

Pharmacy Fraud Detection using Block Chain by Scanning QR Code

Prashant Govardhan, Rupak Ganvir, Ritesh Lolusare, Aniket Kokate, Ishank Thakre,
Priyanka Sarode

*Computer Science and Engineering Department, Priyadarshini College of Engineering, Hingna Rd,
Digdoh Hills, Nagpur-440019, Maharashtra, India.*

*E-mail: rupakganvir12@gmail.com, lolusareritesh@gmail.com, aniketkokate2110@gmail.com,
ishankthakare99@gmail.com, sarodepriyanka58@gmail.com*

Abstract

The pharmaceutical business is one of many that is driving digital transformation with blockchain technology. Lack of transparency, difficulty tracing items, a lack of confidence, and the distribution of out-of-date medicines are all problems in the pharmaceutical industry. Several of these issues have been resolved using blockchain technology. In this article, we give a thorough analysis of the literature on blockchain use in the pharmaceutical sector. We gathered, evaluated, classified, and talked about studies pulled from some databases. Preventing the sale of counterfeit drugs was the most popular category, which is consistent with the pharmaceutical industry's main goal. Data governance, data quality, pharmaceutical turnover, and prescription medication monitoring were the more recent subjects covered in this study. We explore the problems associated with each of these themes and research investigations, as well as their shortcomings and potential solutions. We also look at the difficulties and potential paths for future study in using blockchain technology in the pharmaceutical sector.

Keywords – Pharmaceuticals, Blockchain, Security, Data Transparency, Digital Tracing

Introduction:

In this day and age, almost every product is affected by piracy and counterfeiting, including medications and drugs. Over the past several years, the problem of counterfeit pharmaceuticals in the pharmaceutical business has spread to other parts of the world. A WHO research estimates that 10.5% of the pharmaceutical products sold in low- and middle-income countries are fraudulent. Therefore, it is necessary to create a solid model to address the problem of counterfeit pharmaceuticals. Additionally, the existing business lacks a comprehensive understanding of how pharmaceuticals are delivered from the manufacturer of medicines to the patients. We want to create a blockchain-based system that can track the transit of drugs from the manufacturing process to the consumer while also preventing medication fraud. Contributions: By putting QR codes on drugs as they are being manufactured, the issue of counterfeiting medicines and identifying them can be resolved. After that, by swiping their QR codes, we may find fraud medicines by scanning the QR code present in the medicine box. However, this method will not entirely resolve the issue of pharmaceuticals monitoring and counterfeiting because it is possible to copy the QR code and then apply it to the fake drug. Therefore, we developed a model using Hyperledger fabric that is built on a decentralized system like blockchain, in which the producer will create a drug and submit its specifications on this blockchain.

It becomes urgent to ensure subpar pharmaceuticals when life-critical healthcare shifts. Because fake medicine has devastating effects and a fatal impact on the human body. We designed a drug traceability system utilising blockchain technology to identify the tampered medications. From the manufacturer's business to the patient's hand, our technology can identify inferior and abnormal medication. Smartphones may also be used to check for product defects through scanning QR codes. The system might become more trustworthy and transparent thanks to blockchain security.

Literature Survey:

We designed a drug traceability system utilizing blockchain technology to identify the tampered medications. From the manufacturer's business to the patient's hand, our technology can identify inferior and abnormal medications. Smartphones can also use QR (Quick Response) codes to check for expired and faulty medications on the market. The system might become more trustworthy and transparent thanks to blockchain security. This study uses blockchain technology to guarantee medicine performance, transaction security, as well as data safety. [1]

In order to monitor and trace the location of medicines, a system is needed. Advanced blockchain features have demonstrated their ability to manage complex supply chains and detect items at every level, preventing the distribution of bogus drugs among various stakeholder groups. Therefore, a decentralized system is suggested in this study to track and trace fake medications in the supply chain control. The system is also built on the Ethereum platform, which combines an encrypted QR code method with cutting-edge blockchain technology to effectively track and trace counterfeit pharmaceuticals in the system. [2]

The primary problems with the security of drugs in the supply chain for fake medications have to do with the method the medications are made in the beginning. Medicines that do not contain the desired active components can hurt or even kill end-user patients because it is difficult to trace the proper and active pharmaceutical constituents during real manufacture. Due to its sophisticated capabilities, blockchain can serve as a foundation for complete medicine tracking from supplier to end user as well as the detection of fake medications. In this study, drug safety will be addressed using blockchain technology and secure encrypted QR codes. [3]

The suggested system provides a complete record of the drug circulation process while doing away with the requirement for centralized institutions and outside organizations. Our simulation findings demonstrate that the modified consensus method and access control technique increase efficiency and security. Due to this, our method can provide the high level of safety and privacy necessary to maintain a drug information management system's integrity. [4]

This study uses blockchain technology to guarantee medicine quality, the privacy of transactions, and data safety. This technology can identify suspect and unusual medications from the manufacturer to the patient. Smartphones can also use QR (Quick Response) codes to check for expired and faulty medications on the market. The system might become more trustworthy and transparent thanks to blockchain security. We designed a drug trace system utilizing blockchain technology to identify the tampered medications. [5]

To stop product counterfeiting, a variety of strategies have been used from time to time, including RFID tags, AI, machine learning, QR code-based systems, and many more. However, these techniques have drawbacks, including the ability of QR codes to be copied from a real product to a false one, the requirement of considerable computer power for AI and machine learning processes, and the lack of a fully functional technique. With the use of blockchain technology, we have attempted to enhance the detection of counterfeit goods in this project. [6]

It becomes urgent to ensure subpar pharmaceuticals when life-critical healthcare shifts. Because fake medicine has devastating effects and a fatal impact on the human body. We designed a medicine tracing system utilising blockchain technology to identify the tampered medications. From the manufacturer's business to the patient's hand, our technology can identify inferior and abnormal medications. Smartphones can also use QR (Quick Response) codes to check for expired and faulty medications on the market. The system might become more trustworthy and transparent thanks to blockchain security. [7]

The suggested system may store product data and will produce unique, product-specific codes for each product, saving it as a single unit. It will request the consumer's unique code, which he can obtain by scanning the Quick Response (QR) code on the product, and then check the blockchain database for the code. If the code corresponds, the consumer will receive a receipt for the purchase; if not, they will be informed that the product is fake. [8]

3. Pre-Requisites:

3.1 Blockchain:

A blockchain, in its most basic form, is a network made up of machines that copies and communicates a digital ledger of transactions. A record of the mileage associated with each new valid interest is recorded to each person's ledger each time it enters the ledger. There are several transactions on each blockchain. Disbursed

ledger (DLT) refers to the decentralized ledger that might be maintained by various parties. The term "blockchain" refers to a growing collection of records, or "blocks," that are linked together cryptographically. Every block (which is frequently shown as a Merkle tree contains the date, a cryptography hash of the chain before it, and transaction records. Its architecture, which uses a blockchain, makes data alteration impossible.

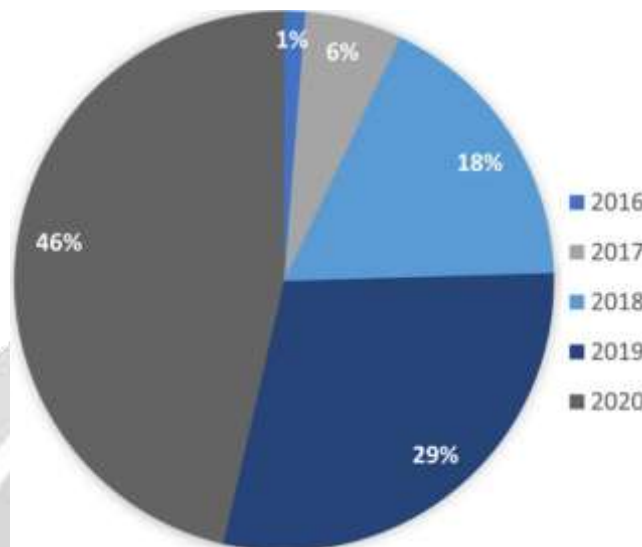


Fig. 3.1 Research Analysis on Blockchain used in Healthcare

A number of issues, such as a lack of transparency, trouble tracking products, a lack of confidence, and the dispatch of expired goods, plague the conventional pharmaceutical supply chain. [9] Nevertheless, the manufacture and distribution of pharmaceuticals requires the pharmaceutical sector to keep accurate records regarding the provenance of raw materials [10].

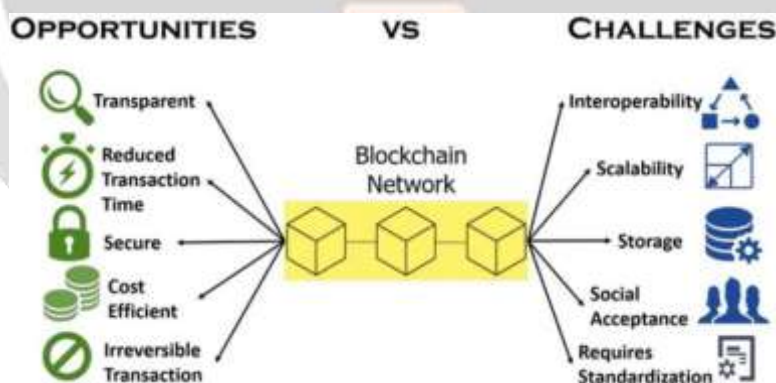


Fig. 3.2 Applications and Challenges in block chain

3.2 HTML & CSS

Two of the key technologies for creating Web pages are HTML, or Hypertext Markup Language, and CSS, or Cascading Style Sheets. For a range of devices, HTML supplies the page's structure while CSS handles the visual and auditory layout. Regardless of the intricacy of a site or the number of technologies used, HTML is the fundamental building block of every web page. CSS, or cascading style sheets, is an acronym. How the HTML parts of a website actually display on the front end of the page is determined by this programming language.

3.3 JavaScript:

Web pages are frequently made using JavaScript. We can add dynamic behaviour and additional effects to the website thanks to it. It is primarily utilised for validation on webpages. JavaScript facilitates interaction between websites and their visitors as well as the execution of sophisticated actions.

3.4 Bootstrap:

Responsive web design is now a reality thanks to Bootstrap. It enables a website or app to recognise the size and orientation of the visitor's screen and automatically adjust the display.

3.5 PHP & MySql:

Applications, ecommerce platforms, and interactive websites that are dynamic can all be created with PHP. From creating dynamic web pages, delivering emails, gathering web forms, and receiving cookies, PHP is perfectly suited for a variety of web jobs. A system for managing relational databases is MySQL. All software programmes require databases as their primary data storage solution. A database system, for instance, stores information whenever someone performs an internet search, logs into an account, while completes an operation in order to can be accessible later.

3.6 Android XML:

eXtensible Markup Language (XML), as its name suggests, is a method of defining data in a text-based document. XML is utilised for a variety of activities due to its extensibility and flexibility, including creating the user interface (UI) layout of Android applications. The term "resources" refers to a broader category of Android files including components, which includes Android XML layouts.

3.7 Java:

It is an OOP (object-oriented programming) language that aids programmers in writing cleaner, more effective code. Java also has automatic memory management, allowing programmers to concentrate on writing code rather than worrying about memory problems. It can be used on every operating system, including iOS and Android because it is platform-independent.

4. Proposed Architecture:

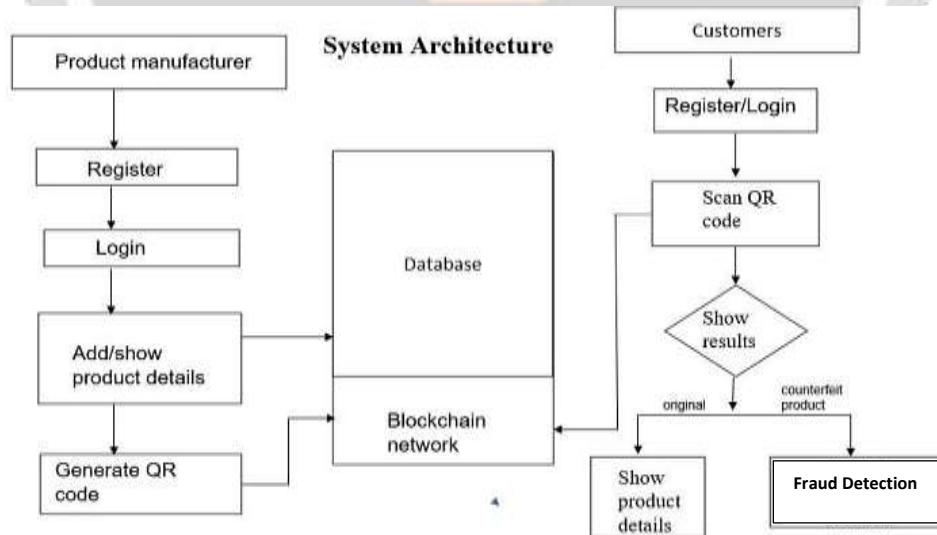


Fig. 4.1.1 System Architecture

The idea behind the undertaking is to use Blockchain, which is one of the ensuring security technologies, to uncover fraud in the pharmaceutical business in the production and distribution of original medications in the pharmaceutical wholesale in addition to the retail market. And using web-based languages like HTML, CSS, JavaScript, Bootstrap, and PHP to implement a frontend. In order to restrict access to the data published in the panel to authenticated users, we utilise a MySQL database to store user data. An application for Android is used

to scan the Quick Response (QR) code produced by product registration for the second module of QR code scanning. Java is utilised as a backend technology for this.

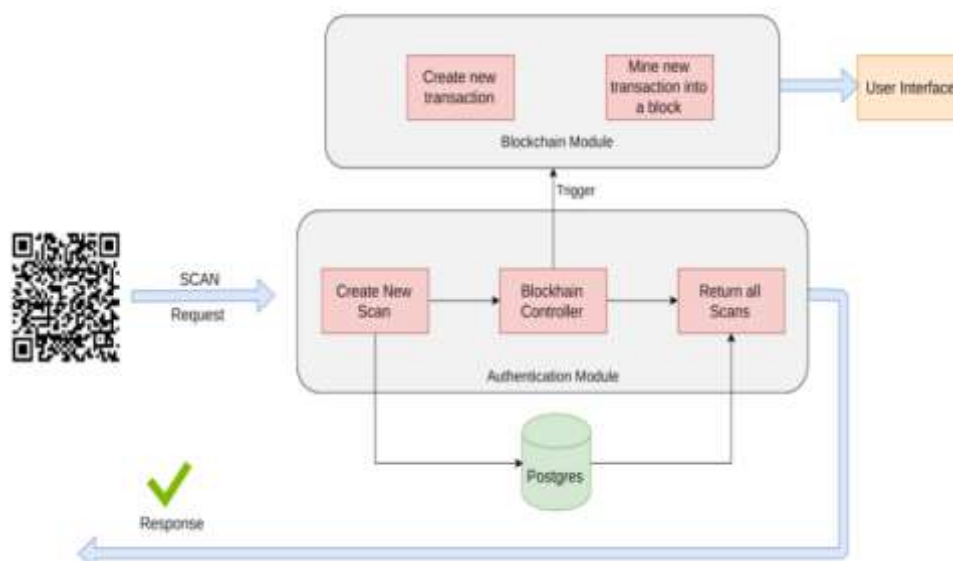


Fig. 4.1.2 QR code Authentication Process

STEP 1 User and Admin Registration:

First of all user had to register details of medicines they are willing to upload into database. After the successful upload a unique QR code is generated to make that particular product unique.

STEP 2 Android Application:

Now to ensure the originality of the product or medicine one has to scan the QR code and read the details from the scanned QR code.

5. Conclusion

In this article, we create a viable, secure infrastructure based on blockchain for the medical supply chain between authorised actors on the traditional drug supply chain. Our solution relies on blockchain security to uniquely and discretely identify the pharmaceuticals. As a result, a fake drug or fraudulent distributor can be readily and quickly discovered. The early version reconstructs the entire traditional medicine supply chain service architecture, enabling it to offer medication security and manufacturer authenticity. The chain is made stable and acceptable by optimising the storage of blockchain data by deleting information about expired medications. Through our investigation, we learned about several blockchain technology applications. Eventually, a robust, affordable, simple, decentralized, and highly secure program was created that deals with phony products and false product detection. It is possible to accomplish this by recognizing the QR code that is attached to the merchandise, and it can handle numerous things simultaneously. The end-user can determine whether a product is legitimate or not by using the information provided by scanning the QR codes attached to it. This information includes manufacturing dates, expiration dates, owner information, and more.

6. References:

- [1] M. R. H. T. S. A. S. F. I. A. R. a. S. M. N. Alam, "Blockchain Based Counterfeit Medicine Authentication System," *2021 IEEE 11th IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE), Penang, Malaysia*, no. doi: 10.1109/ISCAIE51753.2021.9431789., pp. pp.

- 214-217, 2021.
- [2] K. S. R. H. B. T. K. N. a. S. M. P. T. S, "Med Secure: A Blockchain based Authenticated System for Counterfeit Medicine in DecentralizedPeer to Peer Network," *2021 Asian Conference on Innovation in Technology (ASIANCON), PUNE, India*, no. doi: 10.1109/ASIANCON51346.2021.9544648., pp. pp. 1-7.
- [3] R. K. a. R. Tripathi, "Traceability of counterfeit medicine supply chain through Blockchain," *2019 11th International Conference on Communication Systems & Networks (COMSNETS), Bengaluru, India*, no. doi: 10.1109/COMSNETS.2019.8711418, pp. pp. 568-570.
- [4] ., J. H. Y. Z. X. L. PENG ZHU, "A Blockchain Based Solution for Medication," *IEEE Access*, October 6, 2020.
- [5] M. R. H. T. S. A. S. F. I. Nazmul Alam, "Blockchain Based Counterfeit Medicine Authentication System," *2021 IEEE 11th IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE)*, no. DOI:10.1109/ISCAIE51753.2021.9431789, 2021.
- [6] A. S. S. G. Aadeesh Bali, "Fake Product Detection System Using Blockchain," *Research Gate*, December 2022.
- [7] A. B. P. S. Prof. Archana Burujwale, "BLOCKCHAIN BASED COUNTERFEIT MEDICINE AUTHENTICATION," *International Journal of Research Publication and Reviews*, Vols. Vol 3, no 6, no. ISSN 2582-7421, pp. pp 382-384, June 2022.
- [8] S. S. G. T. T. Y. A. S. Rashmi Tundalwar, "FAKE PRODUCT DETECTION USING," *International Journal of Engineering Applied Sciences and Technology*, Vols. Vol. 7, ISSN No. 2455-2143, no. Issue 7, pp. Pages 69-72, 2022.
- [9] S. & Z. Sinclair, "Security requirement prototyping with hyperledger composer for drug supply chain: a blockchain application," *Proceedings of the 3rd international conference on cryptography, security and privacy - ICCSP '19, Kuala Lumpur, Malaysia;*, p. pp. 158–163, 2019.
- [10] P. & Kuznetsova, "The prospects for the use of digital technology 'blockchain' in the pharmaceutical market," *MATEC Web Conference*, no. doi: 10.1051/mateconf/201819302029, p. 193:1–6, 2018.