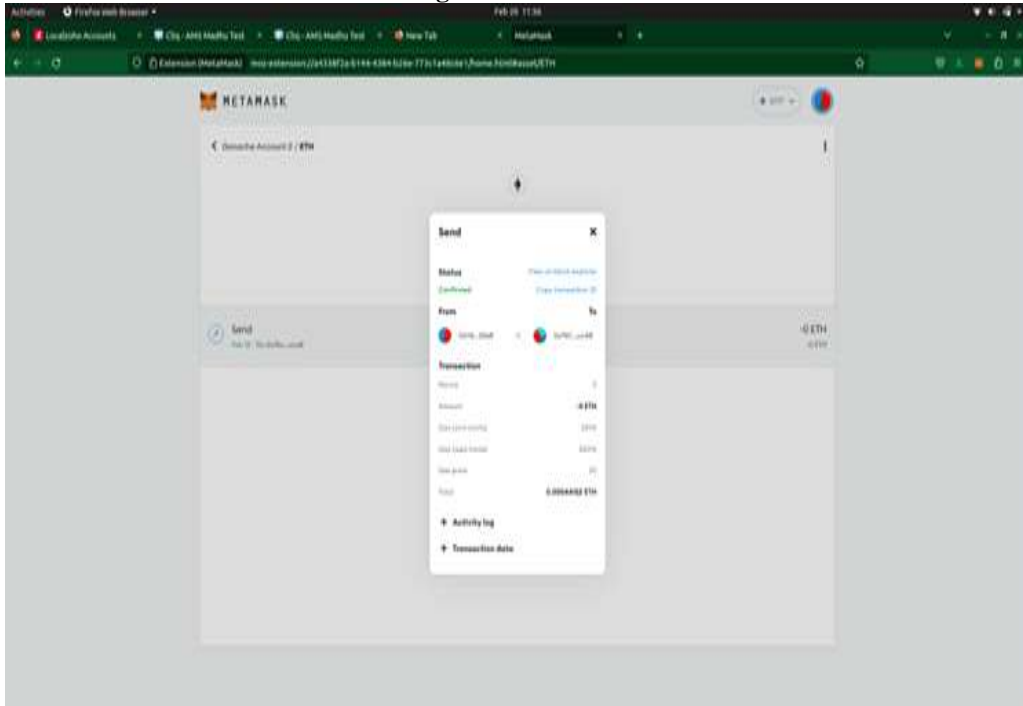


Fig 6.2:-Metamask.

Result:-

The counterfeit product detection real-time system is implemented to check whether the received product is a counterfeit product or original product. The manufacturer system uses SHA-256 algorithm to generate a graphical qr code using block chain technology. The generated graphical qr code is used in the product which will be scanned by the consumer after product purchase. Based on the hash value the product gets verified as counterfeit or original product. Also customer can add review of the product they purchased which will show the graph about overall review value of the particular product.

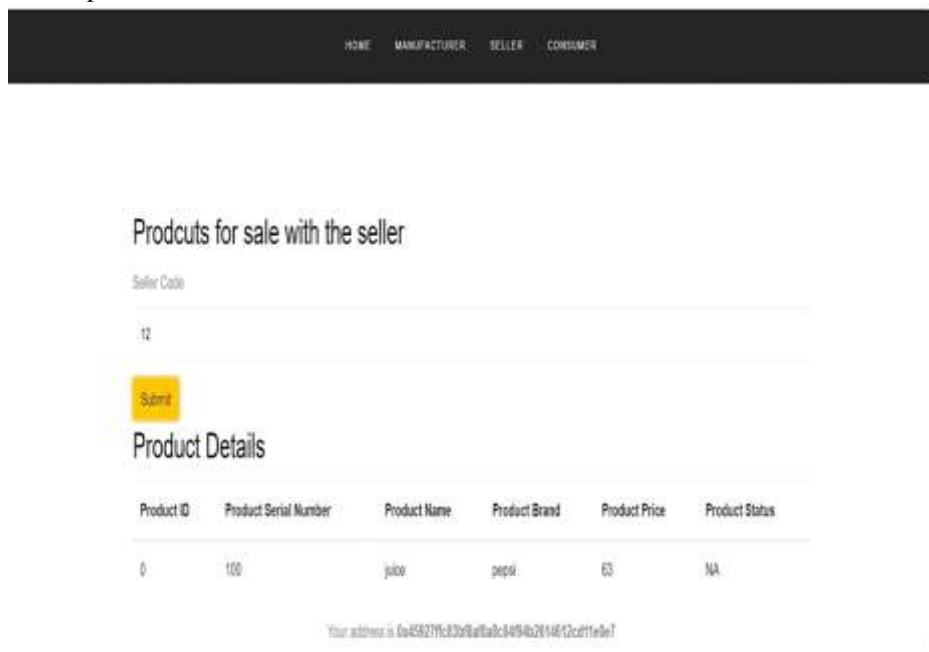


Fig 7.1:- Manufacturer Side.

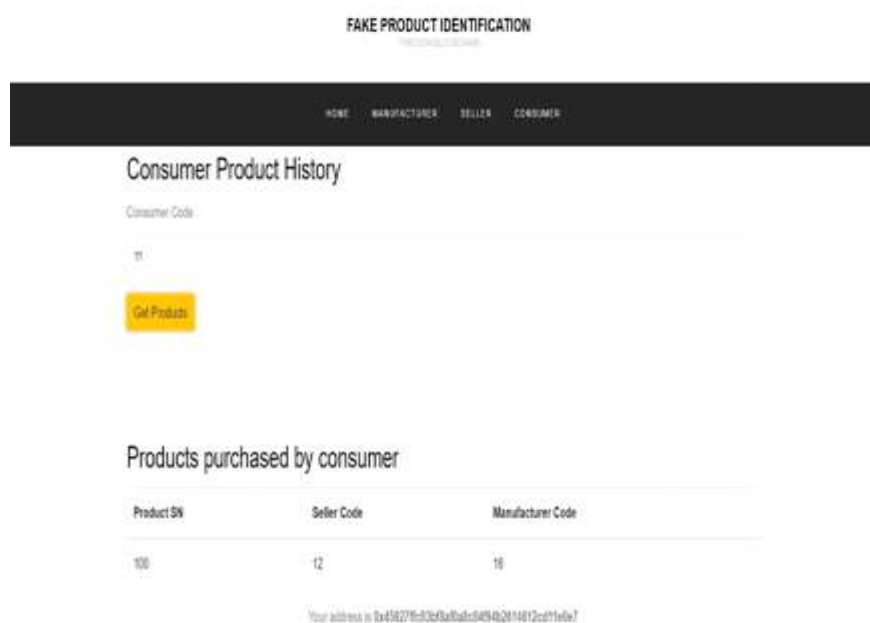


Fig 7.2:- Consumer Side.

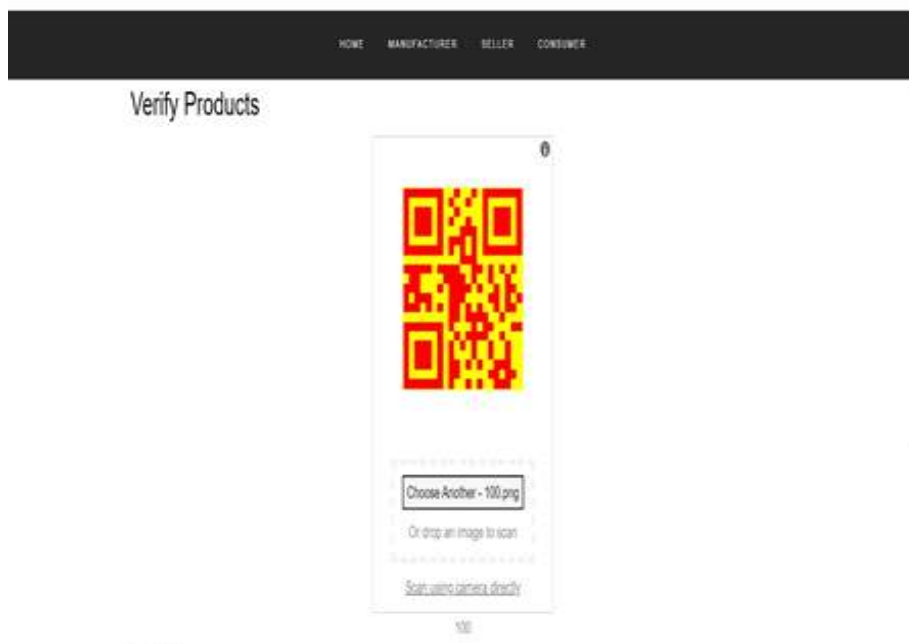


Fig 7.3:- Genuine Product Verification.

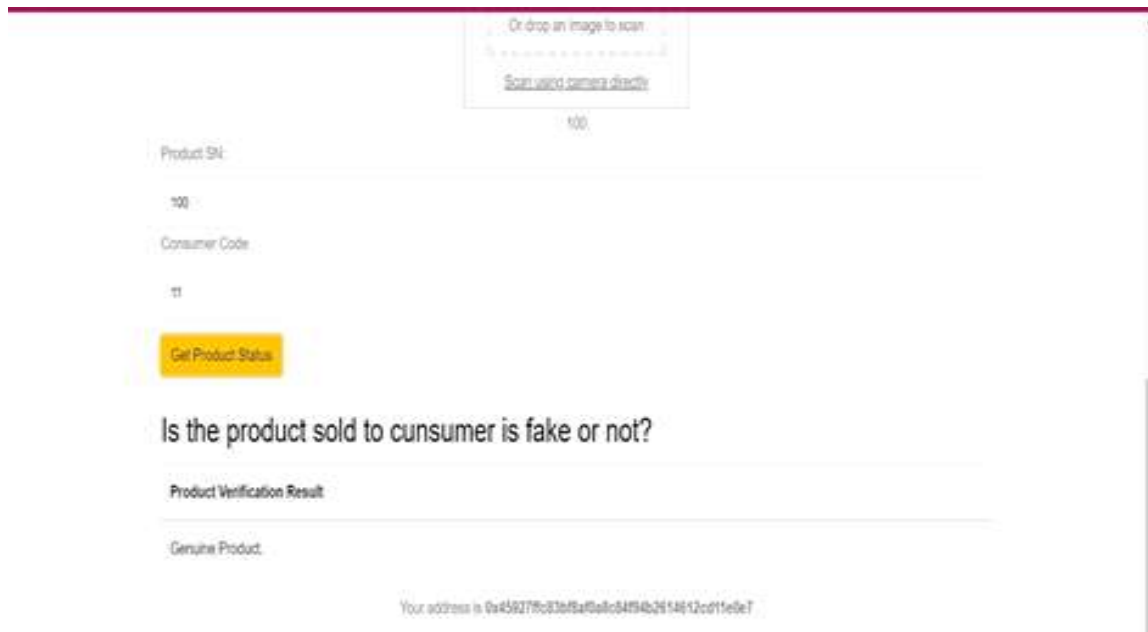


Fig 7.4:- Genuine Product Result.

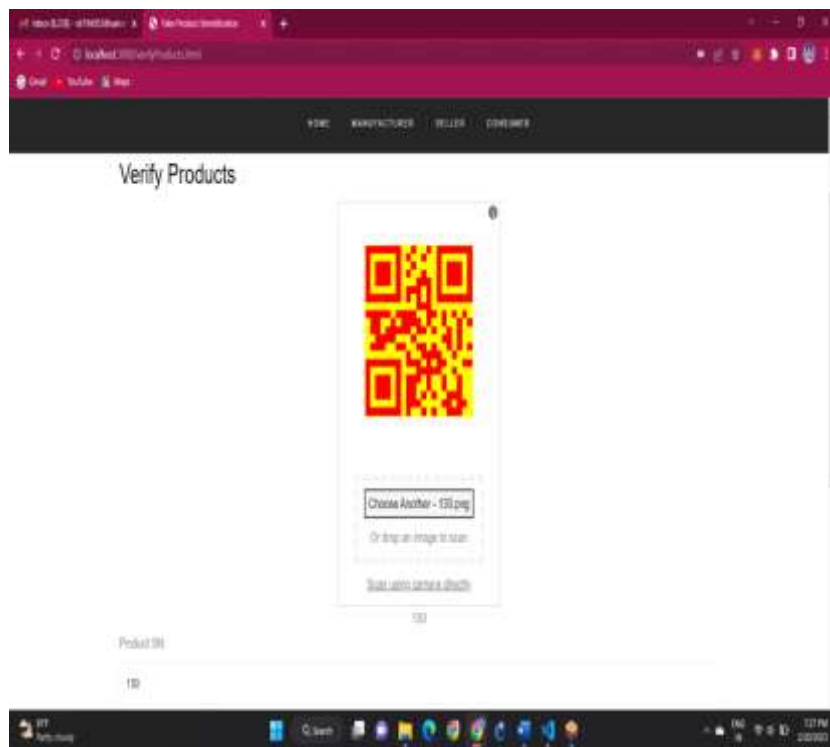


Fig 7.5:- Fake Product Verification.

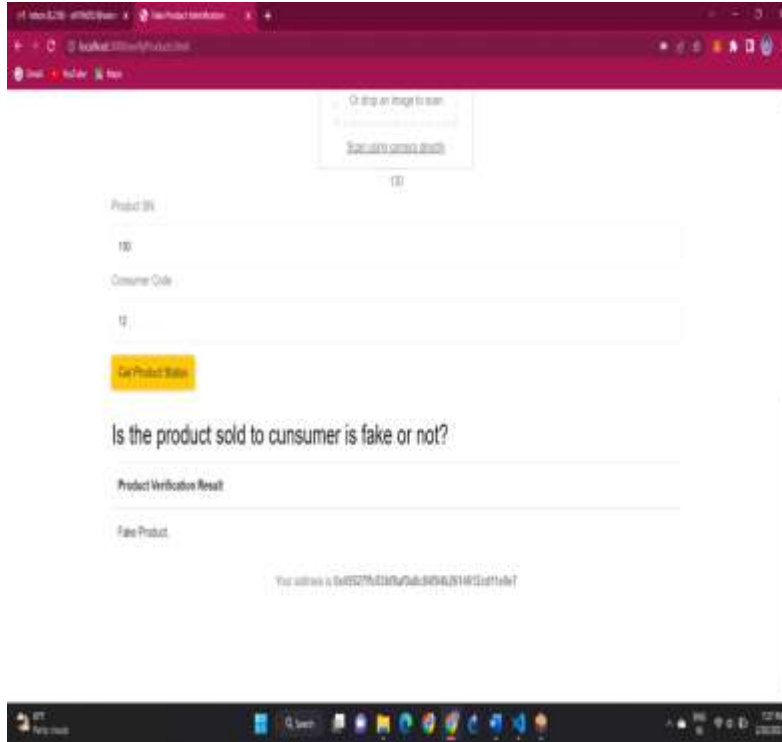


Fig 7.6: Fake Product Result.

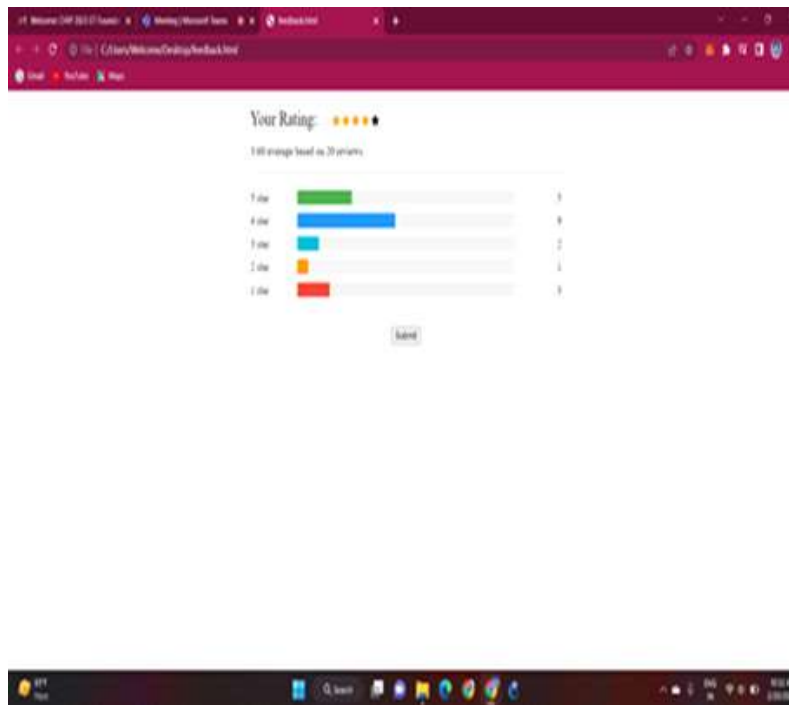


Fig7.7:- Customer Review.

Future Scope:

Now a days counterfeit products are growing exponentially with enormous amount through online or through any whole sale market etc.. which may lead to confidential issues between manufacturer and consumer. So to reduce these issues and give some clarification for consumer we developed this counterfeit product detection system. Here we used

graphical qr code where the data about product is used as input for qr code generation. If the fraudster enter the details as same as original product then they can also generate a similar qr code for their counterfeit product.

To overcome this in future we can use pictograph of the product in the qr code generation from manufacture where the pictograph contains some unique feature confidential to their manufacture side and with the help of color and ink in pictograph we can easily classify the counterfeit product from original product. This system may help the consumer to trust the manufacturer and also we can deliver the good product to consumer side.

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